CHINA'S 13TH FIVE-YEAR PLAN

HEARING

BEFORE THE

U.S.-CHINA ECONOMIC AND SECURITY REVIEW COMMISSION

ONE HUNDRED FOURTEENTH CONGRESS
SECOND SESSION

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UNITED STATES-CHINA ECONOMIC AND SECURITY REVIEW COMMISSION

WASHINGTON: 2016

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The Commission was created on October 30, 2000 by the Floyd D. Spence National Defense Authorization Act for 2001 § 1238, Public Law No. 106-398, 114 STAT. 1654A-334 (2000) (codified at 22 U.S.C. § 7002 (2001), as amended by the Treasury and General Government Appropriations Act for 2002 § 645 (regarding employment status of staff) & § 648 (regarding changing annual report due date from March to June), Public Law No. 107-67, 115 STAT. 514 (Nov. 12, 2001); as amended by Division P of the "Consolidated Appropriations Resolution, 2003," Pub L. No. 108-7 (Feb. 20, 2003) (regarding Commission name change, terms of Commissioners, and responsibilities of the Commission); as amended by Public Law No. 109-108 (H.R. 2862) (Nov. 22, 2005) (regarding responsibilities of Commission and applicability of FACA); as amended by Division J of the "Consolidated Appropriations Act, 2008," Public Law Nol. 110-161 (December 26, 2007) (regarding responsibilities of the Commission, and changing the Annual Report due date from June to December); as amended by the Carl Levin and Howard P. "Buck" McKeon National Defense Authorization Act for Fiscal Year 2015, P.L. 113-291 (December 19, 2014) (regarding responsibilities of the Commission).

The Commission's full charter is available at www.uscc.gov.

June 13, 2016

The Honorable Orrin Hatch
President Pro Tempore of the Senate, Washington, D.C. 20510
The Honorable Paul Ryan
Speaker of the House of Representatives, Washington, D.C. 20515

DEAR SENATOR HATCH AND SPEAKER RYAN:

We are pleased to notify you of the Commission's April 27, 2016 public hearing on "China's 13th Five-Year Plan." The Floyd D. Spence National Defense Authorization Act (amended by Pub. L. No. 113-291) provides the basis for this hearing.

At the hearing, the Commissioners received testimony from the following witnesses: Dr. Yilin Hou, Professor, Public Administration and International Affairs and Senior Research Associate, Center for Policy Research, Maxwell School, Syracuse University; Dr. Weiping Wu, Professor and Chair of the Department of Urban and Environmental Policy and Planning, Tufts University; Dr. Eswar S. Prasad, Tolani Senior Professor of Trade Policy, Cornell University; Dr. Crystal Chang, Lecturer in Political Science, University of California, Berkeley; Dr. Chad J.R. Ohlandt, Aerospace Engineer, RAND Corporation; Mr. Jimmy Goodrich, Vice President, Global Policy, Semiconductor Industry Association; Ms. Deborah Seligsohn, Ph.D. Candidate, University of California, San Diego; Mr. Damien Ma, Fellow and Associate Director, The Paulson Institute; and Dr. Yanzhong Huang, Senior Fellow for Global Health, Council on Foreign Relations. This hearing examined China's fiscal and financial reforms, implementation of China's high - tech industrial policy in the automobile, aviation, and semiconductor sectors, efforts to improve citizens' quality of life, and the implications these reforms and policies have for U.S. economic and national security interests.

We note that prepared statements for the hearing, the hearing transcript, and supporting documents submitted by the witnesses are available on the Commission's website at www.USCC.gov. Members and the staff of the Commission are available to provide more detailed briefings. We hope these materials will be helpful to the Congress as it continues its assessment of U.S. - China relations and their impact on U.S. security.

The Commission will examine in greater depth these issues, and the other issues enumerated in its statutory mandate, in its 2016 Annual Report that will be submitted to Congress in November 2016. Should you have any questions regarding this hearing or any other issue related to China, please do not hesitate to have your staff contact our Congressional Liaison, Anthony DeMarino, at (202) 624-1496 or via email at ADeMarino@uscc.gov .

Sincerely yours,

Hon. Dennis C. Shea
Chairman

Carolyn Bartholomew
Vice Chairman

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CHINA'S 13TH FIVE-YEAR PLAN

WEDNESDAY, APRIL 27, 2016

U.S.-CHINA ECONOMIC AND SECURITY REVIEW COMMISSION

Washington, D.C.

The Commission met in Room 285 of Hall of the States, Washington, DC at 9:00 a.m. Chairman Dennis C. Shea and Commissioner Carte P. Goodwin (Hearing Co-Chairs), presiding.

OPENING STATEMENT OF CHAIRMAN DENNIS SHEA HEARING CO-CHAIR

CHAIRMAN SHEA: Good morning, everyone. Welcome. This is the fifth hearing of the U.S.-China Economic and Security Review Commission's 2016 Annual Report cycle, and I want to thank our witnesses for being here today and for the time they have put into their excellent written testimony. It really was excellent, and I think it was one of the few times we actually got all the written testimony in relatively early so I appreciate that. And Katherine Koleski, who is the staff person on this hearing, you did a great job.

Today's hearing examines Chinese President Xi Jinping's vision for China's development, the 13th Five-Year Plan. This blueprint seeks to create a "moderately prosperous society in all respects" based on innovation, open trade, green growth and inclusive growth.

Understanding the key priorities of the world's top trading nation, most populous country, largest manufacturer, and second-largest economy, and the opportunities and challenges they create for the United States is critically important for U.S. policymakers and businesses.

Our hearing seeks to address three important questions: how will the Chinese government finance its ambitious reform agenda; what is the impact of China's high-tech industrial policies on U.S. automotive, aerospace, and semiconductor industries; and finally, what are the opportunities and challenges for U.S. companies to compete fairly in China's expanding consumer and service market?

The 13th Five-Year Plan builds upon the 11th and 12th Five-Year Plans to shift China's economy away from large-scale infrastructure and export-led growth toward an economy driven by domestic consumption and higher value-added manufacturing.

The Chinese government is hoping to unleash economic growth and create a new consumer base and working class through urbanization. In addition, the Chinese government is expanding access to public services such as education and healthcare through reforms of the hukou residency registration system. By 2020, the Chinese government hopes to increase the share of its population with urban hukou from 40 to 45 percent.

The 13th Five-Year Plan is also the greenest plan, at least on paper, to date and sets caps for energy use and targets for city air quality, carbon dioxide intensity, and reduction in soil and water contamination. These targets are important to both meet public demands for a livable environment and reorient the economy toward more sustainable economic growth.

But the construction of affordable housing and urban infrastructure, expansion of

public services, and environmental clean-up and protection will require significant funding. Local governments, which have to pay for most of these reform initiatives, have a limited ability to raise funds and are struggling with unsustainable debt burdens.

The Chinese government has reiterated its commitment to overhauling its fiscal and financial systems in the 13th Five-Year plan, but reforms have been subject to numerous reversals as the central government struggles to maintain employment and meet its 6.5 percent average growth target for the next five years.

In the first quarter of 2016, the Chinese government once again fell back on its old tools of investment-led growth to bolster the economy, which raises important questions about the ability of the Chinese government's commitment to its fiscal and financial reform agenda.

I will now cede the floor to my co-chair, Senator Goodwin, for his opening remarks.

PREPARED STATEMENT OF CHAIRMAN DENNIS SHEA
HEARING CO-CHAIR

Hearing on China's 13th Five-Year Plan

April 27, 2016

Opening Statement of Chairman Dennis Shea

Good morning, and welcome to the fifth hearing of the U.S.-China Economic and Security Review Commission's 2016 Annual Report cycle. I want to thank our witnesses for being here today, and for the time they have put into their excellent written testimony.

Today's hearing examines Chinese President Xi Jinping's vision for China's development, the 13th Five-Year Plan. This blueprint seeks to create a "moderately prosperous society in all respects" based on innovation, open trade, green growth, coordination, and inclusive growth. Understanding the key priorities of the world's top trading nation, most populous nation, largest manufacturer, and second-largest economy and the opportunities and challenges they create for the United States is critically important for U.S. policymakers and businesses.

Today's hearing seeks to address three important questions: How will the Chinese government finance its ambitious reform agenda? What is the impact of China's high-tech industrial policies on U.S. automotive, aerospace, and semiconductor industries? And, finally, what are the opportunities and challenges for U.S. companies to compete fairly in China's expanding consumer and service market?

The 13th Five-Year Plan builds upon the 11th and 12th Five-Year Plans to shift China's economy away from large-scale infrastructure and export-led growth toward an economy driven by domestic consumption and higher value-added manufacturing. The Chinese government is hoping to unleash economic growth and create a new consumer base and working class through urbanization. In addition, the Chinese government is expanding access to public services such as education and healthcare through reforms of the *hukou* residency registration system. By 2020, the Chinese government hopes to increase the share of its population with urban *hukou* from 40 to 45 percent.

The 13th Five-Year Plan is also the greenest plan to date and sets caps for energy use and targets for city air quality, carbon dioxide intensity, and reduction in soil and water contamination. These targets are important to both meet public demands for a livable environment and reorient the economy toward more sustainable economic growth.

But the construction of affordable housing and urban infrastructure, expansion of public services, and environmental clean-up and protection will require significant financing. Local governments, which have to pay for most of these reform initiatives, have a limited ability to raise funds and are struggling with unsustainable debt burdens. The Chinese government has reiterated its commitment to overhauling its fiscal and financial systems in the 13th Five-Year Plan, but reforms have been subject to numerous reversals as the central government struggles to maintain

employment and meet its 6.5 percent average growth target for the next five years. In the first quarter of 2016, the Chinese government once again fell back on its old tools of investment-led growth to bolster the economy, which raises important questions about the ability of the Chinese government's commitment to its fiscal and financial reform agenda.

I will now cede the floor to my co-chair, Commissioner Goodwin, for his opening remarks.

OPENING STATEMENT OF COMMISSIONER CARTE GOODWIN
HEARING CO-CHAIR

HEARING CO-CHAIR GOODWIN: Thank you, Chairman Shea, and a warm welcome to all our panelists and guests.

In addition to the topics referenced by Chairman Shea, today's hearing will also examine the impact of China's industrial policies on three key U.S. high-tech manufacturing sectors: automobiles, aerospace and semiconductors.

These industries are vitally important for the United States, accounting for nearly three million jobs, roughly a quarter of total U.S. manufacturing jobs. In addition, they represent the three largest manufacturing exports to the world, totaling nearly 20 percent of U.S. exports in 2015. China is obviously one of their largest consumers, and U.S. firms are aggressively pursuing additional market share there.

But the Chinese government would like to break China's dependence on foreign producers and create globally competitive domestic firms in these industries. The 13th Five-Year Plan continues government support for domestic automotive, aerospace, and semiconductor firms through policies such as subsidies, foreign investment restrictions, and compulsory joint ventures, as well as regularly demanding technology in exchange for market access.

Moreover, the Chinese government is supporting domestic firms' efforts to acquire cutting-edge technology by buying U.S. and other foreign high-tech forms. The wave of attempted Chinese acquisitions of U.S. semiconductor firms over the last several months exemplifies this trend. Both outsourcing of production and the acquisition of U.S. firms raise concerns about U.S. jobs, erosion of institutional and technological innovation, and military dependence on imported components.

U.S. aerospace, automotive and semiconductor firms are grappling with how to compete and continue to serve their Chinese customers in this increasingly challenging environment. How the U.S. government and U.S. firms navigate these challenges will have important implications for the viability of U.S. high-tech manufacturing jobs, future economic competitiveness and national security.

Before I turn the floor back over to Chairman Shea, I would like to remind everyone that the testimony and transcript from today's hearing will be posted on our website at www.uscc.gov., where you will also find links to other important resources, including our Annual Reports, staff papers, and relevant news stories.

Additionally, I would like everyone to mark their calendar for the Commission's next scheduled hearing, "China's Espionage Threats to the United States," scheduled to take place on June 9.

Thank you.

PREPARED STATEMENT OF COMMISSIONER CARTE GOODWIN
HEARING CO-CHAIR

Hearing on China's 13th Five-Year Plan

April 27, 2016

Opening Statement of Commissioner Carte P. Goodwin

Thank you, Chairman Shea, and welcome to our panelists and guests. Today's hearing will examine the impact of China's industrial policies on three key U.S. high-tech manufacturing industries: automobiles, aerospace, and semiconductors.

The U.S. automotive, aerospace, and semiconductor industries are vitally important for the United States. In 2014, these three industries accounted for 3 million jobs, roughly a quarter of total U.S. manufacturing jobs. In addition, they represent the three largest U.S. manufacturing exports to the world, totaling nearly 20 percent of U.S. exports in 2015. China is one of their largest consumers, and U.S. firms are aggressively pursuing additional market share there.

But the Chinese government would like to break China's dependence on foreign producers and create globally-competitive domestic firms in these industries. The 13th Five-Year Plan continues government support for domestic automotive, aerospace, and semiconductor firms through policies such as subsidies, foreign investment restrictions, and compulsory joint ventures. The Chinese government has also regularly demanded technology in exchange for market access. Such policies have encouraged U.S. firms to outsource production to China, directly impacting U.S. manufacturing production and jobs.

In addition, the Chinese government is supporting domestic firms' efforts to acquire cutting-edge technology by buying U.S. and other foreign high-tech firms. The wave of attempted Chinese acquisitions of U.S. semiconductor firms over the last several months exemplifies this trend. Both the outsourcing of production and acquisition of U.S. firms raise concerns about U.S. jobs, erosion of institutional and technological innovation, and military dependence on imported components.

U.S. aerospace, automotive, and semiconductor firms are grappling with how to compete and continue to serve their Chinese customers in this increasingly challenging environment. How the U.S. government and U.S. firms navigate these challenges will have important implications for the viability of U.S. high-tech manufacturing jobs, future economic competitiveness, and national security.

Before we proceed, I would like to remind you that testimonies and transcript from today's hearing will be posted on our website, www.uscc.gov. You'll find a number of other resources there, including our Annual Reports, staff papers, and links to important news stories about China and U.S.-China relations. And please mark your calendars for the Commission's next hearing, "China's Espionage Threats to the United States," which will take place on June 9th.

PANEL I INTRODUCTION BY CHAIRMAN DENNIS SHEA

CHAIRMAN SHEA: Thank you, Senator Goodwin.

I would like now to introduce our distinguished first panel, and the subject that we will cover this morning is "China's Fiscal and Financial Reforms." This panel will explore China's efforts to reform its fiscal and financial sectors and how these reforms affect the ability of the Chinese government to finance its broader reform agenda.

First, we will hear from Yilin Hou. Dr. Hou is Professor of Public Administration at Syracuse University's Maxwell School of Citizenship and Public Affairs. Go Orange.

[Laughter.]

CHAIRMAN SHEA: They had a great run in the NCAA.

He has written extensively on China's fiscal and financial reforms for over a decade with his work appearing in numerous leading journals, and he recently authored the book, Property Tax in China: History, Pilots and Prospects, and will be releasing his co-authored book, Scheme Design of China's Local Property Tax, this summer. Dr. Hou, welcome.

Next we will have Dr. Weiping Wu. She is Professor and Chair of the Department of Urban and Environmental Policy and Planning at Tufts University. Unfortunately, Dr. Wu, I don't know the mascot of Tufts University.

[Laughter.]

DR. WU: The Jumbo.

CHAIRMAN SHEA: The Jumbo. Okay.

Dr. Wu's research focuses on China's urban infrastructure development and financing, and her research has received funding from the National Science Foundation, U.S. Department of Education, the World Bank, among others. She has co-authored and co-edited seven books, the most recent published in 2013, entitled The Chinese City.

Dr. Wu, thank you very much for being here.

And our next witness, or victim, is someone we know very well. It's Dr. Eswar Prasad, Tolani Senior Professor of Trade Policy and Professor of Economics at Cornell University, the Big Red; right?

DR. PRASAD: We didn't go as far as the Orange, but thank you.

[Laughter.]

CHAIRMAN SHEA: He's also Senior Fellow at the Brookings Institution and a research associate at the National Bureau of Economic Research. He's a frequent writer and commentator on China's financial sector reforms with numerous publications in leading journals and media outlets.

He authored a Commission-contracted report that was released in February of this year entitled "China's Efforts to Expand the International Use of the Renminbi," which can found on our website at www.uscc.gov, and it's great to have you again here, Dr. Prasad. Thank you very much.

So I think we'll start with Dr. Hou. As is our practice, if you can keep your oral remarks to seven minutes each, we're not at a loss for asking questions. This is a very "questiony" group, if that's a word. Anyway, Dr. Hou.

OPENING STATEMENT OF DR. YILIN HOU
PROFESSOR, PUBLIC ADMINISTRATION AND INTERNATIONAL AFFAIRS AND SENIOR RESEARCH ASSOCIATE, CENTER FOR POLICY RESEARCH, MAXWELL SCHOOL, SYRACUSE UNIVERSITY

DR. HOU: Thank you all. It's a pleasure to be here to testify.

In the next seven minutes, I'll sum up what I have written in the statement. I would like to summarize the kind of a three-stage framework with which I analyze China's fiscal reforms in the past 38 or 40 years.

Beginning from 1979 to 1993, I call that the first stage or the readjustment for growth and for development. In other words, to use Deng Xiaoping's direct quote, it is to develop by all means, because by 1978 and 1979 China was in extreme difficulty financially and economically in every means. So grow, grow, just grow by any means, and within the government, the center then delegated to the provinces, do whatever you can to develop, and the provinces did the same with their local jurisdictions. That is a kind of decentralization but by contracts, so every year I want you to do so much on this amount of revenue,. As long as you are on that target, then it's fine.

And with the state-owned enterprises, it was also kind of contractual system, and as long as you retained so many jobs and also made so much money to turn up, then it's fine. And with citizens, individual citizens, it was also something like this: do whatever you can to become rich.

So as a result of that, several problems occurred. One was the decreasing revenue for the government, in particular, for the central government, so that by 1993, the share of government revenue as a ratio of GDP declined dramatically, and within the total government revenue, the central government revenue was also very, very low, to the extent that the central government was not able to maintain the key functions that the center should be playing.

So by that time, Premier Zhu Rongji and others made the decision, saying we've got to change, and the change came in 1994 with the separate tax and shared revenue system. That was the second stage from 1994 to 2008. And I called it the stage of innovations for a new fiscal system.

The reason for that was, China in those years came out with two major innovations. The first one took five years to implement, 1994 to 1998. It was a separate central versus local tax system. The center collected major revenue, taxes with largest amount of revenues. These taxes are the value added tax and later on personal income tax. The central government kept a larger share, 75 percent of the VAT, 60 percent of the personal income tax. The rest, 25 percent of VAT and 40 percent of the PIT, was shared between provinces and their localities.

And the second innovation, beginning from 1999 to 2003, was to establish the central to provinces and local fiscal transfers for basic public services. Since the center had collected large amounts of revenue so the center saw it necessary to transfer a lot of money down so that provinces and localities could provide the basic services.

And as a result of that, an annually- increasing amount of money was collected, that was collected by the center, was channeling down to local levels to provide these services that should have been provided but was not. So as a result of that, private citizens began to build up. That was a very good thing to see.

So with these two innovations, good things began to take shape. It was good, but

as part of the separate tax system, several other problems cropped up. One was a kind of top heavy revenue because the largest part of the revenue was collected and kept at the center. Well, this was kind of bottom-laden outlay responsibilities. The local governments, here I mean cities and counties, had to provide the service, if not 75 percent of all the basic services. They did not have the means even though they have been getting lots of transfers. That's one.

Second, they were under a lot of pressures to do good, to do well, by local development, in everything on in infrastructure because they were appointed top down. They wanted to do well so that they could be promoted. That was called the so-called GDP championships. It is well known. So that's one of the problems that happened because of the 1994 separate tax reform.

So beginning from 2009 was the third stage. I call it towards efficiency and accountability. So, in this sense, China is now in the third stage of its fiscal reforms with three goals. The first goal is fully addressing the major problems arising out of the second stage. It is in a sense to refine intergovernmental fiscal relations by more closely matching outlay responsibilities with revenue sources to readjust the distribution of taxes by granting localities a reliable and stable source of revenue.

The second goal is establishing accountability. This is to reestablish the revenue-to-service link for accountability. New revenue is by no means a free lunch. It is earmarked for exclusively public services, say education, public health, public safety, and neighborhood facilities, not the big infrastructure, but the neighborhood small ones.

The third goal is raising efficiency of public expenditure. In the past, there was a lot of waste. Now, in this third stage, these reforms will focus on efficiency. So these reforms will by no means be easier than those in the first two stages although resource wise, the country is now much wealthier than before.

The core of this third stage is I call it the real property tax as a financial means and as a socio-political institution.

My time is up.

CHAIRMAN SHEA: Thank you very much. Perfect timing.

Dr. Wu.

PREPARED STATEMENT OF DR. YILIN HOU
PROFESSOR, PUBLIC ADMINISTRATION AND INTERNATIONAL AFFAIRS AND SENIOR RESEARCH ASSOCIATE, CENTER FOR POLICY RESEARCH, MAXWELL SCHOOL, SYRACUSE UNIVERSITY

Testimony before the *U.S.-China Economic and Security Review Commission* (USCC)

Interpreting China's Fiscal Reforms and the 13th Five-Year Plan Targets

Yilin Hou, Ph.D. and Professor

Maxwell School, Syracuse University

April 27, 2016
Room 285, Hall of States
444 North Capitol Street NW
Washington, DC 20001

A Three-Stage Framework for Understanding China's Fiscal Reforms [1]

To provide a starting point for understanding China's fiscal reforms, let me use a three-stage analytical framework that I developed in recent years of the country's whole open-door and reform era that started in late 1978 or early 1979.

The Reform in China has endured over three and a half decades. An important component of the country's comprehensive reform program has been the overhaul of its fiscal and financial systems. Finance underlies fundamental changes in any country's political and state systems as well as economic and social structures. To a large extent, government finance is "technical" in the sense that it is neutral regardless of the political and state systems and the economic and social structures of a country. This important feature of finance makes it an ideal forerunner of any reform efforts and a testing ground for new policies and administrative measures.

This statement is quite true of China's reform since 1979. Before any reform in the political and state system was even attempted, changes had to occur so as to provide the resources for action and incentives for individuals, groups, and entities to engage in innovation. Prior to adopting radical reforms of the economic structure or introducing new social norms, observable and unobservable adjustments emerged quietly in the means of government revenue and the ways of program outlay. After all, institutional adaptations happen gradually and incrementally; but the ways and means of government operations have to move ahead to pave the path for other aspects to evolve. This description is an accurate summary of the relationship between fiscal reforms and other reforms of China's fast-paced transition and growth so far.

In examining how these reforms unfolded and laid the foundation for other dimensions in China's systemic overhaul, a 2009 study formulated a two-stage division, according to which

[1] Yilin Hou (2009) formulated a two-stage framework in an article "政府职能、事权事责与财权财力—1978 年以来财政体制改革的理论分析" published in 《公共行政评论》2009(2): 36-72; then he expanded the framework into three stages in his 2014 co-authored book. This section draws heavily from Hou et al. *The Property Tax in China: History, Pilots, and Prospects* (New York: Springer, 2014), Chapter 1.

financial reforms in the first 15 years (1978/79-1993) were efforts mainly aimed at readjusting the country's fiscal system and those in the second 15 years (1994-2008) were aimed at introducing innovations into its fiscal system. After 2008, a third stage started. The main task of this third stage is to go deeper in overhauling the system, integrating past innovations into a network while resolving some thorny problems that were unsolvable in the past and addressing new problems that have emerged with the innovations under the restraints of some persistent, old institutions.

Stage One: Readjustment for Growth and Development

Under the old, prior-1979 regime, modern government functions were not conducted properly, at least those concerning economic development and living standards were not. At the initial phase of reforms, most of the components of the old regime were very hard to break; but it was easiest to loosen the centralized management of the fiscal system. That path was natural option by China. Measures were taken on three dimensions: (1) within the government, (2) with state-owned enterprises (SOE), and (3) with individual citizens.

Regarding the first, the reform was to decentralize revenues and outlays from the center to the provinces; subsequently provinces granted more discretion and control to localities. Concerning the second, the measure was to place SOEs on job maintenance and profit contracts so as to make them fully accountable for their liability to the government, which conversely provided incentives for them to make profits for themselves. With reference to the third, the reform measure was to relieve individuals from the grips of the state so that every laborer could make their own living, and even a fortune, by working hard with their skills (workers and merchants) and means of production (farmers on collectively owned land). In urban areas, the reforms gave rise to family businesses; in rural areas, farmers got rid of the old "communes" and grew crops on their contracted land and sell produce in the market. The combination of measures in these three dimensions were the Chinese route for growth and development.

Thus, fiscal reforms first broke the ice; however, the old regime remained largely unchanged, which gave rise to new problems. One of the problems was shrinking revenue for governments, particularly central and provincial governments because lower levels of government pocketed the largest share of incremental profits from decentralization and enterprises harvested the initial benefits of the contract system. Among individuals, farmers retained the largest and best fruits of increased output (years later, however, the rural income growth lagged far behind that of urban residents). In urban areas, the self-employed became rich ahead of all others. These policy effects of "some getting rich ahead of others" [2] caused income disparities among the population, and the gap widened over time. A third prominent problem was the gap in growth and income between regions at both the aggregate and the individual levels. The coastal region developed earlier and faster than the interior and western regions because of their locational advantage in attracting foreign investment and cheap labor from the other, under-developed regions.

These three problems, among many others, were not treatable under the old regime or with temporary adjustments to the old regime. In a practical sense, these problems were part of the price for the "fast growth route" [3] the country had chosen for itself. The problems only worsened

[2] This is a direct quote of Deng Xiaoping's practical strategy for development and growth.
[3] This is another quote of Deng Xiaoping, 发展是硬道理 or "to grow by all means out of our current difficulties."

as the country's growth accelerated and maintained momentum. Solving them would be only possible when enough wealth has accumulated to afford (finance, or allow) drastic changes and until public impatience has reached a critical point.

Stage Two: Innovations for a New Fiscal System

In the second stage, policy innovations were introduced to build a new fiscal system in accord with the generic principles of public finance, thereby solving the problems that occurred in the first stage. In a nutshell, those problems could only be tackled by means of fiscal federalism. The goal of the new fiscal structure was to finance the opportunity for equal access to basic public services for every citizen regardless of their location of residence or type of household registration (urban versus rural). The economic and political rationale was to strive for equity between regions and income groups, thereby, to achieve and maintain social stability.

Two major policy innovations were introduced, each taking about five years to implement in this vast and populous country. The first (1994-98) adopted a separate (central versus local) tax system, under which the center collected a larger share of the major taxes (value added tax, and later, the personal income tax); provincial governments, and their localities, split the remainder of these taxes. The new tax structure provided the financial capacity for the central government to play its key roles in macroeconomic stabilization and financing public services nationwide. The second (1999-2003) established the central-local structure of fiscal transfers for basic public services and gradually increased central input into these services. Since the center collects the largest share of revenues, it naturally shall finance a large part of those services. Beginning in 2004, the new public finance structure has demonstrated substantial impacts, with annually increasing amounts of transfers for education, public health, social security, and public housing.

The new fiscal structure has also created unintended consequences that manifest as four problems. First, tax revenue is top heavy at the central level, light in the middle with provincial governments, and minimal at the bottom with local governments, whereas the responsibilities for basic service provision are laden at the bottom with localities. These two problems exist head to head. The center keeps the most resources but has the least direct responsibility; the local level has the least own-source revenue but must bear most of the burden of direct service provision. The middle level, provinces, collects some, but inadequate, own-source revenues to help out the localities; yet, they often wait for actions from the top. A third problem arises from the first two: since revenue sources and outlay responsibilities do not match, no one level can be held accountable for the less-than-desirable results. The center criticizes localities for malpractice in using the transfer funds; localities complain about the lack of resources for task overload.

Meanwhile, local officials are incentivized to fulfill all tasks set by their superior levels, because they are appointed by their bosses – thus career considerations have driven most top local officials to resort to informal, even illegal means of financing for infrastructure and development, including selling the use right of state land for cash and borrowing huge sums via local financing vehicles. The former means has been a cash cow, accounting for nearly half of the total own-source revenue in many localities for over a decade. Indeed, land sale has constituted a large amount of the input into infrastructure that has provided tangible benefits; on the other hand, land price has added considerably to the cost of new housing, which has pushed up housing prices, distorting the market and causing bitter public complaints. The latter means,

hidden borrowing, has piled up long-term liabilities that in some cases are multiple times over annual local revenue. Finally, waste occurs everywhere since no one is held accountable for any specific task.

Stage Three: Towards Efficiency and Accountability

China is now situated in the third stage of its fiscal reforms with the following goals: fully addressing the major problems arising out of the second stage, establishing accountability, and raising the efficiency of public expenditure. These reforms will by no means be easier than those in the first two stages, though resource wise, the country is much wealthier than before.

First and foremost, the goal is to refine intergovernmental fiscal relations by more closely matching outlay responsibilities with revenue sources. Specifically, this goal is intended to readjust the distribution of taxes, not necessarily to increase the overall tax-to-GDP ratio, between the layers of government thereby granting localities a reliable and stable source of revenue. Enriching the bottom level is that single piece of "stone" that can strike several birds at once: correcting the previous top-heavy revenue structure, helping to rectify distortionary local financing practices, and granting localities more autonomy.

The second goal is to re-establish the revenue-to-service link for accountability. A new source of revenue is not a free lunch for local governments; rather the money imposes a set of restrictions on the behavior of local officials. Newly added revenue is earmarked exclusively for public services, linking the new tax to specific services that have been undersupplied – education, public health, public safety, and neighborhood facilities. This revenue-to-service link will explicitly place accountability of officials into the hands of local tax payers, forcing the government to move closer to the people.

With the revenue-to-service link established, local residents/tax payers will possess a much louder voice than before in policy making. In a real sense, they have paid a tax to purchase the right of demanding the type, amount, and quality of services by revealing their preferences. This model of "public choice" for service bears support from theoretical and empirical studies in improving the efficiency of public expenditure, raising the satisfaction of tax payers, and curbing corruption. As a result, local governments will not be forced, but will strive to get closer to the people they serve.

Last, but maybe more important, such a reform of the fiscal system will help advance reforms in other aspects of the overall regime. For example, more public choice in local services plants the seed for the direct election of top local officials who are held in a reporting relationship to their voters rather than their bosses in a higher level government who appoint them. Public choice will also boost demand for free migration among the population that, in turn, will further increase competition among local governments for revenue source and ultimately high efficiency.

The core of this third stage of reforms is the real property tax as a financial means and a socio-political institution. As a financial means, the real property tax is merely a source for government revenue; but as a socio-political institution, the real property tax plays multiple roles, as previously described. This tax will serve the country well in this unfolding, deeper than ever, stage of fiscal reforms. Related to adoption of this tax will be changes to provisions about local

government use of debt, which will be put on a stable, sustainable path.

No doubt, introducing and adopting an institution is never an overnight task; it may take years even decades to arrive at fruition. As I have suggested to the Chinese government in my forthcoming book,[4] the adoption and implementation should embed a 2 to 5 year window to allow reallocation of personal and business owned real property via the real estate market.

A Note on Data Sources

In the following, I provide my opinion as answers to the questions posed by the Commission. The sources of all data and quotes that I use are from publicly available venues. These include official and academic publications in English, and especially in Chinese for authenticity, the websites of the Chinese Central Government, the Ministry of Finance, the State Administration of Taxation, the National Bureau of Statistics, and the National Audit Office. News reports are from the official website of the Xinhua News Agency.

Question 1. China's current fiscal system; role of local governments in economic development; how local governments finance their expenditures; how land sales-based financing worked; critical reforms necessary to address the fundamental challenges of China's fiscal issues; how should the Chinese government sequence these reforms?

Q1a. Describe China's current fiscal system.

The current fiscal system of China is one with *separate central and local taxes*, that finances separate central and local functions (i.e., outlay responsibilities), with the central government transferring over 60 percent of central revenue to lower levels. In China's government structure, "local" refers to all levels below the center; thus, provinces are also called local.

This system started in 1994 as an overhaul of the old, varying subsequent versions of the *contractual revenue and outlay system* that lasted from 1978/79 till 1993 – the stage of China's Reform Program that is mainly to "break away from the prior tight-control scheme" and "to readjust for growth and development." Two typical features of the old contractual systems, as has been famously used in official documents, are two very low ratios that are taken as a symbol of low capacity of the Chinese government in raising revenue and in playing its due functions.

One ratio was aggregate government revenue against gross domestic product (GDP) – it was 24.5 percent in 1980, then continued in an annually declining mode till the lowest point of 12.3 percent in 1993. The other ratio was central government revenue against total government revenue (all levels) – it is the power of policy direction by the central government over the whole nation. This ratio was 25.5 percent in 1980; it climbed within a few years of the open-door and reform program to reach a high of 40.5 percent in 1984. But after that year, this ratio also fell into a declining mode, because the nature of the provincial contractual system was that provinces only had to submit to the center a fixed amount or ratio by pre-agreement of their increased revenues. As a result, the central-to-total revenue ratio fell to the lowest point at 22 percent in

[4] Hou, Yilin et al. (2016 forthcoming)《中国房地产税税制要素设计研究》北京：经济科学出版社.

1993. [5]

Thus, the separate-tax system of 1994 was a necessary and natural correction to the old system in order to reinstall government financial capacity, especially central government financial capacity. The means to achieve this capacity gain was to adopt the modern institutionalized taxation system rather than *ad hoc*, informal, case-by-case intergovernmental contracts. The 15 years from 1994 to 2008 was in my division the second stage of China's fiscal reforms – innovations for a new financial system.

Under the separate-tax system, those taxes that are broad and concentrated are central taxes; those that are narrow and scattered are local taxes. The major shared taxes and their split ratio between the center and provinces (in parentheses) are:

(1) value-added tax (VAT) shared between the center (75%) and local (25%);

(2) corporate and personal income tax shared between the center (60%) and local (40%);

(3) business tax (varies).

By the official *Final Account* for fiscal year 2014 (the most recent fiscal year for which data are publicly available), China's National General Public Budget Revenue was 14.04 trillion RMB, or roughly 10,000 RMB per capita. Of this amount, 6.45 trillion was Central Government General Public Budget Revenue. The center, however, directly spent only 2.26 trillion of its revenue (35%); the rest (65% and higher when deficits are included) were transfers to provinces, cities, and especially counties. For FY2014, total local government general public budget revenue was 12.7 trillion, of which 5.187 trillion was tax returns and transfers from the central government. [6]

The division of outlay responsibilities between the central and local governments is relatively clear between the center and provinces: national defense, foreign affairs, monetary policy, customs, international trade, and countrywide transportation are obvious central functions. Environmental protection, public assistance, and social security are shared between the center and provinces. But the division of outlay responsibilities is infamously not clear between provinces and their lower levels that include cities (prefectures), counties, and townships.

Q1b. What is the role of local governments in economic development?

The role of local governments in economic development is widespread and substantive. In a very real sense, the Chinese government system is highly centralized in official appointments but at the same time also quite decentralized in economic development activities. Ministries and agencies of the central government control the power over regulation, resource allocation, quotas, and approval of numerous activities; these ministries and agencies, however, have to rely on the cooperation of provincial governments in implementing and achieving their policy goals. Furthermore, provincial and lower level offices of these central entities are structurally part of the local government (though some have been adjusted to follow the vertical line of order, i.e., exclusively under the central ministry and away from the so-called dual leadership regime). This

[5] Data source: Li Ping 李萍 *et al.* (2010)《财政体制简明图解》 北京：中国财政经济出版社, Ch. 1.
[6] Data source: Chinese Ministry of Finance, http://yss.mof.gov.cn/2014czys/

complicated intertwined mixture of centralization and decentralization is a strong feature of the Chinese government and its manner of administration.

The following steps illustrate the process of development planning and implementation. First, the central government sets the country's national growth targets for each year, as specified in the country's five-year plans. Second, all major officials are appointed by their higher level governments. These appointees will by all means serve the development targets that have been set top-down – of course the goals are made through several rounds of top-down and bottom-up brainstorming and feedback collection. Third, prospects of promotion of officials depend on the growth rate of each jurisdiction or agency they are personally placed in charge of; thus, each of these officials has the constant incentive to achieve, even exceed the growth targets as has been set for their jurisdiction. This is also why the sum of prefectural annual growths exceeds the provincial growth rate and the sum of provincial annual growths exceeds that of the national growth rate. The officials' career incentive has been extremely "effective" in promoting the country's growth, which has been labeled as "GDP championship" in academic studies. [7]

Q1c. How do local governments finance their expenditures?

Under the old contractual system, local governments were able to retain large shares of their annual incremental revenues. Under the separate-tax system since 1994, local governments face persistent shortage of revenue to cover their outlays and mandates from above. Their shared revenues are mainly of the 25 percent of VAT and 40 percent of the income taxes from the shared taxes. Their own-source revenues are as of this year business taxes, some other minor local taxes, and charges and fees of various kinds. No doubt, the sale of land use rights (details in the next section) has been one dominating source in recent years, especially in developed urban areas. Another source is formal, informal, even barely legal debt that local governments have managed to obtain from state-owned banks and other commercial banks via various means.

Q1d. How has land sales-based financing worked?

By the 1982 revised *Chinese Constitution*, all urban land is the sole property of the state as represented by the central government as an abstract concept of the state.[8] In reality though the guardianship of land-use right is at the discretion of local governments, in particular city and county governments. Before the 1994 separate-tax system was put in place, there were no issues with regard to land-use right though the actual sale of the use right first occurred in the mid-1980s in the special economic zone of Shenzhen City where a joint venture needed land for factory construction. The sale of land-use rights as a cash cow for local governments started in the late-1990s. A few years into the separate-tax system, some local officials under extreme financial pressure complained to the central government. An unprepared, spontaneous response as indirect answer to the local demand was: state land is in your control. Land sale-based financing thus started as an informal, unofficial band aid to a systemic problem that arose from the 1994 separate-tax system.

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[7] The best, systematic study of this phenomenon is by Zhou Li'an 周黎安 (2010)《转型中的地方政府：官员激励与治理》上海人民出版社.

[8] The 1949 *Common Program* (de facto *Constitution*) and the 1954 and 1975 versions of the *Chinese Constitution* all allowed, explicitly or implicitly, private ownership of urban land.

Land-use right sales started small, since few cities had done it before and no major revenue was expected from these sales. As urban development and housing provision reform started, urban land appreciated exponentially, turning land use right into a mammoth of revenue source. This financing venue works as follows. First, a local government will announce its urban development plan for a specific location for developers to bid. The land plot is put on auction, to be taken by the highest bidder. Second, the auction winner (developer) has to pay the local government in cash the land use fee. The amount of the fee is based on multiple factors. One is the length of use: 40 years for commercial and recreational use, 50 years for industrial purposes, and 70 years for residential use. Finally, the cash payment to the local government is upfront – before the start of construction, which is why the developer has to take loans from commercial banks. Then, to make a profit, the developer has every incentive to build upscale, high density projects. Thus, the payment for land use right is forward shifted into the market housing price.

With the collected land-use fee, local governments can afford large scale infrastructure projects. This financing mechanism has been successful to a large extent in filling in the local revenue shortage and meeting the huge demands for capital spending, which explains why and how so many cities in China have built very good airports, railway stations and other public facilities that would have taken a very long time to materialize absent of this mechanism.

The following table provides detailed data on local government revenue from sale of land use right (called "land transfer fees") and its ratio against total local outlays for fiscal years 2008-2011 (in billions of RMB) [9]

	2008	**2009**	**2010**	**2011**
Subnational general budget expenditure	49.99	63.20	74.96	94.33
Subnational fund budget expenditure	12.93	14.29	30.30	37.49
Subnational land transfer fees	10.37	13.96	29.11	33.17
Ratio （%）	**16**	**18**	**28**	**25**

We can use FY2014 figures as an example to depict the local revenue landscape: The total local own-source revenue in 2014 was 7.59 trillion. The amount of land-use right sale was budgeted for 3.43 trillion RMB; the actual sale reached 4.04 trillion. Land-sale revenue was 53 percent of total own-source revenue. Another aspect is to examine the growth of land-sale revenue: the actual for FY2014 was 17.6 percent over the budgeted amount. However, the growth over the 2013 actual amount was only 3.4 percent. [10]

Q1e. In your view, what are the critical reforms necessary to address the fundamental challenges of China's fiscal issues, and how should the Chinese government sequence these

[9] Source: Chinese Ministry of Finance, "Report on central and subnational governments' budget implementation of last fiscal year and budget of this fiscal year," http://www.mof.gov.cn/. The 2015 actual amount is not yet publicly available.
[10] Data source: the Ministry of Finance, http://yss.mof.gov.cn/2014czys/201507/t20150708_1269691.html

reforms?

To fully address the fundamental challenges to the country's current fiscal system, the Chinese government will need to properly design and carefully implement several reforms. I list these reforms by the order that I think will be among the optimal sequence.

First, define and clarify the outlay responsibilities between central, provincial, and other local governments, especially between provincial and other local governments.

Second, readjust the revenue sources and shares of revenue split between the several layers of government according to their outlay responsibilities.

Third, central-to-local transfers will remain an important means of fiscal capacity equalization between regions of varying wealth, but own-source revenue plays a key role in tying local governments to local residents. Of this, I strongly recommend that China grant the real property tax to city/county governments as their exclusive revenue source (not to share with higher levels) to provide key local public services. [11]

Fourth, allow local governments to issue long-term construction bonds with their property tax revenue as collateral – tie their hands to the local tax base, and place local governments on a hard budget constraint.[12] These are not all that is needed to overhaul the current system but they are among the most crucial for ultimate success of further reforms.

Question 2. China's local government debt problem; impact of local governments' dependence on land sales and local financing vehicles on Chinese government's ability to address its misallocation of investment such as the creation of ghost towns?

Q2a. Assess the magnitude of China's local government debt problem.

There is consensus that China's local government debt has reached a very high level. Here the term "local government debt" does not refer strictly to those debts that have been issued by local governments, because the Chinese *Budget Law* does not allow local governments to issue debt; only in recent years have provincial governments officially issued some through the Ministry of Finance. The term "local government debt" refers to those debts whose ultimate liability of principal and interest payment lies with those local governments who have obtained and used, directly or indirectly, the borrowed amounts.

Since 1998, local government debt has been increasing at an annual rate of 20 percent. In 1998 the rate was 48 percent and the 2009 annual increase rate was 62 percent. The total of local government debt reached 5.48 trillion by the end of 2008; 10.72 trillion by the end of 2010; 15.89 trillion in 2012, 17.89 trillion in 2013, and 24 trillion in 2014. The interest payment by local governments on their debt in FY 2014 was 98.3 billion. [13]

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[11] For details, see Hou et el, T*he Property Tax in China: History, Pilots and Prospects.* New York: Springer, 2014.
[12] Hou, Yilin and 马海涛 (2016)."中国房地产税设计原理和实施策略分析"in《财政研究》2016 (2).
[13] Data sources: China State Audit Office and Ministry of Finance.

Q2b. Local government financing vehicles

These include (1) sale of land use right as described in Question 1 above, and (2) various vehicles for borrowing from commercial banks. The Chinese budget law prohibits local governments from taking loans from commercial banks. To circumvent this restriction, local governments created various "financing platforms",[14] whose main if not sole function is to borrow from financial institutions of all kinds on behalf of local governments. These entities may assume various names, such as corporations for city construction investment, city asset investment, urban development investment and so on. Another vehicle is for city construction corporations to issue city construction bonds.

The collateral for the loans are local government general budget revenue and state land (use right). The purpose of these loans are mostly for building bridges, urban (overhang) highways, old town renovation, and industrial parks. As of June 2013, 57 percent of local government debt was loans from commercial banks.

Q2c. How does local governments' dependence on land sales and local government financing vehicles impact the Chinese government's ability to address its misallocation of investment such as the creation of ghost towns?

The benevolent motivation and design of local government borrowing was to use these loans for infrastructure investment so as to create a favorable business environment of the locality in order to attract investment. Local governments expected that with these steps taken, the urban land under their control will appreciate, which would generate more than enough revenue through the sale of land use right for them to retire all those debts and to earn some extra.

The State Audit Office classifies local government debt into three categories:

(1) those that the local government is liable to retire,
(2) those that the local government is liable as guarantor, and
(3) those that the local government is liable for some limited relief.

Of the debts that local governments are liable for repayment, 37 percent are loans with land-use right revenue as collateral.

Most of local government borrowing has been used on infrastructure, which helps lay the foundation for higher productivity growth and higher living standards. Such use of debt should be taken as a huge plus because they accumulate assets. The formation of ghost towns was a distortion of the real estate sector and the housing market by overuse of land use right that pushes housing price to the super-high region, beyond the affordability of most ordinary citizens. To address this issue, local governments should not rely on land sale as their main revenue. They should instead move to the stable, annual property tax. [15]

[14] These are called 融资平台 in Chinese.
[15] For details, see Hou *et al.* (2016 forthcoming)《中国房地产税税制要素设计研究》北京：经济科学出版社.

Question 3. China's existing fiscal system versus the reform agenda; changes necessary to enable a sustainable revenue stream; how will fiscal reform impact central-local government relations and the current style of economic growth? Importance of the revised Budget Law and 2017-2019 National Mid-Term Fiscal Plan; impact of recentralization of the budgeting and allocation process on China's fiscal challenges; new proposals in the 13th Five-Year Plan.

Q3a. Can China's existing fiscal system finance the reform agenda?

China's current fiscal system cannot fully finance the above-mentioned reform agenda. For one thing, the existing system is the target of reform in terms of the revenue sources and outlay responsibilities between the hierarchical layers, especially between the provincial level and their subsidiary levels. For another thing, the current revenue composition of both the central and local governments rely too heavily on indirect taxes such as the value-added tax and business taxes rather than direct taxes like the personal income tax and the real property tax.

Q3b. What changes are necessary to enable a sustainable revenue stream?

The Chinese government has already sensed, if not identified, at least some of the root causes of the problems. Mr. Lou Jiwei, the sitting finance minister is one representative. In his 2013 book, Mr. Lou clearly outlines some changes to be made. These measures include, among others:

(1) refine the personal income tax into one with annual filing by the household of their total income, thereby converting this tax into a more equitable, redistributive instrument;

(2) readjust the central-local fiscal transfer categories with more lump sum discretionary grants and less special purpose grants; and

(3) channel more transfers directly to the county level in order to better secure provision of public services. [16]

Q3c. How will fiscal reform impact the central-local government relations and the current style of economic growth?

A more formal and systematic use of the personal income tax will help substantively improve on equity and efficiency of this tax. If, within the next few years, China can effectively implement and strictly enforce a comprehensive personal income tax so that this tax makes up a sizeable share of total tax revenue (the current share of this tax in annual total government revenue is less than 7 percent by 2013 and 2014 data), it will improve both on the horizontal and vertical equity. With strict enforcement of this tax, the overall efficiency of the economy will also improve. When the amount and share of revenue from the personal income tax substantively increases, it will be more likely that the center grants more revenue sources to the local level.

Another major reform is to design and implement a local real property tax that is to be levied on all residential, commercial, and industrial property. The revenue from this tax shall be exclusively for city and county governments to finance basic public services. An important

[16] See Lou Jiwei 楼继伟 (2013)《中国政府间财政关系再思考》北京：中国财政经济出版社.

pretext for this tax is the central and provincial governments give up their share in the multiple current taxes and fees levied on property transaction.

A third major reform is to regroup many current special purpose transfer programs into lump sum discretionary grants more directly channeled to cities and counties.

These reforms will change the landscape of central-local fiscal relations in that localities will have the financial basis to more closely follow the demands and preferences of local residents and tax payers rather than merely following the order/mandates from their higher levels.

The impact of the real property tax, as designed by me (2016 forthcoming book) will exert lasting influence on changing the paradigm of economic growth at the city/county level. By my design, cities and counties shall not collect the upfront land use fee anymore; instead these will be part of the annual property tax. Thus, the amount of land revenue will shrink substantially; local governments will rely on the stable, lasting annual property tax and annual land use fees. Economic development can be much more orderly and smooth, incremental rather than the roller coaster style of the past two decades.

Q3d. In your view, how important is the revised Budget Law? How, if at all, will recentralization of the budgeting and allocation process impact China's fiscal challenges?

The first *Budget Law of China* became effective in 1995. The new *Budget Law* was passed in 2014 and became effective in January 2015. The 2015 *Budget Law* revised the old law in five major areas. The first are rules on budget management with emphasis on transparency. The total budget is composed of four parts: general public budget, governmental funds budget, state-owned assets management budget, and social insurance fund budget. [17]

The new law stipulates that "all revenues and outlays must be included in the government budget", which applied the comprehensive principle of public budgeting. By this rule, the official report and account schedules on all budgeted items, adjustments, final approved amounts, and details of budget implementation should be made public by the Finance Ministry (or Department) within 20 days of approval by the People's Congress, with explanations on arrangements for transfers, implementation, and debt use.

The second area of revision is in the manner of budget control: All levels of government should create a cross-year balance mechanism and establish a budget stabilization fund in accord with related rules of the State Council for the purpose of filling in unexpected revenue shortfalls. In boom years when current revenue exceeds the budget, the extra should be placed in the stabilization fund. [18]

The third revision is in retaining risks of local government debt. Whereas the old law requires local governments to achieve annual balance and does not allow localities to incur any deficits, the new law imposes five specific restrictions on borrowing by local governments:

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[17] Some scholars in China are quite critical of this quadripartite division of the total budget. They criticize that the division violates the unity principle of public budgeting.

[18] For a detailed examination of the mechanisms and effects of the budget stabilization fund, see Yilin Hou (2013) *State Government Budget Stabilization: Policy, Tools, and Impacts.* (New York: Springer)

a. Only provincial governments, with prior approval by the State Council, can incur debt;
b. Government debt can be used only for capital outlay that produces public goods/services;
c. The amount of debt for each province should be submitted by the State Council to the National People's Congress or its Standing Committee for approval. Each province can only borrow within the approved limit with the approval of the standing committee of the provincial people's congress;
d. The method of borrowing can be only via issuing local government bonds, not any other means or venues; and
e. To control risk related to and rising from local government borrowing, any issue of provincial government bonds should have a matching debt service plan and stable source of revenue for debt retirement. The State Council shall set up a risk evaluation and warning mechanism of local government debt, an emergency management mechanism, and accountability system.

The fourth major revision is in the central-local fiscal transfer system, promoting equalization between regions of varying wealth of basic public services. Transfers will consist mainly of equalization grants that are to be of discretionary use by recipient local governments. Special purpose transfers will be reassessed regularly for their necessity, with sun-set dates and with thresholds set up. Functions or services that can be effectively provided by the market should not be financed with special purpose transfers. Except cases where the State Council has explicit provision for shared vertical responsibilities, higher level governments shall not require lower levels to match transfers with their own-source revenue. Besides, higher levels should notify lower levels their estimates of transfer amounts ahead of local government budget preparation; all local governments should include the estimated transfers in their budget.

The fifth major revision are restraints of budget outlay to impose a hard budget constraint. These are targeted at wastes and luxuries in operation spending and office building construction, listing penalties for those to be held accountable for violations. To enforce the hard budget constraint, the new law provides that all governments are in general not to enlist new revenue sources or outlay programs during budget implementation, nor are they to seek any new revenue reduction policies or measures in the middle of the fiscal year.

In my professional judgment, these revisions are all very well intended and will exert very positive impacts on government operation in China. They are all targeted at existing problems that have been prevalent for a long time. These measures represent a great leap in public administration and government operations in China. Though it is way too early to draw any conclusions, we can predict with high certainty that these measures will over time yield huge, lasting benefits.

Q3e. In your view, how important is the (2017-2019) National Mid-Term Fiscal Plan? [19]

China has been proactively exploring methods and mechanisms for fiscal stability, learning from advanced economies. The three-year mid-term fiscal plan (MTFP) [20] is part of China's effort in going beyond the annual budget balance tradition toward cross-year balance in order to

[19] I put the years in parentheses that came with the original question. Three-year mid-term plans are a generic financial planning tool compiled on a rolling basis, as specified in my discussion.
[20] It is called "中期财政规划" in Chinese.

better handle fluctuations of the economy and financial operations. This three-year fiscal plan can be said to carry elements of the OECD mid-term expenditure framework (MTEF), transplanted into the Chinese context. The official document announcing China's adoption of this planning instrument came out in 2015 by the State Council, followed by a Ministry of Finance implementation plan at the central level. [21]

The MTFP is a transition from annual to mid-term budget; it serves as a platform for more accurately determining revenue and outlay policies in order to achieve stable financial policy goals on the basis of scientific forecasting; the platform allows for timely adjustments in accord with socio-economic developments. The MTFP covers the four types of budgets as components of the government's total budget (general public budget, governmental funds budget, state-owned assets management budget, and social insurance funds budget). Each year's MTFP includes four parts:

a. Forecasts major economic indicators and socio-economic status in the next three years under the existing five-year development plan and annual plan, considering major international and domestic changes in combination with base-year actual figures. Based on economic forecasts, estimate the mid-term revenues and outlays in accord with current macroeconomic policies.
b. Analyze issues with existing policies on revenues and outlays. Such issues cover:
   (1) those on revenue sources (taxes) and their impacts on resource preservation, environmental protection, dissolution of overcapacity, income redistribution and revenue collection, as well as regulation of non-tax revenues;
   (2) those on program outlays such as social security and healthcare, changes of these programs due to demographic changes, and the impacts of these outlays on revenue growth and outlay structure; and
   (3) those on the risks of government debt, in particular localities where governments have incurred large amounts of debt.
c. Compose reform plans of revenue and outlay.
   (1) Regarding revenues, the Ministry of Finance shall consult with the Tax, Customs, and Development Ministries to propose routes and timelines for tax reform, major revenue adjustments, regulation of fees/charges, with clear policy goals and implementation schedule. These ministries should also evaluate the impact of the proposed policies on the economy, related industries, and tax burden of individuals.
   (2) Regarding outlays, the Ministry of Finance shall consult relevant agencies to outline major reforms within the MTFP period, policies and projects of outlays, specify policy goals, list annual tasks and deadlines, with clarifications on performance measures.
   (3) Regarding governmental debt, the Ministry of Finance shall, based on revenue and outlay and debt risk forecasts, determine appropriate scope of deficits and debt limits as risk control target. Classify debts and place them into the budget. Establish debt risk warning and emergency management mechanisms.

[21] These two documents are: "国务院关于实行中期财政规划管理的意见" (国发[2015]3 号), http://www.cas.cn/gj/201501/t20150123_4303947.shtml and "财政部关于推进中央部门中期财政规划管理的意见" (财预[2015]43 号) http://www.mof.gov.cn/mofhome/shenzhen/lanmudaohang/zhengcefagui/201507/t20150710_1283138.html

d. Estimate revenues and outlays in the next three years after implementing the proposed reforms, and conduct overall balance.

All these are no doubt very useful for operation and significant as reforms. Of course, the MTFP is still a new planning tool at the current stage with its effect and benefits to be tested over time.

Q3f. Has the 13th Five-Year Plan outlined new proposals?

The 13th Five-Year Plan proposal by the Central Committee of the Chinese Communist Party outlines five broad public finance tasks. [22] They are:

a. Further the financial and tax reforms to establish modern financial infrastructure that is favorable for transforming the model of economic growth, for formulating a nationally unified market, and for promoting social equity and justice.
b. Establish a taxation system that is scientific in tax-type composition, optimal in structure, efficient in administration, and equitable with a full set of governing rules and laws.
c. Establish an intergovernmental relations system that matches functions with outlay responsibilities of each government level, with appropriate centralization of functions and outlay responsibilities to the central government. Better allocate the division of revenue sources between the central and local governments.
d. Fully establish a modern, transparent public budgeting system, with cross-year balancing and mid-term fiscal plan mechanisms.
e. Create a formal debt financing mechanism for local governments.

Linking these five overarching tasks to the analytical framework presented at the beginning of this statement, it becomes apparent that China has charted an agenda and path for its third stage of fiscal reforms. With these tasks accomplished, the country's fiscal structure will have mounted a higher platform for smooth development and growth.

Question 4. Assess the progress of fiscal reforms. How successful, thus far, has the Chinese government been in increasing transparency, reining in debt, and strengthening accountability? How effective have these reforms been at lowering the debt burden for local governments and addressing the current gap in revenues and expenditures?

A lot of progress has been made in the fiscal reforms and measures that I have discussed in response to the previous questions. The new *Budget Law of China* that was promulgated in 2014 and became effective in January 2015 lists transparency as one major target. Progress in this area is evidenced by the online availability of numerous budget documents and financial reports of various ministries at the central level and of most provincial governments. Furthermore, increasing transparency is not only common in coastal areas where the reform programs are very advanced but also in inland and western provinces where sophisticated reform ideas have also

[22] Data source: "中共中央十三五规划建议" made public by the Xinhua News Agency on November 3, 2015. http://news.ifeng.com/a/20151103/46094489_0.shtml

taken deep root.

The success in reining in debt, however, is hard to assess. At least, we can say that though the central government has implemented harsh administrative measures and exerted political (within the Party) pressure, it will not be easy to reduce debt that has already been incurred. The reason is clear: the structural friction in revenue and outlay responsibilities between higher levels and cities/counties has not been fully addressed. The current strict measures can help restrain the momentum of debt increase at best until the systemic issues have been solved.

The anti-graft campaign since 2013 within the Communist Party has been successful in deterring rampant corruption; most senior officials and offices at all levels have begun to follow the formal rules rather than disobey rules or apply the informal rules. Still, it is hard to conclude that accountability has substantially improved. In other words, the full benefit of the anti-graft movement takes time to yield economic benefits; but no doubt it is one important step.

The "new normal" of economic development that targets medium high growth rates (for example, the 6.5 to 7.0 percent rate for FY2016, even the 7.0 percent annual rate for the 12th five-year plan period) is/was an important step towards lowering the pressure for local governments to incur more debts for the purpose of boosting development. An even more important and effective measure in this regard is to give up each locality's annual GDP growth rate as the performance measure of top local leaders.

A current reform that has just been announced at this year's session of the National People's Congress that adjourned in mid-March is to reduce tax rates, thereby lessening the tax burden on businesses and taxpayers (the so-called "supply-side reform"). One part of this is to convert some categories of the old "business taxes" into the value-added tax – the VAT automatically deducts the input by the lower-stream firms whereas the business tax does not allow deduction. For local governments, the share they get from the newly converted VAT is 50 percent rather than 25 percent as in the 1994 split on the VAT. It is too early to draw conclusions about the effects of these most recent reforms, though some experts in China hold reservations about the tax reduction claim.

Question 5. How is the Chinese government attempting to restructure local government debt, and how effective have these policies been? What is the importance and effectiveness of China's reissuance of the provincial bond system, debt-for-bonds swaps, and debt-for-assets/debt-for-equity swaps? How, if at all, does China's New-Type Urbanization Plan and land reforms impact China's fiscal policies? What other policies are under consideration in order to restructure local government debt and create new revenue streams?

Most of local government debt has been invested in local infrastructure including public facilities and industrial parks; some debt was guaranteed for local state-owned enterprises.

Provincial bonds are a relatively new policy that was started several years ago. The bond issuance is typically done by the Ministry of Finance on behalf of provincial governments; the annual total amount has not been large, on average each province got several billion at most, which is far from enough to cover the huge gap between revenue and outlay of local

governments.

Thus, most of the existing local government debt was taken out under the name of the various "financing platforms" mentioned earlier. The most recent initiatives such as "debt-for-bonds swaps", "debt-for-assets" or "debt-for-equity swaps" are all designed to alleviate the tremendous imminent pressure on local governments to pay back their loans to financial institutions. This type of debt swaps was used in the late-1990s under Premier Zhu Rongji to facilitate the transformation of state-owned enterprises ahead of China's entry to the World Trade Organization. That round of swaps was to a large extent successful in that state banks were able to wipe out their bad loans so that their account books looked good; the bad assets were separated from the banks into the hands of four asset management corporations created specifically for that purpose (each corresponding to one state-owned commercial bank then). Later, these asset management corporations were able to make a profit due to China's entry into the WTO deal and the boom of the real estate sector and the housing market.

This current round of swaps have not yet been fully launched. The mechanisms will be the same as with the 1990s round: local governments and their affiliated industrial parks and supported enterprises will not go bankrupt, the financial institutions that had loaned to local governments will not have to bear the bad or dead loans on their balance sheet. So, in the immediate- and short-term, the loan-to equity swaps may turn out to be a win-win for both creditors (banks) and debtors (local governments). But in the medium- and long-term, it is hard to say whether both sides will win, because the swaps do not solve the root cause to bad loans. Furthermore, the swaps transfer the financial uncertainty from local governments (debtors) to the financial institutions (creditors) who are good at making fixed-term investments but are poor at managing assets and businesses. However, since the swaps grant local governments some breathing time, the hope by the central government is that the debt-ridden local state-owned enterprises will return to profitability within a short period of time. If this bright prospect does not happen, then the financial uncertainty now hanging over the banks may turn into a systemic financial collapse.

Question 6. Tax reforms by the Ministry of Finance and State Administration of Taxation to boost revenues; viability of value-added, property, resource, and personal income taxes; impact of property tax on local government revenues; will the expansion of the value-added tax to real estate, financial, and consumer services affect the drivers of economic growth?

Q6a. What tax reforms have the Ministry of Finance and State Administration of Taxation undertaken to boost revenues (e.g., VAT, property, and resources)?

The new measures, not necessarily as formal as reforms, that the Ministry of Finance and the State Administration of Taxation have taken since last year (2015) to boost revenue are mainly administrative rather than any new taxes. The Chinese government has become accustomed to double digit revenue increases each year, at a higher rate than the growth of GDP. Therefore, since late 2014 when the New Normal, i.e., slower economic growth became the norm, a much more serious dilemma facing the government is the drastically slowed down growth of tax

revenue. Since 2015, the Ministry of Finance and the State Taxation Administration have been working to enforce collections in an effort to boost revenue. The reason for this dilemma is that the slower growth creates higher demand for services, meaning the government at all levels will have to spend more. This is a typical countercyclical outlay picture. So far it is hard to say how effective the revenue boosting measures have worked.

Beginning from this year, the State Council has been emphasizing the expansion of the value added tax to several sectors that used to be subject to the business tax. This effort has been labeled as tax reduction for businesses in an effort to boost the economy. Thus, we have seen opposite directions from last year to this year, which is an indication that the government is facing hard choices, with deficits rising for sure.

Q6b. What is the viability of value-added, property, resource, and personal income taxes?

The value-added tax has been used in China since the mid-1990s, with a relative mature structure of tax administration and enforcement. This tax in general has been successful as an efficient major revenue source despite many cases of tax evasion and tax receipt fakes.

There remains a long way to go with regard to the personal income tax. The Ministry of Finance has outlined a clear map for turning this tax into a major revenue source, which it is yet to be. There are many reasons behind the very low ratio of the personal income tax in the total revenue. An important one is the heavy, widespread use of the informal economy, grey income, and fringe benefits that do not count into the tax base. In the past several years, China has made a lot of progress in widening the tax base. As of now, the PIT-total revenue ratio is still below 10 percent.

The real property tax as of now remains one on commercial property. The one on residential property was piloted in Shanghai and Chongqing since 2011, more as a signal than as a serious tax because the base for the two pilot programs is very small. Thus, the real property tax is not a viable revenue source.

The first version of the Chinese resource tax was started in 1984 to adjust the differential profit gap between stages of production and distribution. It was levied as an *ad valerom* tax on petroleum, natural gas, coal and so on, but not on metallic and nonmetallic minerals. Beginning from 1994, this tax was expanded to cover all minerals plus salt; the levy was changed to a fixed amount by production volume. Over the years there has been a hot debate about this tax between mining firms, local governments, and tax/finance authorities, each side highlighting their own arguments.

In mid-2009, during the depth of the financial crisis, hundreds of mining companies petitioned in unison to the Ministry of Land and Natural Resources pressuring against the resource tax, claiming that the tax was dragging economic recovery. Around the same time, the Chinese coal sector association suggested to postpone universal levy of the tax. The National Development and Reform Commission stated explicitly that a market price system of energy that recovers externality costs is the first step toward the target of resource preservation and omission reduction. Near the end of the year, a State Council document clearly stated to expedite resource

tax reform and to improve the center-local allocation ratios of the resource tax.[23]

In general, the Ministry of Finance, the State Energy Agency, and the State Taxation Administration have since the end of 2009 repeatedly expressed opinions that the resource tax reform would be coming soon. A May 2010 circular of the State Council even said that the resource tax would start within the year. [24] One task listed in Premier Li Keqiang's 2016 Government Work Report is to spread price-based resource tax levy to the whole country. [25]

From the *Final Account* of the *2014 National Budget*, we see that the resource tax was budgeted at 120.8 billion but collected only 89 percent of the expected amount (108 billion).

Q6c. How would the property tax impact local government revenues?

The real property tax will exert huge and lasting impacts on local government revenues if it is levied on all properties, in particular residential property. But as of now there has been a lot of deeply rooted opposition to the tax, together with misleading policy recommendations by tax experts and think tanks. My design of the tax scheme is universal levy with a tax burden reduction mechanism to achieve horizontal and vertical equity in order to minimize loopholes and efficiency loss. Specifically, it is to exempt an amount of the house value that is the product of the number of household members, one-third of the local average housing space, and the median market price of housing per square meter.[26]

Q6d. How will the expansion of the value-added tax to real estate, financial, and consumer services affect the drivers of economic growth?

From March to now this year, the State Tax Administration has repeatedly emphasized, with strong support from Premier Li Keqiang that the VAT expansion will not add, but only reduce the tax burden on businesses and households on their housing transactions.

Question 7. What other policies is the Chinese government pursuing to raise revenues? How successful have these efforts been? What proposals are currently under consideration?

Since 2013, the main economic policy in China has been deregulation and decentralization, or the supply-side measures, as the concerted efforts to boost the economy. The theme of the December 2015 Central Economic Conference, as specified in the Government Work Report by Premier LI Keqiang to the National People's Congress in early March this year, can be summed up as five tasks. The following table lists the tasks and provides the most recent data of the first quarter of 2016: [27]

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[23] For details, see《国务院办公厅关于应对国际金融危机保持西部地区经济平稳较快发展的意见》（November 4, 2009）：加快推进资源税改革，进一步完善矿产资源补偿费中央与地方的分配关系。
[24] See 国务院批转发改委《关于 2010 年深化经济体制改革重点工作的意见》(May 31, 2010)
[25] See the whole report at http://www.gov.cn/guowuyuan/2016-03/17/content_5054901.htm
[26] For details, see Hou *et al.* (2016, forthcoming)《中国房地产税税制要素设计研究》北京：经济科学出版社.
[27] Data source: China National Bureau of Statistics, http://www.stats.gov.cn/

Task	2016 Quarter 1 performance
(1) Reducing excess production capacity of steel and coal	Raw steel -3.2%; coal -5.3%
(2) Reducing stock of newly developed housing and industrial products	Housing sales: floor space +30%; volume +50% Products: +0.7%
(3) Reducing leverage (January and February)	Industrial firms: 56.8% (0.1% lower from last year same period)
(4) Lowering taxes and fees on businesses (January and February)	Cost down by -0.29 per 100 RMB of industrial revenue
(5) Making up the short-board: invest more, especially in targeted areas	+20% in infrastructure like power, communications, and urban facilities

The Chinese Minister of Finance and Central Bank Governor at the Washington, D.C. G-20 annual financial officials meeting revealed China's first quarter performance in these areas; [28] Director of State Statistics Bureau also announced specific figures in these areas.[29] Overall, the indicators are positive, reflecting the efforts the Chinese government has made since last year.

Instead of increasing revenue, the Chinese government is incurring more deficits for fiscal year 2016, at 2.18 trillion or 3 percent of GDP, which is 560 billion over the deficit level of FY2015. Of the total deficit, 1.4 trillion is for the central budget and the remaining 780 billion for local budgets. [30] By a most recent inter-ministry plan, reducing the excess production capacity in the steel and coal industries will displace 1.8 million workers whose placement (many to retire early) will add a huge burden on government finances. The Premier made the public announcement in his annual work report (March) that "government at all levels are to tighten their belts, to spend each sum on a touchable item for substance."

Question 8. The Commission is mandated to make policy recommendations to Congress based on its hearings and other research. Assess the implications of China's on-going fiscal reforms and 13th Five-Year Plans for United States. What are your recommendations for Congressional action related to the topic of your testimony?

China's on-going and planned fiscal reforms as well as those fiscal reforms outlined in China's 13th Five-Year Plan display several important signals. First, there exist many huge distortions in

[28] The *Wall Street Journal* (mid-April) covered these details during the 2016 G-20 Financial Officials D.C. Meeting.
[29] Details are made public via the Xinhua News Agency, http://news.xinhuanet.com/fortune/2016-04/19/c_128911090.htm
[30] Data source: Chinese Premier's annual government work report in early March to the National People's Congress, http://www.gov.cn/guowuyuan/2016-03/17/content_5054901.htm

the country's economic system and government financial structure; these distortions were accumulated residuals from previous reforms that relied on extensive, expansionary models of development for the country to achieve very high GDP growth. Under this perspective, the double digit growths were remarkable accomplishments; on the other hand, extraordinary expansions necessarily left behind a heavy trail of inefficiencies, distortions that have become increasingly heavier drags on the economy. Therefore, the so-called "new normal" of 6.5% to 7% annual growth rate is only natural; it is much more fitted with the development and current status quo. It will be very hard, if not impossible, to resume the previous double digit growths. In other words, even if double-digit growth is doable again, the Chinese government would probably opt not to resume that high pace, for the simple reason that the ultimate cost is too high. The New Normal's annual growth target is already reasonably high, for sustainable development.

Second, the series of fiscal reforms are headed in the right direction. Higher reliance on direct taxes like the personal income tax and real property tax will better address wealth inequality and increase the overall economic efficiency of the whole society and economy. Deregulation of the old, rigid grips by the government of businesses and individuals will boost innovation and productivity. Decentralization and readjustment to the intergovernmental fiscal relations will grant provinces and other local governments more discretion and hold them accountable to citizens, free them from GDP championship that had caused the overhang of mammoth local government debts. No doubt, none of the above reforms are easy; thus, the Chinese government faces many challenges in the coming years.

OPENING STATEMENT OF DR. WEIPING WU
PROFESSOR AND CHAIR OF THE DEPARTMENT OF URBAN AND ENVIRONMENTAL POLICY AND PLANNING, TUFTS UNIVERSITY

DR. WU: Thank you.

I'm very, very encouraged by the attention to urbanization and issues related to that, and especially, as Dr. Hou has laid out, the central-local fiscal relation framework. I want to highlight five points out of my written testimony. The first is rapid urbanization in China is massive. So in 1980, it was around 20 percent of urbanization rate. Now it's about 53 percent, and the goal for the New Urbanization Plan is for 60 percent in 2020.

But as Chairman Shea has noted, that is actually a different indicator from how much the population is urbanized. So there is the effect of the hukou system. The actual urban hukou population right now is about 36 percent, and the goal is to 45 percent in 2020. There lays the persistent urban-rural divide that still perpetuates within cities and, particularly in regards to the rise of migrants and the access to services by migrants.

So the second point I want to highlight is that the New Urbanization Plan recognizes that the investment-driven and land-financed dependent path of urban growth is unsustainable, and so if. If you look at urbanization, all of the data reported in the past tended to focus more on what we call the urbanization of land use of physical areas. So that 53 percent to 60 percent is more based on how many jurisdictions will be counted as cities and towns, and now the focus will be shifting more towards urbanization of population.

As a result, the New Urbanization Plan hopes to grant urban status to about 100 million migrants by 2020, and currently there are already more than 200 million migrants. But this change in the hukou system will mostly only happen in second to fourth-tier cities, those cities with populations of less than three million. So it's not a wholesale type of reform of the hukou system.

The third point is also related to that, so: urbanization has been rapidly increasing, and in this sort of the current central-local fiscal framework, there is a significant what we call revenue and expenditure mismatch for cities. That is how much responses, as Dr. Hou has already pointed out.

As a result, financing for infrastructure in Chinese cities is actually fundamentally different from the main mechanisms that we see in other countries, both developing as well as developed countries. For instance, property tax is the main source here, and capital markets is also a very large source. But in Chinese cities, that is not the case, and as you will see in my written testimony, and there's a proliferation of local government financing vehicles that really are not sovereign government units, but they have strong involvement of the local governments, but they behave more like corporates, and sometimes circumvent the rules that local governments may not use revenue sources to pay off, for instance, debt obligations.

This leaves a very sort of precarious situation in which local governments need to finance a lot of the service and infrastructure responsibilities through what we call the extra-budgetary revenues, and much of that comes from land and land transfer and lease fees that are one-shot payment by users of land to local governments because land ownership in China, especially in the cities, is not a free-hold system. It's a lease-hold system so: the government essentially owns the land and leases out the use right on a long-term basis, anywhere from 20 to 70 years.

And so that's really problematic because much of the leasing of the land is a one-

time payment, and there's not a consistent flow of income revenues to local governments as property taxes.

My fourth point, so in that kind of large context situation, I think, fiscal reform, particularly to consider the interest of local governments, needs to address at least two key issues need to be addressed, and I think Dr. Hou has spoken to some of that. One is the central-local relations and how the mismatch between expenditures and revenues continues to drive local governments to use land as leverage for both borrowing from banks and as collateral payment as well as revenues for financing infrastructure. The land -infrastructure -leverage is really problematic and stems very much from this mismatch.

And, of course, it doesn't appear that wholesale, large-scale revamping of the fiscal system really is likely in the current plan. In fact, property tax isn't even mentioned in the urbanization plan. A number of scholars have pointed to perhaps some, you know, sort of the transfer, sort of the more like the service-to-revenue link, and then; the goal to give 100 million migrants urban status does come with the stipulation that there will be transfer payments associated with that providing services because the. The New Urbanization Plan will cost something like $6.4 trillion cost plan.

So the second reform really is about what Dr. Hou has mentioned, the discipline and accountability for local finance.

My last point has to do with for U.S. and global investors,: the urban infrastructure space actually continues to be a risky space in terms of investment, particularly given the risk in demand forecasting, risk in currency, risk in management of general business, as well as, you know, sort of a lack of regulations and a regulatory framework that is consistent with international norms.

But there are a number of sectors that have been relatively open to foreign investors. That includes water, renewable energy, ports, and now increasingly in healthcare, senior care and private hospitals.

Thank you.

PREPARED STATEMENT OF DR. WEIPING WU
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Testimony before the U.S.-China Economic and Security Review Commission
China's 13th Five-Year Plan

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April 27, 2016

Thank you to the U.S.-China Economic and Security Review Commissioners for inviting me to testify today, particularly as related to fiscal reform priorities. I appreciate your interest in China's urbanization processes and outcomes. How China accommodates its rising urban population is critical to the well-being of an increasing number of its people but also indirectly to the country's sustained economic development. The rapid urbanization (see Table 1) is in no small part powered by massive building and expansion of urban infrastructure, and public finance matters for this. I hope to address the opportunities and challenges in this area by responding to your specific questions.

1. ***How have municipal governments financed China's rapid urbanization over the past two decades? Is there a divergence in strategies pursued by coastal and western cities? Has past infrastructure investment met the needs of China's rapidly growing urban population? How, if at all, has the fiscal burden on cities impacted the level of services, healthcare, and education of its urban citizens?***

Infrastructure financing at the local level in China is fundamentally different from that in most other countries. The common sources include borrowing from banks (instead of through capital markets) by local government financing vehicles (LGFVs), and local governments' own taxes and fee revenues (though not in the form of property taxes commonly levied in the West). Budgetary allocation from central and local governments has become a less important source. Given that expenditures have exploded while revenues have not kept pace since the 1994 tax reform, local governments cope with funding shortfalls through a variety of off-budget or extra-budgetary mechanisms, particularly through the collection of land lease/transfer fees.[1] An additional problem is that local governments may not establish taxes or issue bonds – save the ten cities and provinces now permitted to issue bonds under a pilot program initiated in 2014.

On an aggregate level, China has made significant progress in infrastructure services since 1979. Most urban residents have access to faucet water, cooking gas, and public transportation.[2] Yet the continuity of service and especially the quality of tap water remain a major concern. While

[1] In 2010, for instance, receipts from land lease/transfer accounted for an estimated 35 percent of comprehensive fiscal revenues for prefectural-level cities, compared with just 30 percent from tax revenues. See Christine Wong, "Some Suggestions for Improving China's Municipal Finance for the 21st Century." Paulson Policy Memorandum, the Paulson Institute (2012).
[2] Water supply coverage reached 98 percent in urban areas in 2015, according to the World Bank. Another area of significant progress is the treatment of wastewater, the rate of which more than doubled between 1996 and 2006, from 23.6 to 55.7 percent. Now, this rate is estimated to be around 77 percent (http://chinawaterrisk.org/).

demand is tremendous and growing, water resources are so limited and/or polluted that they cannot meet the demand, especially in northern cities. There are noticeable differences in nearly all available aggregate indicators of urban infrastructure services across the three broad regions (eastern, central and western). Cities in the eastern region uniformly enjoy higher levels of service in all sectors. In many inland provinces, utility services, such as public transportation, roads, streets, water supply, and waste treatment, are in poorer conditions. Some of the poorest provinces, primarily in the central and western regions (such as Anhui, Henan, Hubei and Gansu), continue losing ground in their capacity to finance urban infrastructure. Cities in the western region, in general, have much less the ability to raise funds from extra-budgetary sources. Instead, they rely much more on fiscal allocation and borrowing.

Access to other urban services, particularly education and health care, continues to be shaped by the long-standing urban-rural divide that persists even within urban jurisdictions.[3] For the more than 200 million migrants living in cities (particularly those from rural origins), their situation is not on par with urban residents with local household registration (*hukou*); in a similar fashion, local residents with rural *hukou* also lag behind their urban counterparts. There has been limited attempt to integrate rural areas into the new social insurance system that includes pension, medical insurance, and unemployment insurance (as well as maternity insurance and occupational injury insurance). Rural residents by and large are left out of social insurance, perhaps with the exception of health insurance since the late 2000s that offers basic benefits. The limited fiscal transfer scheme also offers no incentive for destination cities to provide services to migrants. Research based on the 2005 mini census (1 percent survey) data for Beijing and Shanghai shows that for both migrants and local residents, having a rural *hukou* is disadvantageous, particularly for pension and unemployment insurance.[4]

2. Describe China's New-Type Urbanization Plan and its key targets. What policies has the Chinese government pursued to achieve these targets? How much financing will be required to finance public services and provide basic infrastructure for its growing population? What, if any, fiscal reforms were announced in the 13th Five-Year Plans?

The plan, proposed for the period of 2014-2020, emphasizes a "human-centered and environmentally friendly" path to urbanization. It is a comprehensive blueprint, ambitious in scope but brief on details as implementation is largely left to local governments. Five themes constitute the broad framework: integrating rural migrants into urban society, improving the distribution and form of cities and towns, raising capacity for sustainable development, promoting integrated urban-rural development, and reforming urban development institutions. The Plan makes it clear that the investment-driven and land-finance-dependent urbanization path should not continue; instead, the future path needs to be more inclusive and sustainable.

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[3] Chinese cities, particularly the large ones (the so-called prefecture-level cities), encompass both a central city and surrounding areas. Many also embed considerable rural territory. Within a city's jurisdiction, there are both non-agricultural (with urban *hukou*) and agricultural (with rural *hukou*) populations. A prefecture-level city may contain multiple urban districts, counties, county-level cities, or other similar units. It can be considered as the Chinese version of the term "metropolitan area" as used in the U.S. See Weiping Wu and Piper Gaubatz, *The Chinese City*, New York and London: Routledge (2012).

[4] For health insurance, a small share of rural migrants obtains it (16.2 percent), as opposed to most local urban residents (86.2 percent). For pension benefits, 12.7 percent of rural migrants, 38 percent of local rural residents, and 85.5 percent of local urban residents have obtained them. For unemployment benefits, the distribution is 5.6, 5.6, and 47 percent respectively. See Weiping Wu and Guixin Wang, "Together but Unequal: Citizenship Rights for Migrants and Locals in Urban China," *Urban Affairs Review* 50, 6 (November 2014): 781-805.

The key targets of the Plan are about raising the rate of urbanization, as well as improving urban services and housing conditions.[5] Most prominently, it projects urbanization level to increase from 53.7 percent in 2014 to 60 percent by 2020, while the share of population with urban *hukou* from 36 to 45 percent. This will be achieved by a renewed focus on small and mid-sized cities and development away from the coast. In addition to urbanizing about 100 million people in central and western regions, an important element of the Plan is urban *hukou* reform, primarily in second through fourth tier cities (with population of less than 3 million), that would allow 100 million migrants to gain full urban residency by 2020. According to a large report on urbanization jointly by the World Bank and China's Development Research Center, extending this may cost on average as much as 100,000 RMB ($16,400 U.S.) per migrant.[6] Currently, except in small cities and towns, migrants have limited access to local public schools, welfare programs, state sector jobs, and affordable social housing options. The proposed *hukou* reform remains confined to small cities and towns, though committing to addressing migrant rights are a welcoming step forward.

The total estimated cost for the Plan, including urbanizing an additional 200 million people, is estimated by the Ministry of Finance at about 42 trillion RMB ($6.8 trillion).[7] How to finance this remains to be worked out, and the Plan contains only a few new proposals. The first is that the Ministry of Finance will establish a mechanism that connects fiscal transfer payments with the urbanized agricultural population. This is intended to improve the fiscal transfer payment system and promote equitable public services including social security, health care, and education. Second, allowing local governments to issue bonds and attract non-state (broadly referring to private) capital in infrastructure projects, the Plan specifically alludes to three key sources of finance: (1) fiscal allocation by central and local governments, (2) private investment, and (3) more flexible mechanisms such as municipal bonds, investment funds, policy banks, and public-private partnerships (PPPs).[8]

Obviously missing from the Plan is local property taxes that have been under discussion extensively and piloted in select cities. Unlike in Western countries, local governments cannot use tax revenue for debt obligations, leading directly to land leasing as a source of funds for repayment. Indeed, land, real estate, and natural resource-based assets have been calculated as 47 percent of the collateral put up to secure bonds at the local level and land has been earmarked as providing 37 percent of the funds needed for repayment. Yet, it is not uncommon for land leasing fees to fall short of even covering bond interest payments.[9]

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[5] These include raising service levels of public transit, water supply, wastewater treatment, and waste decontamination in cities, accelerating the construction of high-speed rail and highways among major cities in central and western city clusters, and providing full coverage of basic housing and public services for shantytowns in which around 100 million people reside.
[6] World Bank and the Development Research Center of the State Council (DRC) China. Urban China: toward efficient, inclusive, and sustainable urbanization. Washington, D.C: The World Bank (2014).
[7] Reported by www.bloomberg.com (May 25, 2014).
[8] Xiaodong Ming (China's National Development and Reform Commission). "Infrastructure's Central Role in China's 'New Urbanization'." Rethinking Infrastructure: Voices from the Global Infrastructure Initiative, McKinsey, May 2014.
[9] See Yang He, Kun-Chin Lin and Ran Tao, "The Local Government Fiscal Imperative and Debt Financing in China," in Philip Arestis and Malcolm Sawyer (Eds.), *Fiscal and Debt Policies for the Future*, Basingstoke, Hampshire, UK: Palgrave Macmillan (2014): 195-236; Brent W. Ambrose, Yongheng Deng and Jing Wu, "Understanding the Risk of China's Local Government Debts and its Linkage with Property Markets," SSRN working papers series, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2557031 (2015).

3. ***How, if at all, does China's New-Type Urbanization Plan and land reforms impact China's fiscal policies? How does local governments' dependence on land sales and local government financing vehicles (LGFV) impact the Chinese government's ability to address its property bubble?***

While the Plan recognizes that the current investment-driven style of urban development is unsustainable in both fiscal and environmental terms, it contains few new proposals for furthering urban land reform. One exception is to move forward with ensuring that rural land rights can be transferred and traded, which is just short of privatizing. Land features central in local finance, particularly for LGFVs. Behind China's impressive urban growth lies a potential fiscal crisis that did not come to light until a 2010 report by the National Audit Office warning of the risks inherent in a RMB 10 trillion-plus local debt burden.[10] Barred from borrowing directly, local governments have set up more than 6,500 LGFVs (corporate platforms) to raise funds for infrastructure and other public projects. The culmination of local debts stems from a confluence of factors, primarily institutional in nature, including the expenditure-revenue mismatch, acceleration of debt buildup by the stimulus package to ease recent financial crisis (and loosened credit policies), a complacent state-controlled banking system willing to accommodate wishes of local governments, and a so-called "land-infrastructure-leverage" strategy to tap the windfall from land development.[11]

LGFVs perform four common functions: (1) as a financing platform, raising funds for needed infrastructure projects; (2) as a public sector investor, managing and operating the local government's assets; (3) as a land development agent; and (4) as project sponsors/owners. Aside from their role in infrastructure, many LGFVs also make large investments in two other lines of business: real estate (particularly residential development and construction but also a variety of commercial development) and financial services (investment banking, private equity, loan guarantee, and mergers and acquisitions). The principal backing asset for LGFVs is land, for engaging in heavy borrowing via various methods including bank loans, bond issuance, initial public offerings, and even trust loans through shadow banking activities. While procuring funds from capital markets was not allowed for local governments, as corporate entities, LGFVs could raise funds from equity and bond markets.[12]

Local governments have a powerful incentive to place local banks' excess liquidity into real estate, which would expand the local housing market and their bottom lines. They have a direct interest in seeing land and construction prices rise, which are significant parts of housing prices, to increase government revenues.[13] The property sector also is a huge employer, accounting for

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[10] This debt was equivalent to 27 percent of the country's GDP in 2010, and now close to 30 percent. About 8.5 trillion of the outstanding liabilities came from bank loans, primarily from state banks. See Meng Li, "China's Local Government Debt Crisis," *SERI Quarterly* April 2012: 33-39.

[11] Kai Yuen Tsui, "China's Infrastructure Investment Book and Local Debt Crisis," *Eurasian Geography and Economics* 52, 5 (2011): 686–711.

[12] In fact, shadow banks – trust, securitization, insurance, and leasing companies, and other non-bank financial institutions – hold large amounts of bonds issued by LGFVs that in total amounted to about 5 trillion RMB outstanding by the end of 2014. It also has been estimated that up to 76 percent of LGFV loans may be at risk of repayment problems because the infrastructure projects they are created to support do not generate sufficient cash flow. See Kunyu Tao, "Assessing Local Government Debt Risks in China: A Case Study of Local Government Financial Vehicles." *China & World Economy* 23, 5 (2015): 1-25.

[13] As much as 40 percent of local government revenues are tied to property development. See Neil Gibson, "The Privatization of Urban Housing in China and its Contribution to Financial System Development." *Journal of Contemporary China* 18, 58 (January 2009): 175–184.

about one-fifth of the country's economic output. In general, national-level regulating agencies lack effective clout – political as well as economic – over local interests. As such, cooling the housing market has proved to be more difficult than anticipated. Even the recent global economic recession (2008-2009) failed to make a significant dent in China's property boom. Housing prices dropped sharply in mid-2008 but went back up within a year. They rose between 10 to 15 percent in the first quarter of 2010 in such cities as Beijing, Hangzhou, Shanghai, and Shenzhen.[14] It was not until the late 2011 were there signs of the "housing bubble losing air"

4. ***Describe the role of public-private partnerships in financing urbanization in China. How are they structured? How are they implemented? What incentives are utilized to attract private capital and participation? How effective are these partnerships in providing public services or constructing infrastructure?***

In China, PPP projects were first introduced in the late 1970s and have become more widespread since the 1990s. Many of the more successful projects were in the water and transport sectors (see Table 2). But the scope and number were limited, and some were not typical PPPs as perceived in the West since many domestic "private" service providers and operators had some elements of state involvement. Earlier steps to promote private participation focused on developing the legal and regulatory frameworks at the national level, which left the execution to local governments to the effect of significant variation. During 1990s to the early of 2000s, many PPP projects were contracted with either flexible rate or fixed investment return rate with local governments. But the central government opposed and curbed the tendency for fixed-rate returns, issuing a directive in 2002.[15] This policy reversal was followed by rounds of intense debates, particularly within the Ministry of Finance, about the nature and application of PPP, accompanied by a substantial wane of private investment in the wake of global recession. In 2014, a set of new central directives were issued to encourage PPPs, for at least two reasons: the high level of debt among local governments and the substantial investments local governments require for infrastructure. Current incentives include offering major infrastructure projects generous tax incentives by local governments, including a tax holiday and corporate income tax rate reduction to 15 percent, although details on qualified projects are elusive.

BOT (build-own-transfer) has been the most common form of PPPs in China, requiring large investment and long duration. It is a kind of integrated solutions approach, a collective offering of goods, services, knowledge, support, and self-service for customers. BOT approach with foreign private sector participation generally falls into five types: Cooperative Joint Venture BOT, Equity Joint Venture BOT, Non-official Wholly Foreign Owned BOT, Official BOT (a specific project institutional arrangement and legal structure being developed by the central government under a "National Experimental BOT Program"), and BOT Variant (e.g., Transfer-Operate-Transfer). Other forms of PPP implemented in China includes BT (build-transfer) and

[14] See Xinzhen Lan, "Toil and Real Estate Trouble," *Beijing Review* April 15, 2010: 28-29.

[15] Specifically, the State Council specially issued the Notice on Appropriate Handling of Existing Problems in Guarantee of Foreign Investment Fixed Return Projects on 10 September 2002 (State Council General Office's No. 43 Decree). This policy led many foreign invested PPP projects to be renegotiated to replace fixed return with a legitimate proceeds allocation method such as 'return of investment' or acquired by local government. On balance, this ban also was a reaction on the part of the central government to curb over-promises by some local governments and subsequent financial losses. See Jae-ho Choi, Jinwook Chung and Doo-Jin Lee. "Risk perception analysis: Participation in China's water PPP market." *International Journal of Project Management* 28, 6 (August 2010): 580-592.

BOO (build-own-operate). Overall, most PPPs involve the building of new facility, or the so-called greenfield projects, and are often perceived as carrying higher risks by private investors. By contrast, other forms of PPPs, such as service and management contracts, concession, and divestiture, are less common in China.

There are a number of challenges – some are institutional while others are operational. Research shows that many risk factors for PPPs in China are related to or affected by government in one way or another. Among these, the following deficiencies in the legal and policy framework require serious attention: fragmented legal and administrative decisions at central and local levels, lack of institutional capacity and skill set required to support PPPs, lack of appropriate and enforceable dispute resolution systems, and lack of level playing field between state-owned enterprises and independent providers. In particular, there is a complex legal situation because of different ways of PPP implementation in different places. On balance, the rise of PPPs in China seems to have generated higher transaction costs, particularly as related to organizing tendering, evaluating and selecting bids.[16]

5. ***What, if at all, is the role of the private sector in filling those gaps in the level of services, healthcare, and education of its citizens? What, if any, are the potential opportunities for domestic and U.S. insurance and banking firms?***

Compared to other emerging economies, such as Brazil, India, and South Africa, China is still at an early stage of developing the institutional sophistication for engaging the private sector in infrastructure.[17] Trends in the past two decades show that significant private investment in China's infrastructure is South-South investment (from other developing countries) and domestic in origin. Private providers are more common in water, power, and road projects. Going forward, the opportunities for private and global investors will likely materialize in the following infrastructure services:

<u>Water & Sewerage</u>
Water (including desalination) and wastewater projects look particularly promising for global investors. Low sewerage coverage, inadequate treatment facilities, and low water discharge fees all have contributed to contaminated groundwater and polluted surface water that further aggravate urban water shortages in urban China. Most attractive has been water production and distribution services with a number of large multinational providers (e.g. Suez Group, Veolia Environment), and wastewater treatment plants with a maturing set of domestic private providers. Such projects demonstrate solid fundamentals and sound demand.

<u>Energy</u>
Renewable energy projects have been growing fast. However, the scale of these projects tends to be smaller than conventional power projects. Most are located in coastal provinces except for wind farms and hydro power projects. Renewables are interesting to investors because they are part of a larger, and conscious, shift by the Chinese government toward lower-carbon sources of

[16] Rui Mu, Martin de Jong and Joop Koppenjan. "The rise and fall of Public–Private Partnerships in China: a path-dependent approach." *Journal of Transport Geography* 19, 4 (July 2011): 794-806.
[17] Between 1990 and 2012, China had more than 1,020 transactions with private participation for a total value of US$114 billion, in transport, energy, telecom, and water and sewerage sectors. By comparison, Brazil had $398 billion and India $303 billion during the same period. Based on World Bank Private Participation in Infrastructure Database.

energy.

Airports and Ports

Airports remain high on the government's agenda.[18] But for global investors, airports are a mixed target. A key issue relates to the regulatory environment as the air space is completely controlled by the Ministry of Defense, not by a regulatory body. In contrast, port operators experience less monopoly and there is more space for private participation. There are also a sizeable number of ports along the coast to offer choices for interested investors. Firms from Hong Kong, Norway, Singapore, Spain, and UK have been operating in China.[19]

Toll Roads

The highway sector was among the earliest open to private and foreign investment, and since the 1990s toll road PPPs have proliferated. But investment performance is mixed, due to a mixture of unreliable demand forecast, drivers avoiding tolls, and political interference in rate setting. Investment in the sector also illustrates the complex regulatory environment investors may encounter.[20]

Outside of the infrastructure sector, the scope of private participation is limited in health care and education and foreign providers tend to be limited to the upper segments of the market (e.g. foreign hospitals and medical offices). Regulatory hurdles, particularly those restricting foreign ownership, also have kept foreign presence in the insurance market to a minimum. However, recent central directives (issued around 2014-15) seem to encourage private investment in senior care business (given the rapidly aging population) and hospital development.[21] Similar to the infrastructure sector, domestic providers, especially public sector providers, continue to dominate and crowd out private participation to some extent.

6. In your view, what are the critical reforms necessary to address the fundamental challenges of China's municipal fiscal issues, and how should the Chinese government sequence these reforms?

Local governments in China have neither sufficient tax resources nor sufficient authority to leverage capital markets. In borrowing from domestic banks to finance infrastructure, local

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[18] The central government announced that it would build 82 airports and refurbish a further 101 by 2015. This will take the number of airports in China to around 230. The flagship project is Beijing's second airport with capacity of up to 72mn passengers by 2025 (Business Monitor International 2014).

[19] Hong Kong-based Hutchison Whampoa Ltd., for instance, has been one of the largest global investors in China's infrastructure. Between 1990 and 2012, it was involved in 17 different seaport projects, spanning from Xiamen in southeast China to Dalian in the northeast and all the way in between.

[20] A road PPP project has to involve different laws and statutes: Road Law (2004), Tendering and Bidding Law (1999), Land Management Law (2004), Contract Law (1999), Regulation on the administration of toll roads (2004) if it is toll road, and Decision on Reforming Investment Scheme (2004) if it involves domestic private investment. There are also other laws and policies to address aspects of environmental protection and construction quality management, which are relevant to a road project.

[21] **The National Planning Guideline for the Healthcare Service System (2015–2020) was the first comprehensive five-year blueprint targeting keys areas for development by 2020.** More regions will be included in the pilot program allowing for the establishment of wholly foreign-owned hospitals. At of 2015, they were allowed only in Beijing, Tianjin, Shanghai, Jiangsu Province, Fujian Province, Guangdong Province and Hainan Province. Other than Hong Kong, Macau and Taiwanese investors, foreign investors are not allowed to wholly-own a Chinese traditional medicine hospital. See Norton Rose Fulbright, "China's New Healthcare Reform 2020." http://www.nortonrosefulbright.com/files/china-healthcare-reform_10-things-to-know-128860.pdf.

governments face virtually no limit and little accountability. State banks also are ill-equipped to provide the discipline expected from capital markets. It is unlikely for local governments to count on revenue from asset sales (mainly land) as a major, lasting source of funding to expand infrastructure construction and maintenance. At least two sets of reform measures are called for to address the fundamental challenges.

First and foremost, the mismatch between revenues and expenditures at the local level is a fundamental problem. Addressing this requires changes to the tax and fiscal systems, particularly the tax-sharing schemes, although drastic revamping seems unlikely at present. Inter-governmental transfers can be helpful in reducing the fiscal mismatch, so is more effective use of such transfer for the intended recipients (e.g. the proposed transfer targeting migrants in the new urbanization plan). In addition, local governments may be granted more autonomy in setting rates for a few select taxes (e.g. vehicle tax and license fee). The realignment of central-local fiscal relations also may help reduce local reliance on land financing. Cities can find other sources of revenue by broadening the municipal tax base and/or making more effective use of user charges.

Second, local finance needs stronger discipline, and this may require a process of moving public investment off the budget and into the capital market.[22] The central government has recently (in late 2014) issued a directive to further clear out local government debts generated through LGFVs. Part of the directive indicates that provincial-level governments can issue municipal bonds and project bonds on behalf of municipalities and counties, and the repayment of the debts must be reflected on municipal budgets. Imposing stronger discipline also includes unwinding LGFVs as pure financing platforms so that municipalities begin to borrow on their own, and their credit worthiness is based on sovereign ratings. As part of the process of shifting borrowing to capital markets, new rules and limits must be put in place, such as moving to the widespread practice of governments only being allowed to borrow for long-term, capital investments. Moreover, if local governments are expected to become more competent in managing both costs and revenues of capital investment, municipal bonds are a key component of that ultimate objective, as are the means of repaying those bonds. In addition, municipal bonds provide transparency and standardization, firmed up by the requirements of capital markets.

7. ***The Commission is mandated to make policy recommendations to Congress based on its hearings and other research. Assess the implications of China's 12th and 13th Five-Year Plans for United States. What are your recommendations for Congressional action related to the topic of your testimony?***

China's urban transformation does and will have global implications. To power its growth, urban China will account for about 20 percent of global energy consumption. Given the low per capita resource endowment domestically, most of this will be imported. For hundreds of cities, the building of mass-transit systems and new roads will continue, combined with a steady rise in demand for health care and educational capabilities. This represents an opening of opportunities for American providers and investors, much in the same way as the manufacturing sector did about three decades ago. However, China's infrastructure space continues to pose risks, in the

[22] For more details on this policy recommendation, see Christine Wong, "Some Suggestions for Improving China's Municipal Finance for the 21st Century." Paulson Policy Memorandum, the Paulson Institute (2012).

form of regulatory, currency, demand, and general business risks.

First, we can encourage the adoption of a consistent set of policies and practices at the national level in China that conform to international norms. Market openness varies substantially across different infrastructure sectors in China. So are rules and regulations. For instance, there is a policy preference for state-owned enterprises in a number of infrastructure sectors still considered strategic, including natural gas, mining, telecom, and airports. With state monopoly, backed by government subsidies, there are significant entry barriers for private investment. Specifically, in the area of PPP governance, it is essential to continue building and integrate the legal and regulatory framework.[23] At the national level, a single PPP legislation should guide approval processes across sectors and regions. Legal safeguards also need to be present in the form of effective regulatory oversight and efficient dispute resolution system. In addition, it is common for host governments to guarantee fixed returns for private concessionaires in sectors where prices for infrastructure products and services are kept low because of equity goals, including water, waste management, and public transit. If China wishes to attract more private investment in these sectors, it will need to follow 'the rule of games.'

Second, a knowledge asymmetry needs to be bridged. For global investors, China is still at the margin of their radar screen, if on it at all. Risks abound, particularly the lack of a regulatory environment with transparent, published rules, and independent of politics that may be driven by popular demand. Unfamiliarity with the business culture and local context adds further discomfort. For Chinese local governments, developing infrastructure is often a mechanism to increase land values that will lead to higher transfer/lease revenues. Bundling with other on-site development deals is often the norm, a practice unfamiliar to global investors. Aside from built-in risk tolerance, reliable local partners can hold the key to more positive outcome in sourcing viable projects and deals. Infrastructure fund managers, particularly those knowledgeable with China, also can bridge the asymmetry. For large global institutional investors such as pension funds and insurance companies, these managers help with accessing the Chinese market. They also provide the due diligence and local monitoring that investors lack about an overseas locale

Third, China can learn from effective practices elsewhere. One such practice is non-bank financial intermediaries, which can be a promising investment platform to bridge the 'investability gap' in China and especially in poor localities. Of particular relevance is the U.S. model of state bond bank.[24] Bond banks serve municipalities, school districts, fire districts, water and sewer districts, and more. They are able to provide lower-cost financing as long as they have higher credit ratings than the entities that seek to borrow. There are at least two benefits. On the one hand, investors may be reluctant to invest in municipal securities of a small town with limited resources, but eager to invest in those issued by a larger entity with significant resources like a bond bank. On the other hand, bond banks can pool together a number of small offerings to provide investors with a more attractive diversified product. The conditions for launching non-bank intermediaries for financing infrastructure are maturing in China, and there is forward movement locally (e.g. Guangdong and Shanghai) exploring the feasibility of doing so. Given

[23] In some of the largest emerging economies, including Brazil, India, Egypt, South Africa, and Turkey, special purpose legislation governing the delivery of infrastructure PPPs has been enacted.

[24] A bond bank in U.S. is a state-level entity that provides that state's smaller public entities with debt financing at a lower cost than what the small entity could obtain on its own. States operating such banks include Maine, Indiana, Idaho, New Hampshire, New York, Vermont, and Alaska. Some municipalities also operate bond banks.

that infrastructure finance has revolved around state and development banks in China, government sponsored funds hold particular promise.

Table 1. China's urbanization at a glance

	~1980	~2010	% change
Urbanization level (%)	19.4	51.0	162.9
Number of cities	193	657	240.4
Eastern region	69	344	398.6
Central region	84	218	159.5
Western region	40	95	137.5
Cities by population size			
Super large (> 2 million)	-	42	
Extra large (1-2 million)	13	82	530.8
Large (0.5 -1 million)	27	110	307.4
Small & medium (< 0.5 million)	153	423	176.5
Agriculture's share in employment (%)	64	39	-39.1
Ratio of urban-rural per capita income	2.6	3.2	23.1

Source: Weiping Wu and Piper Gaubatz, *The Chinese City*, New York and London: Routledge (2012).

Table 2. Select PPP infrastructure projects in China

	Form of PPP	***Private client(s)***	***Time frame***
Water & Sewerage			
Chengdu Water	Official BOT (build-operate-transfer)	Vivendi & Marubeni	1999 (18 years)
Pudong Waterworks	Divestiture (time-bound)	Veolia	2001 (50 years)
Hefei Wastewater	TOT (transfer-operate-transfer)	Berlinwasser International	2004-2026 (23 years)
Transport			
Beijing Metro Line 4	SPV (special project vehicle, joint venture) + BOT	HK MTRC	2004-2033 (30 years)
Shenzhen Metro Line 4	BOT (wholly foreign-owned) "Rail + Property"	HK MTRC	2005-2040 (5 years construction and 30 years operation
Hangzhou	SPV (joint venture) + BOT	HK MTRC	2010 (25 years)
Shanghai	Service and Management	Public-Public	3-5 years

Metro Line 3 contract Partnership

OPENING STATEMENT OF DR. ESWAR S. PRASAD
TOLANI SENIOR PROFESSOR OF TRADE POLICY, CORNELL UNIVERSITY

DR. PRASAD: Chairman Shea, Vice Chairs Goodman and Bartholomew, as always, it's a pleasure to come before your Commission.

Every year we meet here and it seems like the problems we talk about are much the same.

[Laughter.]

DR. PRASAD: At one level, the scope of the problems seem to increase, the risks seem to increase, but at the same time, there is progress in some reforms at least. And the question with China always is whether the risks are going to outrun the reforms and the progress that is being made in turning the economy in the right direction?

Now if we were a meeting a few months ago, the picture would have been very different, not just in the financial centers around the world, but even within China, there was a sense that the economy was stalling, there was a sense that the industrial sector had basically stopped growing, that the currency had nowhere to go but down, and that capital was fleeing the country in massive amounts.

Things have changed a bit since then to some extent because of policy and to some extent because of luck. In terms of policies, what the government told us last year, or at least told some of us, was that, in fact, there was not as much reason to be concerned about the economy because there was some stimulus that had been put into the pipeline in the first half of 2015 that would come on stream only in early 2016. This was not quite taken at face value, but things included the following:

The number of projects or the amount of projects approved by the National Development and Reform Commission in the first half of 2015 was about double the dollar amount of the projects approved in the first half of the previous year, plus around the middle of the year, the constraints on local government financing were eased a little bit. Local governments were told they could use the bond markets rather than bank financing. And this dropped financing costs by about two percentage points. So this freed up money.

The property sector had begun to come back up by the middle of last year. Again, not across the board but at least in the first and second-tier cities, and even in the third-tier cities, prices were beginning to stabilize, and there was a sense that this might lead to some investment coming on line early in 2016.

So what we are seeing right now is not just the stimulus effects coming through from early this year, although as Chairman Shea pointed out, there does seem to be some going back to the old playbook. But this should be interpreted as something that's been in the works for about a year or so.

Having said that, certainly growth for this year is not quite in the bag yet. And as always, the big question that remains is how will the Chinese government get to its growth target? I have little doubt that China can generate growth in the range of six-and-a-half to seven percent if it wants to. The question is do they do it using the credit financed investment boom that they used in the past very effectively or do they do it through a better mix of macroeconomic policies, especially with fiscal policy that I think would be better both in terms of supporting short-term growth, but also in terms of promoting the longer-term rebalancing of the economy towards a more consumption-led economy that is less dependent on both investment and exports?

And, again, on this front, too, there is some progress. It looks like there is some fiscal stimulus along with some of the monetary stimulus that has been put into the pipeline earlier this year.

So stepping back a little bit, it's worth thinking about what has been accomplished over the last year and what has not. And if one looks at the reform checklist, in fact, a fair bit has been done over the last year. There was the institution of the explicit deposit insurance system, which is supposed to instill a little more market discipline in the banks. Interest rates have been fully liberalized. The last step was the liberalization of deposit rates. There was the ostensible move towards a somewhat more flexible currency, a topic I'm sure we'll return to, but at least the intentions were right if not executed very well.

There have been more capital account opening measures so there is progress, but set against that I think are two very fundamental concerns I have about the Chinese economy right now. Not that there are no reforms, but that they are becoming very unbalanced, and that I think has very significant risks in itself.

There are these two dimensions that I would think about. One, virtually every reform that I spoke about has to do with financial markets or capital markets. If one looks at reforms to the real side of the economy, certainly there has been progress, as my co-panelists have pointed out, especially on the fiscal side, but it's been very limited and very slow.

If one looks at the real side of the economy, especially state enterprise restructuring, very little has happened over the last year. We've heard the right words and perhaps the right words with a little more precision than in the past, towards the end of last year and also in the Party documents earlier this year, but in terms of concrete steps, in terms of a time frame for implementation of the steps, we've seven very little progress.

And my concern is that if you have financial market reforms, including capital account opening, moving without with the real side reforms, you're going to create very significant risks.

The other issue is about the Chinese government's commitment to market-oriented reforms. They have stated, and I think we have reason to believe, that they do care about moving towards more liberalized financial system, a more market- oriented economy, but what they mean by free operation of markets is clearly very different from what we might think.

What we've seen over the last year, especially in terms of turmoil in currency and stock markets, suggest that they think that the markets do serve a useful role in the allocation of resources, but that the government needs to maintain stability and control, and to me, as an academic, this is a fascinating experiment to see whether these two fundamentally contradictory impulses, letting the market work and having the government maintain stability and control and not let the market get out of hand, whether these two can work in tandem? Events over the last year suggest that this is going to lead to a lot of missteps and stumbles along the way.

The other issue is that if one thinks about reforms to the financial system, they are proceeding in the right direction, but they are not taking place with institutional support. If one thinks about the stock market, yes, the government did go in and try to intervene in a very ham-handed way after cheerleading the stock market in late 2014 and early 2015. But what is needed for the stock market or indeed any markets to work well are an institutional framework.

In the case of the stock market, that would mean better corporate governance standards, better auditing and accounting standards, more corporate transparency, more public transparency. They don't have progress on any of that so I think China is at an interesting juncture right now. The scope of many of the problems have risen. I don't think any of these are

going to lead to an explosive crisis, especially in the financial system. There is going to be a big price to be paid, both a fiscal cost in terms of repairing the financial system and dealing with the environmental consequences of the growth model China has followed.

But my fear right now is that if reforms proceed in this very unbalanced way, that could create even more risks and generate a lot of volatility rather than the benefits that market-oriented reforms could truly deliver.

Thank you.

PREPARED STATEMENT OF DR. ESWAR S. PRASAD
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U.S.-CHINA ECONOMIC AND SECURITY REVIEW COMMISSION

HEARING ON "CHINA'S 13TH FIVE-YEAR PLAN"

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China's Economy and Financial Markets: Reforms and Risks

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Chairman Shea, Vice Chair Bartholomew, and honorable members of the Commission, thank you for the opportunity to share with you my views on the status of market-oriented economic reforms in China, with particular emphasis on financial market reforms and capital account liberalization, along with a discussion of the risks the economy faces. In this testimony, I will also discuss China's efforts to expand the international use of its currency, the renminbi (RMB), and how this is tied in to the domestic reform agenda.

These developments have taken place against the backdrop of a challenging domestic environment. Over the past year, China's GDP growth has slowed significantly, producer prices continue to fall, and various other indicators of economic activity have weakened, including growth in industrial production, investment, and imports. However, the most recent data on GDP growth as well as industrial and services sector activity suggest that the economy has stabilized. Still, some further macroeconomic stimulus might be necessary to hit the government's growth target of 6.5 percent.

On a more positive note, there has been some progress over the last 2-3 years on growth rebalancing, an important objective of the 12th five-year plan. The consumption to GDP ratio has gone up slightly, the service sector's share in the economy has risen to over 50 percent, and the household saving rate has declined. China's current account and trade surpluses have declined from their levels in 2007, although the merchandise trade surplus has climbed back to nearly 6 percent of GDP in the last half of 2015.

[1] This testimony draws extensively on a report that I recently prepared for the Commission: "China's Efforts to Expand the International Use of the Renminbi," Brookings Institution, February 2016. Please see that report for more detailed analysis, data, and documentation of sources. I am grateful to Audrey Breitwieser, Karim Foda, and Tao Wang for excellent research assistance.

Capital Account Liberalization

China still has an extensive capital control regime in place, but it is selectively and cautiously dismantling these controls. In most cases, constraints on capital inflows and outflows have been loosened but not eliminated. Nevertheless, the country's capital account is becoming increasingly open in de facto terms.

China's government has created a number of schemes that allow for controlled and calibrated opening of the capital account to both inflows and outflows. These schemes have been designed to generate many of the indirect benefits of financial openness (such as domestic financial development and international portfolio diversification) while enabling freer movement of capital. Table 1 contains a summary of the main schemes that have been instituted in recent years to liberalize inflows, outflows, and two-way flows.

Rising foreign investments by Chinese households, corporations, and institutional investors have led to major changes in the pattern of China's overall exports of financial capital. The composition of gross outflows has shifted markedly from reserve accumulation to official and unofficial flows due to both the private and state sectors. This shift is consistent with the government's stated objective of shifting foreign exchange holdings from the central bank's balance sheet to those of households, corporations, and state-controlled entities such as the sovereign wealth fund.

The objective of "foreign exchange holdings by the people" (rather than the central bank) will have a significant impact on the composition of future capital outflows from China. While the government is providing channels for international portfolio diversification, which is a positive development, there is a risk that lack of effective oversight of domestic securities markets and institutional investors that enable such diversification could portend risks for household and corporate balance sheets.

Table 1. A Summary of Recent Schemes to Liberalize Cross-Border Capital Flows

Channels for Inflows

Qualified Foreign Institutional Investor (QFII) Scheme: Launched in 2002. Allows qualified foreign institutions to convert foreign currency into RMB and invest in Chinese equities (both A shares and B shares) and a range of other RMB-denominated financial instruments. As of October 2015, a total quota of $78.9 billion had been granted to 277 foreign institutions, including 8 central banks and 10 sovereign wealth funds.

Renminbi Qualified Foreign Institutional Investor (RQFII) Scheme: Launched in 2011. Allows qualified institutions to use offshore RMB funds to invest in Chinese equities and other RMB-denominated financial instruments. As of July 2015, a total quota of $68.4 billion had been granted to 135 financial institutions.

Channels for Outflows

Qualified Domestic Institutional Investor (QDII) Scheme: Launched in 2006. Allows Chinese domestic financial institutions—commercial banks, securities companies, fund management companies, and insurance companies—to invest in offshore financial products such as securities and bonds. As of November 2015, a total quota of $90 billion had been granted to 132 financial institutions.

Qualified Domestic Individual Investor (QDII2) Scheme: Proposed in 2013; not yet launched. Will permit individual retail investors with at least RMB 1 million ($160,000) in assets to invest in certain offshore financial products.

Channels for Two-Way Flows

Free Trade Zones (FTZs): Shanghai FTZ launched in September 2013. Three new FTZs in Guangdong, Tianjin, and Fujian launched in April 2015. The FTZs use a "negative list" approach to regulate foreign investment—there are few restrictions on foreign investment in industries not on the list. Cross-border capital transactions and establishment of financial institutions within the zones have been liberalized.

Shanghai-Hong Kong Stock Connect: Launched in 2014. Allows mainland Chinese investors to purchase shares of select Hong Kong and Chinese companies listed in Hong Kong, and lets foreigners buy Chinese A shares listed in Shanghai. HK-to-Shanghai annual quota: RMB 300 billion ($47 billion); daily quota RMB 13 billion ($2 billion). Shanghai-to-HK annual quota: RMB 250 billion ($39 billion); daily quota: RMB 10.5 billion ($1.6 billion).

Mutual Fund Connect: Launched in July 2015. Allows eligible mainland and Hong Kong funds to be distributed in each other's markets through a streamlined vetting process. Initial aggregate investment quota: RMB 300 billion ($47 billion) each for

inward and outward fund flows.

The Exchange Rate Regime

China has continued to move gradually—and at least in principle—towards a more flexible market-determined exchange rate. On August 11, 2015 the People's Bank of China (PBC) changed the reference pricing mechanism for the onshore CNY-dollar exchange rate, whereby the PBC sets the opening price for trading on the Shanghai China Foreign Exchange Trading System (CFETS) each morning. The reference price is no longer delinked from the previous day's closing price although, with RMB trading now taking place in markets such as London that are in other time zones, the two prices need not necessarily be the same. The key point is that the RMB exchange rate relative to the dollar is now more subject to market forces. This policy change was combined with a 1.9 percent devaluation of the RMB relative to the dollar

It appeared that the PBC had combined a move to weaken the RMB with a shift to a more market-determined exchange rate. China's currency move could be interpreted as a relatively modest and defensive one, aimed at signaling that the PBC would not persist in supporting the RMB's value relative to the dollar if the dollar were to keep rising against other major currencies. Indeed, in the year before this move, the trade-weighted effective exchange rates of the RMB had appreciated by about 13 percent. However, the shift in currency policy set off a negative reaction in financial markets that were already nervous because of fears over a sharp slowdown in growth in China and the sharp drop in the Chinese the stock market since June 2015.

On December 11, 2015, the PBC indirectly hinted at another change in policy, posting on its website an article indicating that the CFETS would begin publishing a set of trade-weighted exchange rate indexes. This approach appears to reflect a change in the PBC's strategy regarding both practice and communications. First, by finally putting into practice a policy that had in principle been in operation since 2005, this move would make it easier for the PBC to delink the RMB from the dollar. Second, the PBC may be preparing the market for further RMB depreciation relative to the dollar in the short run—if the dollar were to strengthen further—and focusing attention on a more suitable benchmark for future movements in the currency. However, the PBC has not revealed what currencies will be in the basket that the RMB's value is managed against and what the weights on those currencies will be.

From August 2015 until January 2016, there was substantial downward pressure on the RMB. China's foreign exchange reserves, which peaked at nearly $4 trillion in June 2014, fell to about $3.2 trillion by January 2016. Since then, the pressure appears to have eased and the stock of foreign exchange reserves has stabilized. However, there is still a lack of clarity about the precise nature of China's exchange rate policy, with PBC officials stating only that the value of the RMB is determined by supply and demand, with the PBC also striving to manage the currency's value "with reference to" a basket of currencies.

Financial Sector Development and Reforms

China's financial system remains bank-dominated, with the state directly controlling most of the banking system. Recognizing the importance of a better financial system for an improved allocation of resources within the economy, the Chinese government has instituted a number of reforms in recent years.

Bank deposit and lending rates have now been fully liberalized. Commercial banks can now set these rates freely, although the PBC still sets reference rates to guide banks. An explicit bank deposit insurance program has been in operation since May 2015. This program is intended to expose banks to some degree of market discipline by replacing the implicit full insurance of all deposits by the government. The system also allows for early intervention by the banking regulator and has an improved resolution mechanism for failing banks. Since the system is relatively new, there have been no test cases as yet.

These reforms are important steps in the right direction. Future reforms and development of the banking system will have significant implications for the development of China's more nascent financial markets, including the corporate bond market and also for economic development more broadly.

In particular, China's aspirations to make the RMB a global reserve currency rest in large part on the pace of development of its fixed-income markets. Reserve currency economies are expected to issue high-quality and creditworthy government debt or government-backed debt instruments that can serve to hedge against foreign investors' domestic currency depreciation during a global downturn.

China's fixed income markets, especially for corporate debt, have developed considerably in the last few years. The stock of government bonds stands at about $3.5 trillion. Nonfinancial corporate debt was practically nonexistent a decade ago, but the outstanding stock has now risen to about $1.5 trillion. Turnover, a measure of trading volume, remains quite low in both markets, however. China has recently lifted restrictions on foreign investors' participation in its bond markets, which should improve both the depth and liquidity of these markets over time.

China's financial markets have improved in some respects during the last decade, but there are still significant gaps, especially in terms of achieving sufficiently large and liquid debt markets. More importantly, the structure and quality of debt markets will also need to be improved to fully prepare for a currency used widely in international financial transactions and reserve holdings. With relatively low external and government debt positions, China's debt markets can in principle expand rapidly without serious threat to inflation credibility or vulnerability to external risks. Effective regulation of corporate debt markets is an important priority, so these markets can expand without generating financial instability. As discussed in the next section, the financial system features prominently among the major risks that the Chinese economy faces.

Economic and Financial Risks

The Chinese economy faces risks in several categories. The first is related to capital account liberalization and the possibility of a surge of capital outflows, which could destabilize the financial system as well as the overall economy. The second is a set of concerns specifically about China's financial system, including the stability of the banking system, wild swings in the stock market, and a large shadow banking system. The third set of risks is related to more fundamental aspects of China's policymaking. These include the possibility of policy missteps in the process of the difficult and risky transition from a largely command-driven economy to a more market-oriented one. Indeed, many of the reforms and measures taken to promote the RMB's international role have created their own risks for the economy.

The Capital Account

Allowing for the free flow of financial capital has been an important element of the plan for increasing the RMB's international stature. However, many developing economies have faced crises when they opened up their capital accounts without having a market-determined exchange rate and a well-functioning financial system.

An analysis of China's external balance sheet, i.e., its international investment position, suggests that the economy faces only modest direct risks from a more open capital account. Foreign direct investment and portfolio equity together account for 70 percent of China's external liabilities. This structure of liabilities is safer than one dominated by foreign currency debt.

China has traditionally had a low level of foreign currency external debt, which amounted to about $800 billion or 7 percent of GDP in 2015, a lower ratio than virtually any other major emerging market (total external debt, including debt denominated in RMB, was $1.5 trillion). The stock of foreign exchange reserves, which was $3.2 trillion in February 2016, is sufficient to meet all of these debt obligations. Moreover, China's net foreign assets amounted to $1.6 trillion at the end of 2015, implying that it has enough foreign assets to more than cover all of its foreign liabilities. In short, China is not subject to the traditional risks associated with opening up the capital account in advance of increasing exchange rate flexibility.

China's approach to capital account liberalization has allowed it to retain some control over capital flows. The schemes the government has put in place allow it to control the volume of flows in both directions and, to a significant extent, the composition of flows as well. However, trying to maintain a gradual approach to freeing up the exchange rate while opening up the capital account can create tensions that show up in large and volatile movements of capital.

Capital Outflows and Capital Flight

Capital flow surges in one direction or another can be exacerbated if the exchange rate is not allowed to adjust freely, and speculative pressures on the currency start building up. The scale of outflows during 2015 indicate how sentiments about economic and financial market conditions can shift quickly. These outflows put pressure on the PBC to expend a significant portion of its reserves to keep the RMB's external value stable.

Many emerging market economies have faced balance of payments crises following a rapid rundown of foreign exchange reserves. In China's case, as noted earlier, the stock of reserves still remains high by traditional metrics such as coverage of imports or external debt. But if Chinese households and corporations were to withdraw bank deposits on a massive scale and transfer the money abroad, reserves would cover only about 15 percent of total deposits. To take account of such factors, the IMF calculates a composite metric of reserve adequacy that takes into consideration potential capital flow volatility. By this measure, China had one and a half times the adequate level of reserves at the end of 2014. Even with the fall in reserves since then, the stock remains above this metric.

A more worrisome aspect of capital outflows is related to capital flight through both illegitimate and legitimate channels. Capital flight is quite different from more conventional outflows that are driven by a desire for portfolio diversification or macroeconomic factors such as better interest rates in other countries. One possibility is that the anti-corruption drive has caused some ill-gotten wealth to leave the country to avoid expropriation during the crackdown process.

Illicit capital flows are a particular concern for financial stability as they bypass traditional channels that the government can control. One widely used proxy measure for such flows is net errors and omissions (NEOs), which is the residual in the balance of payments accounting and reflects unrecorded capital account or current account transactions. Negative NEOs typically reflect money leaving the country through unofficial channels. China's NEOs have been persistently negative since 2009. During 2014, such outflows amounted to $140 billion and in 2015 they were $132 billion.

Money laundering and capital flight also go hand in hand. Casino operations in Macau have long been seen as a major conduit for money laundering and illicit capital flows from the Mainland. Regulatory authorities on the Mainland have taken aggressive steps to combat these operations as capital flight has picked up. An alternative channel for capital flight is related to informal financial institutions that act as conduits for cross-border transfers. In 2015, China's Ministry of Public Security is reported to have cracked down on an illegal foreign-exchange network that it said handled up to $64 billion in transactions. In September 2015, authorities discovered 37 underground banking dens accounting for deals totaling more than $38 billion, according to a statement on the ministry's website.
Although a full-blown capital flight crisis seems unlikely, particularly given China's relatively strong external balance sheet characterized by a low level of external debt and a large stock of foreign exchange reserves, the government has certainly been concerned about illegitimate outflows and the fact that they may exacerbate overall capital outflows and add to financial and macroeconomic stresses the economy is already facing.

The Debt Burden

China's overall level of debt has raised considerable concerns about a looming crisis. The level of central government debt was only 17 percent of GDP in 2015. The IMF computes a measure of augmented public debt, which includes various types of local government borrowing, including off-budget borrowing by such Local Government Financing Vehicles (LGFVs) via bank loans, bonds, trust loans, and other funding sources. By this measure, China's public debt to GDP ratio is estimated to be 60 percent in 2015, which would still be below the public debt to GDP ratios of major advanced economies.

However, the broader picture of debt in China looks more worrisome. According to a recent McKinsey report, the level of gross debt in 2014 was 282 percent of GDP. This includes government debt (55 percent of GDP, similar to the IMF's estimate) and debt owed by financial institutions (65 percent of GDP), nonfinancial corporations (125 percent of GDP), and households (38 percent of GDP). More recent estimates suggest that corporate debt may have risen above 150 percent of GDP by early 2016.

The level of Chinese corporate debt is a major concern, especially since a substantial portion of outstanding bank loans has gone to large SOEs. The notion that such high debt levels heighten the risks of a financial meltdown is, however, overstated. The balance sheet of the government as a whole is healthier than an examination of just the gross debt figures would suggest. There are undoubtedly corporations that have borrowed too much and will suffer considerable financial stress, which could result in bankruptcy or painful restructuring. The government, on the other hand, has a large trove of assets—including its foreign exchange reserves, ownership stakes in the state enterprises, and foreign investments through the sovereign wealth fund.

A legitimate concern, however, is that many of the problems with debt in China will ultimately cause a collapse of the banking system, which has financed much of the debt accumulation.

Banking System

The average ratio of nonperforming assets (NPA)—loans that are unlikely to be paid back—to total bank loans outstanding is around 2 percent. But this is widely seen, even by the government itself, as an understatement of the true extent of the problem. Adding in the category of "special mention" loans, those which are not yet in default but have a high probability of becoming so, even the official data put the NPA ratio at about 5 percent. Banks have kept NPAs off their books by "evergreening" their loans, i.e., giving even weak and unprofitable companies new loans to pay off their old loans.

Private analyst estimates of the actual ratio of NPAs range from 6–7 percent to as much as 20 percent, with even higher ratios of around 25 percent for some of the smaller banks. Still, Chinese banks do not face the potentially catastrophic problems that many Western banks faced during the financial crisis. Most of their funding comes from bank deposits, which tend to be stable, rather than from debt. Moreover, banks have about 17 percent of required reserves at the PBC.

Even if a banking crisis can be avoided, however, it will still be necessary to cover losses from loans made to companies that become insolvent or go bankrupt. This could involve a combination of two types of measures—sweeping nonperforming assets into asset management companies and infusing new capital into the banks. This will ultimately result in a fiscal cost. This cost would be reduced by partial loan recoveries, asset sales, and the use of loan loss provisions that banks maintain. Still, the fiscal cost will be substantial.

A bigger question the Chinese economy faces is whether the financial system, especially the banks, are being freed up from government directives and allowed to operate on a commercial basis to a greater extent. While there has been modest progress on banking reforms, at a minimum addressing the legacy problems created by state-directed lending and distorted incentives in the banking system will incur significant costs.

Shadow Banking

The government has also taken a more aggressive approach to rein in shadow banking, which involves credit intermediation through entities and activities outside the regular banking system. China's shadow banking sector has expanded rapidly as a way around many of the regulations imposed on the formal banking system including (until recently) controlled interest rates, a high level of reserve requirements on bank deposits, and rising demand for financial intermediation services that are not satisfied by traditional institutions or conventional banking products (both for savings and credit).

Definitions of the shadow banking system vary, but the major categories of credit that fall under its rubric include (i) entrusted loans, which involve nonfinancial corporates as borrowers and lenders, with banks acting as intermediaries but bearing none of the credit risks; (ii) trust loans, which are financial transactions undertaken by trust companies that are regulated separately from banks and have some characteristics of banks and fund managers; and (iii) bank acceptances, instruments issued by banks that commit to pay a fixed amount in a given period and that are backed by deposits of the party seeking these certificates. There is a range of other instruments included in definitions of the shadow banking system, including wealth management products (WMPs) that offer higher returns than traditional bank deposits and that can even be offered by banks themselves.

The shadow banking system is not large relative to that in many advanced economies, although its growth rate in China in recent years is certainly among the highest in the major economies. Based on data from Moody's, shadow banking assets amount to 65 percent of GDP in China, compared with 150 percent in the United States and a world average, weighted by country size, of about 120 percent.

Concerns about the financial stability risks posed by the growth of shadow banking have prompted the Chinese authorities to impose stricter regulation of shadow banking activities, both by banks and nonbank financial entities. Off-balance sheet activities by the commercial banks could affect their risk profiles. While trust companies and other nonbank financial entities are not backed by the government, their liabilities pose broader risks as the failure of any such institution

could undermine confidence in the overall financial system.

In its present form and at current levels, it is unlikely that the shadow banking system by itself poses significant threats to overall financial stability. Nevertheless, the government has been concerned that risks in this sector could translate into vulnerabilities in the formal banking system (given the connections between the two sectors through products such as WMPs).

With rising concerns about the financial stability implications of the shadow banking sector, various regulatory agencies have stepped up their oversight of this sector. This has resulted in a decline in shadow banking. In recent months, the flow of credit associated with shadow banking has been small or even negative.

Stock Market Swings

After a sharp run-up during 2014 and the first half of 2015, Chinese stock market indexes have fallen sharply. This prompted a series of measures by the government to limit the stock market turmoil. Some of these measures were heavily interventionist and, although described as emergency measures, they have hurt the credibility of the government and created doubts about its attitude toward market-oriented reforms. The measures included propping up stock prices and also limiting activity that could push down prices.

The key measures to mitigate downward pressures on stock prices include:

- Limitations on short selling, with the China Securities Regulatory Commission threatening to arrest those engaged in "malicious short selling"
- A ban on initial public offerings for four months starting in July
- Suspension of trading in the shares of over a thousand firms
- A six-month ban on stock sales by stockholders with a 5 percent or higher equity stake in a given company

Measures to prop up prices through direct intervention include:

- New rules allowing pension funds to invest up to 30 percent of their net assets in equities (previously, pension funds could not invest in equities)
- Relaxation of rules on margin financing
- Giving banks permission to make corporate loans using equity as collateral
- A PBC pledge to lend RMB 250 billion ($40 billion) to major brokerage firms through the China Securities Finance Corporation to help them cope with liquidity shortages
- State-owned funds and institutions encouraged to buy stocks

Other propaganda measures included news articles in official media blaming "foreign forces" for the stock market turbulence. In addition, nearly 200 people were arrested for allegedly spreading false information that caused the market crash. Those arrested included financial practitioners, regulatory officials, and also financial journalists.

The government's other actions to stabilize the market have not inspired confidence either. On January 4, 2016, the CSRC introduced a circuit breaker mechanism in the Chinese stock market. This led to a negative reaction in markets, with the main indexes plunging by about 14 percent

over the next three days. The circuit breakers were activated multiple times during that period, worsening the sell-off as many market participants tried to sell their holdings before the circuit breakers were activated. The circuit breaker was deactivated three days after its introduction.

Chinese stock markets have been prone to concerns about weak corporate governance, limited transparency, weak auditing standards, and shoddy accounting practices. In the absence of broad institutional and regulatory reforms that are necessary to support effective price discovery and the overall efficient functioning of stock markets, these markets could remain unstable. The recent volatility in the stock market and the manner in which the government has addressed it has heightened many of these concerns.

Policy Instability

There are two reasons to be concerned about the path that China is taking towards market-oriented reforms. The first is the unbalanced nature of the reforms. The second is the government's ambivalent approach towards economic liberalization and the operation of free markets.

Reforms on the real side of the economy have not kept pace with financial liberalization. The 13th five year plan echoes many items from the previous plan, including further restructuring of state enterprises, liberalization of the services sector so new firms can more easily enter this sector and operate with fewer restrictions, streamlining of the tax and public expenditure systems, and easing of restrictions on labor mobility within and across provinces. China's economy and the RMB's rise have also been impeded by the lack of a robust institutional framework—including transparency in the policy-making process, sound corporate governance and accounting standards, and operational independence for the central bank and regulatory authorities—that ought to supplement financial and other market-oriented reforms.

The turmoil in equity and currency markets during 2015 and 2016 appears to have shaken confidence in the economic management skills of the leadership. Such volatility, and the heavy-handed intervention it has sometimes provoked, could erode political support and economic space even for the reforms to which the technocrats are committed. A more fundamental concern is that the government seems to be caught in a deep internal conflict between its stated objective of letting markets operate freely and its desire to maintain stability and control above all else. The tension between these two perspectives could cause a number of missteps even in the implementation of reforms, especially in terms of promoting the RMB's role in international financial markets.

The RMB's Role in Global Finance

China has taken a number of measures to promote the RMB's use as an international currency, one that is used as a medium of exchange for trade and finance transactions. These include:

- Permitting the settlement of trade transactions with RMB. In 2015, RMB trade settlement amounted to roughly one quarter of China's annual trade volume.

- Allowing issuance of RMB-denominated bonds in Hong Kong (with an outstanding stock of bonds worth nearly $400 billion in 2015) and other financial centers.
- Permitting selected banks to offer offshore RMB deposit accounts.
- Setting up 15 offshore RMB clearing centers, including in Frankfurt, Paris, and London.
- Creating a payment system for easier settlement of cross-border RMB transactions.

These steps are gaining traction, although they are still modest in scale. The RMB has become the fifth-most important payment currency but still accounts for less than 3 percent of worldwide payments for cross-border trade and financial transactions. The RMB also accounts for less than 2 percent of turnover in global foreign exchange markets. The shares of other major emerging markets' currencies are all below 2 percent.

China has set up a new payment system—the China International Payment System—that is organized more in line with internationally accepted standards, which is essential for facilitating cross-border RMB transactions, including trade and investment flows. The payment system provides a central platform that helps clear interbank financial transactions in a standardized manner both domestically and internationally. The adoption of international standards makes the new payment system a meaningful move in facilitating the international use of the RMB.

A stock-taking exercise, based on a traditional set of criteria for a reserve currency, show the progress the RMB has made towards attaining that status as well:

- *Economic size:* A country's size and its shares of global trade and finance are important determinants of the status of its reserve currency. China now accounts for 16 percent of world gross domestic product (17 percent if measured by purchasing power parity rather than market exchange rates) and 10 percent of world trade in goods and services. In 2014-2015, it is estimated to have accounted for about one-third of world GDP growth.
- *Open capital account:* Reserves must be acceptable as payments to a country's trade and financial partners, which requires that the currency be easily tradable in global financial markets. China is gradually and selectively easing restrictions on both inflows and outflows. The capital account has become increasingly open in de facto terms, but there are a number of capital controls still in place.
- *Flexible exchange rate:* Reserve currencies are typically traded freely and their external value is mostly market determined. China has over time increased the flexibility of the exchange rate and, in principle, permitted market forces to play a bigger role in foreign exchange markets. Despite these changes, China still has a closely managed exchange rate, which will become increasingly hard to control as the capital account becomes more open.
- *Macroeconomic policies:* Investors in a country's sovereign assets must have faith in its commitment to low inflation and sustainable levels of public debt, so the value of the currency is not in danger of being eroded. China has a lower ratio of explicit public debt to GDP than most major reserve currency economies and has maintained moderate inflation in recent years.
- *Financial market development:* A country must have broad, deep, and liquid financial markets so that international investors will have access to a wide array of financial assets

denominated in its currency. China's financial markets have become large but are highly volatile, poorly regulated, and lack a supporting institutional framework.

While China measures up favorably in the first four areas, financial market development and stability could be the crucial determinant of how the RMB measures up against the other reserve currencies. Despite concerns about China's financial markets, the RMB is already making its presence felt on the international stage, in part as the result of policy actions by the Chinese government and in part because of the sheer size and growing role of China in international trade and finance.

Since 2009, the PBC has moved aggressively to establish bilateral local currency swap arrangements with other central banks in order to facilitate and expand the use of the RMB in international trade and financial transactions. So far, 34 central banks have signed such bilateral arrangements with the PBC. The total amount that could be drawn through these arrangements amounts to the equivalent of roughly half a trillion dollars.

Moreover, despite its lack of convertibility, the RMB is already becoming part of international reserve portfolios. A number of central banks have added or are considering adding RMB-denominated assets to their reserves. The list includes Austria, Australia, Chile, Malaysia, Nigeria, Pakistan, South Africa, Switzerland, Tanzania, Russia, and the United Kingdom. The IMF estimates that in 2014, about 1.1 percent of official foreign currency assets were held in RMB, up from 0.7 percent in 2013. This puts the RMB in the seventh spot in terms of the identified composition of official foreign currency assets.

On November 30, 2015, the IMF executive board voted to expand the Special Drawing Rights (SDR) basket to include the RMB. The new basket will become effective in October 2016. The RMB's inclusion in the SDR basket (with a weight of 10.9 percent) is an important symbol of the currency's ascendancy in global finance as it thus attains the IMF's imprimatur as an official reserve currency.

The IMF's decision is an important validation of China's efforts over the past year to liberalize financial markets, open up its capital account, and allow the RMB's value to be determined to a greater extent by market forces. However, developments in both equity and currency markets since the IMF made its decision point to the challenges that persist in financial market liberalization. Domestic opposition to further financial sector reforms and market-oriented liberalization measures remains fierce, and the IMF decision by itself is unlikely to shift the balance substantially.

The decision will also not by itself be a game-changer in terms of generating a surge of capital inflows into China. SDRs currently account for less than 3 percent of reserve asset holdings worldwide, so the direct effect of including the RMB in the SDR basket will not be large. Ultimately, it is the availability of sufficient high-quality RMB-denominated financial assets and the ease of moving financial capital into and out of China that will determine the RMB's trajectory as a reserve currency.

There could be significant effects on the patterns of global capital flows if this decision does lead

to further financial sector reforms, capital account liberalization, and exchange rate flexibility in China. These changes would open the doors for more capital inflows into China and also further tilt the composition of China's outflows away from foreign exchange reserve accumulation by the central bank, as it will spur more foreign investments by China's households, corporations, and institutional investors.

Implications for the U.S. Economy

China's capital account and financial market liberalization could have significant effects on the volume and, more importantly, the composition of its investments in the U.S. For nearly two decades, the major channel for capital flows to the U.S. has been the official accumulation of foreign exchange reserves. At present, Treasury and agency debt (issued by U.S. government-sponsored enterprises) continues to dominate Chinese investment in the U.S. Chinese portfolio investment in the U.S. has expanded rapidly, from $29 billion in 2007 to nearly $350 billion in 2015. Direct investment from China to the U.S. has been growing as well but, in absolute amounts, still remains relatively modest. In the first half of 2015, Chinese FDI flows into the U.S. were only about $7 billion.

The U.S. Treasury International Capital (TIC) System data suggest that the absolute amount of Treasury securities held by China remained relatively stable during 2013-2015, even though China's foreign exchange reserves fell by nearly $800 billion from June 2014 to February 2016. As of February 2016, China holds $1.3 trillion of Treasury securities according to the TIC data. Thus, it does not appear that China has been selling U.S. Treasury securities while trying to prevent RMB depreciation. Meanwhile, China's declining share of U.S. government debt ownership (from 26 percent in 2010 to 20 percent in 2015) indicates that other investors, both domestic and foreign, are maintaining their strong demand for U.S. Treasuries.

As Chinese financial markets develop and private investors increase the international diversification of their portfolios, the shifts in China's outward investment patterns are likely to become more pronounced. Chinese investors' search for diversification and yield will result in rising flows into various asset markets in the United States, from equities to real estate.

Thus, the various policy reforms that are needed to support the international role of the RMB could also create significant changes in China's economy and the patterns of its capital inflows and outflows, both overall and also specifically from and to the U.S.

The Renminbi vs. the Dollar

While the RMB is likely to become a significant reserve currency over the next decade, it is unlikely to challenge the dollar's dominance. There is still a huge gulf between China and the U.S. regarding the availability of safe and liquid assets such as government bonds. The depth, breadth, and liquidity of U.S. financial markets will serve as a potent buffer against threats to the dollar's preeminent status.

Moreover, the RMB will not contest the dollar's supremacy unless China's leaders align the country's political and legal institutions with its economic reforms. These changes are necessary

to engender the trust of foreign investors. Global investors seeking a safe haven still automatically turn to U.S. Treasury securities in times of global financial turmoil. Foreign investors now hold $6.2 trillion of these low-yielding securities, not to mention large quantities of other dollar assets. The dollar's share in global foreign-exchange reserves has held steady since the crisis. Indeed, recent data from the IMF suggest that the dollar's share of global foreign exchange reserves increased slightly, to about 64 percent, in 2014 and 2015.

It is nevertheless likely that, as the RMB becomes a prominent international currency, and as the costs of transacting in the RMB and other emerging market currencies falls, the dollar's prominence as a unit of account (for denominating trade transactions) and as a medium of exchange (for settling cross-border financial trade and financial transactions) will decline. This could affect the use of the dollar in international financial markets, which by itself will not necessarily have a substantial impact on the U.S. economy. However, these developments, in tandem with measures taken by China to develop its own payment system, could diminish the primacy of U.S. financial institutions. This would affect the ability of the U.S. to continue wielding the financial clout that it currently has as a result of the dollar's dominance in international finance.

PANEL I QUESTION AND ANSWER

CHAIRMAN SHEA: Thank you, Dr. Prasad.

I'm going to ask the first question--prerogative as the co-chair of the hearing--and this is for Dr. Hou and Dr. Wu primarily, but Dr. Prasad, please weigh in, and it's about fiscal issues.

It's my sense that the fiscal situation in China lacks transparency, and I was curious in your roles as researchers, is it tough to get accurate information about the fiscal situation at the central government level, the provincial level, the local level? Is this information readily accessible?

Also if you wouldn't mind just educating me, what taxes does the central government use and what taxes do the provinces and localities use? Just a little primer on that.

Dr. Hou, you're a proponent of the property tax as the means of sort of helping rectify this mismatch between responsibilities and outlays. So I'd like you to talk a little bit more about that. It's not in the 13th Five-Year Plan; right?

DR. HOU: Okay.

CHAIRMAN SHEA: And I wonder how do you have a property tax if no one owns property?

[Laughter.]

CHAIRMAN SHEA: Is it more like a use tax?

And then, finally, fiscal reform, maybe Dr. Prasad could weigh in, how important is fiscal reform to moving to a consumption-led economy and reduce precautionary savings by households? How important is fiscal reform to that goal? So why don't Dr. Hou or Dr. Wu?

DR. HOU: All right. Thank you. Let me first touch upon the fiscal transparency issue. It's like this. If we look at China from any particular point, time point, it is far less desirable than we like it to be. If we look at this case from a time procession, then we can see a lot of progress. Put it this way. Back in the 1970s, 1980s, 1990s, if we wanted to find some data from the central government, the provinces, and the localities, it was very hard. Nowadays, I stay in my office at Syracuse University, I go online, check the central government, check the provinces, it's much better. I won't say it is now already as good as we would like it to be, as we say I wanted to check the federal government, the North Dakota, or other states or D.C. Not as good as that, but far better than before, and the trajectory is towards the positive. So that's good.

All the data, and all the sources I used in writing this statement is from publicly available online sources and publications.

The taxes levied, collected and maintained mainly by the central government include the following: one is--the big items are two--one is the value added tax. The center keeps 75 percent of that. By far, this is the largest item. It started in 1994. Then the second item would be the personal income tax. One reform change or one change was made back in the year 2000-2001, and before that, it was kind of a different way.

Beginning from year 2000, the center collected this tax. They called it a shared tax between the center and provinces and localities. But the center kept 60 percent; the other 40 is reserved for provinces and their localities. So these two are the major items.

The others include, say, for example, the customs and duties, excises, and taxes from the centrally-owned state-owned enterprises. This is kind of a bit confusing. If they are state-owned enterprises, why center, province--yes. There are centrally-owned SOEs, provincially-owned and locally-owned. So the centrally-owned are the big ones, which is also

why, as Dr. Prasad said, the reform, all the change, according to the fundamental market rules of the SOEs has been so difficult. They are by definition at the different levels. So these are the main ones.

As far as the local property tax, obviously if the Chinese people do not own property, how can you levy and collect this tax? Beginning from the late 1990s, with the reform of the provincial housing provision in cities, the Chinese people began to have the freedom to buy anywhere, well, almost. anywhere As long as you are not buying in Beijing or Shanghai, you can buy anywhere as long as you have the money, any apartment or condos. They can.

So with that came the era of property ownership in China. So by different estimates, the house ownership in China is now pretty high. Some figures say maybe even higher, but at least as high as in the U.S. So that's kind of an encouraging sign.

With that, it is possible for the government, whether it's prefectural or local, counties and cities, to levy and collect the property taxes. The problem, though, is, as Professor Wu will be talking about that, the ownership of land. By the 1982 Constitution of China, all urban land, at least, belongs on paper to the state. The state, of course, is an abstract concept. It's the central government, but the guardianship of land ownership is, in fact, in the hands of local governments--cities and counties--which is why the cities and counties have been so, quote-unquote, "able" to do so much leveraging on that land.

So with vastly increasing home ownership, it is possible to levy and collect local property taxes. With that, the landscape of local debt can be changed, which is my plan.

Thank you.

CHAIRMAN SHEA: Thank you. Just got a few, limited time, so Dr. Wu.

DR. WU: Yeah. To add to that, I think what I've been hearing about the proposed property tax is you basically levy on the improvement because if you look at assessment here, you have land value and you have the improvement value.

So it's the housing part that can be taxed. And there is already now a sort of property tax on commercial and office and non-residential properties that are levied at the local level.

And to also add to the answer earlier, it's the local taxes, even though they're local, they're limited. Couple of them are used for urban infrastructure. That includes the urban maintenance and construction tax. The rates are actually set at the central level, and that's a major concern is that localities don't have the discretion to set different rates as what we see here.

And so really the fiscal transparency part is at the local level the main challenge for us as researchers is you see the revenue side, you see the expenditure side, but they don't connect. So there is no balance sheet for you to really look at, and so, you know, for instance, if you have 30 percent coming out of land transfer fees as revenues, what are they used for? We don't know. And you have 30 percent from bank, you know, borrowing. What are they used for? We don't know. Now taxes only accounts for about 15 percent of revenues.

CHAIRMAN SHEA: Okay. Thank you very much. I'm going to have to end there, and Commissioner Wessel.

COMMISSIONER WESSEL: Thank you all for being here. I come to these hearings and this discussion sometimes confused, my colleagues would say I always come confused.

[Laughter.]

COMMISSIONER WESSEL: In a Western notion of reform, that has positive connotations. We view reform as something that moves things forward in a--

CHAIRMAN SHEA: Hopefully.

COMMISSIONER WESSEL: Hopefully. What I see now is China pursuing reforms not in a Western ideal, if you will, but to further the power of the state, that when one looks at things like, for example, overcapacity, which we discussed at a recent hearing, we have Chinese government leaders saying they intend to deal with it, that they realize they have a problem. We in the West always say great, they understand this, and we should be patient.

Last month, steel production in China reached an all-time high, and China's negotiators left the OECD meeting refusing to even negotiate on overcapacity issues.

Help me with this notion of reform. All of you have talked about it, but, Dr. Hou, you talked about it more than others-- in terms of the interrelationship between the central and the provincial and local governments, the power to tax and the power to share are significant tools. Why isn't China using them to advance the kind of reforms that we want, or should we start calling this something different?

Dr. Hou, do you want to start first?

DR. HOU: This is a very good question. Correct me if I'm wrong, it's focusing on overcapacity. Let me explain this.

COMMISSIONER WESSEL: It's focusing on--

DR. HOU: Yeah, I'll go from here.

COMMISSIONER WESSEL: --all of the reforms, you know, consumer, production, you know, all the various changes. Chinese leadership statements of what they want to do, but then they don't do it. And we applaud them at summits, saying, great, China gets it, but at the end of the day, our trade deficit reached historic levels last year; we have more offshoring and outsourcing. Granted, that the U.S. trade situation may be an aberration because of China's global current account situation, but the U.S. is different.

We advise the U.S. Congress, and you don't have to read too deep into this presidential campaign to realize the frustration of the people. What should we be telling them? What should we be advising Congress when we look at this mismatch between statements and reality?

DR. HOU: As I said, there has been and will be in the near future a tug of war for the Chinese leaders at the national level and provincial level. The tug of war is between reform in the market direction, as we see it, and also internal domestic stability, meaning the growth rate and jobs.

On the one hand, they do see the necessity to reform in the market direction. They have got the idea. They know how to do it, and they have a whole bunch of very wise advisors. On the other hand, they do see during their office hours, even during their time at home, the crisis for stability.

The problem, for example, the overcapacity of steel and coal, was to a large extent caused in this way. In the past 30 years, when the center decentralized, the need or even demand to grow, provinces, prefectures, cities, saw it as for the building or construction of steel complexes, large coal mines and large manufacturing facilities, as the best means to get the GDP target. That's the best way, for growth and also the best way to attract foreign, direct foreign investments so that they can make big money there. And once the center says go, grow by any means, provinces, localities did this. They called it, I said, the championship for GDP (growth rate.). You called--you get promoted. So another term it's kind of decentralized.

COMMISSIONER WESSEL: But let me ask you, two weeks ago, I guess, the leadership said you can't, they're going to block the use of the term brother-in-law; right? And so

for me I look at a very powerful government with the ability to effect change, the power to tax and the power to share is pretty absolute. If they really want to deal with these kind of economic imperfections, not just steel but across the board, they could do it if they really wanted to.

Dr. Wu?

DR. WU: So, yeah, I think maybe an example about this property tax dilemma, you know,: it sounds like a very good, you know, instrument; right? Many countries have it, but if you look at the tug of war and the pushback from the local governments, it's very significant. So when you have extra-budgetary revenues, with fees of all sorts, local governments get to keep them, but if it's a tax, then the rate is set by the central government, and a certain amount has to be repatriated to the center.

And so much of the pushback comes from a lot of the particularly prosperous localities on the east coast. Before 1994, before that, the fiscal reform was also driven by Guangdong Province and so on that really wanted to retain more revenues and more control. China is a central state, right, but actually it's very decentralized if you look at fiscal relations, and it's probably more decentralized than most of the former socialist countries.

So I think, I don't know if the central state is that powerful in terms of where money really goes and where, you know, you walk the walk.

DR. PRASAD: May I add one remark? When we think about reforms, we think about moving towards more market-driven solutions. But to the Chinese government, as far as I can see, the state is not the problem; the state is the solution. So the markets are seen as serving a very useful purpose in terms of determining the right prices, in terms of determining the allocation of resources in the economy, but with the paternalistic oversight of the state.

So when they talk about reform of the state-owned enterprises, it is hardening the budget constraints on the state enterprises, making them behave more on a commercial basis but while the state maintains control, and that I think leads to fundamental tensions in terms of this reform effort, whether you can, in fact, have market- oriented enterprises that are still under the control of the state. As my copanelists have pointed out, there are still very fierce tugs of war among the different competing parties, and although certain things Beijing can do by dictat, there are many things that it cannot do.

And the system has worked very well for many of the powerful provincial governments, the large state-owned enterprises, and the large state-owned banks. To my mind, what you need for any reforms in China are two things. One, you need a framework and you need an effective advocate. Last year is the perfect example. The reason why we had financial sector reforms and very little else is because there was a very clear endpoint getting the RMB into the IMF's SDR basket. They had to tick off a few boxes, and, by God, they did it despite opposition from a lot of the banks.

They had a very effective advocate--the People's Bank of China, which pushed these through. If you look at state enterprise reforms, fiscal reforms, there isn't as clear a framework and there isn't as clear a unified advocate, which makes things harder.

COMMISSIONER WESSEL: Thank you.

CHAIRMAN SHEA: Dr. Wortzel.

COMMISSIONER WORTZEL: Thank you for excellent testimony.

I'm looking through an extract of Li Keqiang's Report on the Work of Government, and there were five themes apparently in the 13th Five-Year Plan: innovation; open trade; green growth; coordinated response to the urban-rural divide; and shared development.

And you've addressed a lot of those, Dr. Hou, but I don't see fiscal and tax reform

in there. So I mean it seems to sort of not be addressed except when they need to or the central government feels like it. Is my understanding wrong?

And then I have, you know, a more fundamental set of questions. This tax structure you've described seems to be mired in essentially the tax structure of the Qing dynasty and the Kuomintang.

[Laughter.]

COMMISSIONER WORTZEL: I mean it's not a new tax structure, and the hukou structure is the same. It's mired in dynastic control that the Kuomintang carried over--

DR. WU: Right.

COMMISSIONER WORTZEL: --and then the Communist Party carried over. So is this a constitutional issue? I mean would the kind of tax reform you're talking about really take a constitutional revision or is it just the Communist Party wants and feels it can't survive without this sort of central control?

[Laughter.]

COMMISSIONER WORTZEL: I mean on the hukou side, it's you, and then--

DR. WU: Yeah, so maybe I'll--

COMMISSIONER WESSEL: He took my question also.

COMMISSIONER WORTZEL: --and on the fiscal side, it's you, Dr. Hou.

DR. WU: Right. You're absolutely right in pointing out the continuity of some of these instruments; right. The New Urbanization Plan actually does sort of bring up a couple of potential fiscal reform items. One is the sort of marking of transfer payments for migrants who would be absorbed into second to fourth-tier cities. But there are no details on how that would be actually implemented.

And second is the, you know, after experimentation, the encouragement of municipal bonds. That very, interestingly, actually, sort of parallels the discussion on property tax, but the property tax didn't make it to the plan. So the pushback is far more I think from local governments on property tax.

As for the hukou aspect, I think it's a very long-standing urban bias that is driving the lack of a hukou reform because essentially that's separating the two halves of the country into two different types of citizenship.

COMMISSIONER WORTZEL: But it was a control mechanism on the population.

DR. WU: That's correct, but now the challenge is that when you open up particularly the very large cities so if. If you look at Shanghai and Beijing, a third of their populations are migrants. And given the lack of transfer payments, large cities are very reluctant to open up even more, and so it's really linked that the question how do you dissociate hukou with the provision of services, and if provision of services can be in some ways more fiscally guaranteed, then cities will have somewhat more incentives to open.

So large cities essentially are excluded from the New Urbanization Plan for opening up to migrants. So I think the hukou and the fiscal reforms actually are related in many ways.

DR. HOU: Two points. One is what Dr. Prasad mentioned, the all powerful state or the paternalistic state, and here hukou also. These two actually have very long tradition--I'm glad you know so much about Chinese history--they have a very long history in China. It dates back for more than 2,000 years it has been like this in the China--it's not just the Communist

Party. It's China. It's a long tradition. It takes time to get rid of that. It's a kind of gradual process, one.

Second, the hukou, the current hukou system started in 1953. Why 1953? That was the start of the first Five-Year Plan. The Five-Year Plan was a kind of means to mobilize all available resources by all means so that China could build into a modern industrial state. China borrowed heavily from former Soviet Union with what? With all available resources that China at that time could possibly collect from the countryside so that all rural residents were bound in the countryside. You contribute what you have grown. The cities were built. That was kind of say, that was almost the only available source of resources or revenue. So that has continued till now.

Why China has been, Professor Wu said, so reluctant to open up Beijing and Shanghai? Instead China has been very willing to open up county seats, smaller cities. One lesson China has learned in the process was, one example, Mexico. Another was a few other developing countries where it has been a disaster, the capital city, or large metro areas have become slums. China didn't want to and will never want to step into that trap. That's my take.

CHAIRMAN SHEA: All right. Thank you.

Vice Chair Bartholomew.

VICE CHAIRMAN BARTHOLOMEW: Thank you. Thank you to all of our witnesses.

This is really interesting, and I really appreciate your ability to take these complex, sometimes ethereal issues, and translate them into a way that we can get a handle on.

A couple of things. I have a number of questions, of course. I'm interested in, one of the things that we hear, of course, is that this transition to a consumer-led economy is dependent in part on their being some sort of safety net, and I wonder as you talk about decentralizing some of these revenues to the local, what is the impact on the ability to create programs that will address the breaking of the iron rice bowl? That's one.

Second is what impact does this decentralization have on corruption? Is it going to lead to more corruption? Is it a possibility that it will lead to less corruption?

My response on transparency always--Dr. Prasad, you mentioned that we hear it everywhere, everywhere we hear analysts, but the reality, I think, is that the people who could ensure that transparency in the regulatory process, in data, are people who they or their families are benefiting from the lack of transparency. So I don't see how transparency actually happens? Just most recently even look at something like the Panama papers, that kind of information.

And then I guess my third question would be that, Dr. Hou, you mentioned that access to information was much better than it was, but how accurate is the information that you're getting access to? So any of you want any of those questions?

DR. WU: So maybe I'll just address your first question in terms of the provision of the safety net programs. Let's take example of social security and health insurance and so on that are really the typical and main important elements. There really isn't a national program. It's very different from what we see here. It's actually sort of two layers. One is urban and rural. It's completely different, especially medical care and medical insurance.

It's a lot. So In rural areas, the whole barefoot doctor system was abandoned, and now there is a basic insurance system with very limited service. In urban areas, essentially all medical services commodified and privatized, not privatized because hospitals still are state, but you have to pay for them. There is a state sort of urban segment of the insurance system. You buy it, right, and then in terms of social security, it's essentially only urban based,

and there is none for the rural population.

And then if you look at the social security in urban areas, they are then local. Every province runs a program. And so it's not portable really in a way. You know, some of the states in the U.S. do that; right? But there's always an option that you can have with a portable program. That's still not in place, and so in a sense, the safety nets are not as well structured, and that's why so much--that's one reason a lot of migrants hold on to their land in the home origin because that's their social security, and then a lot of urban residents buy a second house or apartment because that's where they will be able to make sufficient savings for retirement.

DR. HOU: I think you are right using decentralization as a key word. It is true. I quite agree with Dr. Wu that even though that in the western world, China has been kind of, quote-unquote, featured as a "centralized" or "even highly centralized" state, as a matter of fact, it has been always very decentralized. Centralized in the sense of a political appointment. All the top officials are appointed by the top. That's correct--centralized.

But as a matter of fact, when you come to management, the data administration, it has always been very decentralized. So then from 2013 with the new team of leadership, the State Council has been emphasizing very much on the so-called deregulation or decentralization. Would that lead to corruption? Yes and no. Yes, so when, once the center relaxes control on a lot of things, that may give rise to a lot of corruption.

And also the accuracy of information, if it's publicly available. So the central theme here is the transparency. If we can set up the mechanisms, the reliable, stable and consistent transparency system, it can check on decentralization where they have done it really, and also it can constrain on corruption and also improve on the accuracy of the information.

So, again, if we look at it over a certain period of time, back from 1980, 1990, 2009, there has been a lot of progress, but it's still in the process of transitioning.

VICE CHAIRMAN BARTHOLOMEW: So what are the internal incentives for transparency? I mean if my promotion is dependent on meeting certain targets, and I have the ability to make sure those targets are met, I'm not sure what the internal incentives for transparency are?

DR. HOU: The targets have been changed. In the past, it was kind of the GDP championship. Now in, actually in the 12th Five-Year Plan, the annual growth rate target was set as 7.5 percent. In the 13th, it's seven. It's already lowered, and the new normal, if you know the term, the new normal has been saying slow down, slow down. Once we are slowed down, we can gradually, incrementally solve the problems that we have not been able to solve. So the landscape is different.

VICE CHAIRMAN BARTHOLOMEW: Of course, there are some people who believe that the real growth rate is only about three-and-a-half percent. I mean because the data is so--I know my time is up.

CHAIRMAN SHEA: All right. Dr. Tobin.

COMMISSIONER TOBIN: Great. Thank you. I agree with you, Vice Chair Bartholomew, that this has been a wonderful teaching experience, and it's great to have three academics, and I am certain our audience back there is appreciating it too.

I have an accounting question for you, Dr. Wu. You mentioned as you spoke about getting the data, that you could see the revenue coming in, and you could see the expenses, but you couldn't see any connection there. So I suppose is it a matter of the transparency or is it the fact that there's really fungible money that can be used for anything? So hold on to that. That's one question.

And then for Dr. Prasad, your closing remarks orally and in your testimony, you said the renminbi will not contest the dollar's supremacy unless China's leaders align the country's political and legal institutions with its economic reforms. These changes are necessary to engender the trust of foreign investors.

So my question for you is to what extent do you believe the leadership centrally or decentrally is aware of that in terms of the foreign investors? Two, have you seen, if there is awareness or consciousness, have you seen any inklings of progress? And three, is there any speaking to this in the new plan?

So Dr. Wu.

DR. WU: Thank you. That's a really good question. I'm not sure I can answer it fully. When you look at the revenue side of the data, it's mostly like what sources, you know, alike bank, borrowing, land use fee, and then you look at expenditure, you actually look at sectors. You're looking at so much expenditure on transport, on environmental infrastructure, sanitation. So I think there's certainly an element of fungibility because in addition to land use fees, there are actually also other sources they call extra-extra-budgetary revenues that are raised from various different SOEs and the institutions within the local jurisdiction, and that changes.

So unlike fees, that actually has no set rates. There's no set procedures and so on. There's certainly that. For larger cities you see more of that.

But I think the second factor is in terms of the statistical and accounting mechanism, there's still, still there's sort of a call for modernization. I think municipal data generally are not as well collected and also detailed as national data. So it's really difficult to get really local data.

COMMISSIONER TOBIN: I notice you mentioned that you do extensive field work so this could probably be a whole topic to look into--

DR. WU: Right. Right.

COMMISSIONER TOBIN: --to see specifically.

Dr. Prasad--thank you.

DR. PRASAD: The financial market liberalization and capital account opening that China is undertaking is going to have a very significant effect on the nature of financial flows from China to the U.S. Most Chinese financial flows to the U.S. in years past have been in the form of the central bank acquiring U.S. government treasury securities. That is already shifting, and it is going to change very substantially as China opens up avenues for institutional investors and retail investors to invest abroad.

Chinese are going to come looking for equities. They're going to come looking for acquisitions of major corporations not only to get hard assets but also in order to acquire technology. So I think we are going to see a wave of Chinese investment coming to the U.S. through these sources.

In terms of the dollar, I have a sense that the dollar's supremacy as the medium of exchange, the unit of account, the fact that, for instance, a lot of international trade is still denominated in dollars, most oil contracts are still denominated in dollars. When China trades with an African country, a lot of that is intermediated in dollars. That is going to change very significantly as the renminbi plays a more important role.

The renminbi is becoming a reserve currency on October 1, 2016. The IMF will include the RMB is the SDR basket so officially it becomes a reserve currency, and de facto it has become one. There are about one percent of global foreign exchange reserves, which doesn't sound like very much, but starting from zero, and over a short period, that amounts to quite a bit.

But my view is that to become a safe haven currency, what China will need is a broad set of institutions. This is why people come to the U.S. and even came to the U.S. in the midst of the financial crisis because this is seen as a safe place to put money. You need open and transparent political institutions for the checks and balances in the system. You need an independent judiciary and you need robust public institutions, all of which I think China at the moment lacks.

China has indicated it wants to move in some of these dimensions. On political reforms, I think, the government has made it very clear that these are off the cards. Freedom of expression is off the cards. Legal reforms, interestingly, there is statements about what is going to happen, and the Supreme Court's five-year review plan of the judiciary was in fact put out last year. It talks about the rule of law playing a more important role.

But the rule of law will be undertaken under the supervision and leadership of the Party. All legal reforms are to take place under the guidance of the Party so this is a very specific vision of the rule of law. Going back to our discussion about what market-oriented reforms mean, they understand that you need a legal system that enforces property rights, contractual rights for a market-oriented system to work well.

They want that to work efficiently, but what you and I might think of rule of law, where you and I could take the U.S. government to court or the Chinese Communist Party to court in China, that isn't going to happen. So I don't think it's going to be enough to engender the trust of foreign investors. Indeed from all evidence, even the Chinese don't trust China when it comes to safe keeping of financial assets. This is why you have people coming to buy property in Vancouver and Oregon.

COMMISSIONER TOBIN: Thank you. I have more questions, but maybe we'll have a second round.

CHAIRMAN SHEA: Sure. Commissioner Cleveland.

COMMISSIONER CLEVELAND: I have a big question and a small question. If somebody--maybe not now but for the record--could provide a listing of the rights and privileges under the hukou system? I'm interested in that. We had a hearing a couple of years ago on this, and I'm just interested in whether or not it's changed over the years. Obviously, it is connected to fiscal policy. But if you could do that for the record, I'm curious about that.

I'd like to imagine for a moment that you are advisors to the finance secretary, a very capable person, and I would like you to think about, and, Eswar, I loved your characterization of they don't have the framework and they don't have the advocate except on these selective issues, I'd like you to think for a moment what would be three policy recommendations you'd make over the course of the next five years, five to eight years?

Because I think the Chinese are always self-interested. They always--I'll leave it at that--so what would you recommend as the top advisor to the finance secretary on what the right next steps are in terms of fiscal and economic policy? And if you want to put it in the context of Tralima [ph] that would be interesting, but however you choose to advise the secretary?

DR. PRASAD: Just to be absolutely sure, you mean the Chinese Ministry of Finance?

COMMISSIONER CLEVELAND: Yes, not ours.

[Laughter.]

DR. PRASAD: Okay. You used the word "Secretary" so I wanted to be absolutely sure. What needs to be done in China, I think, is beyond the purview of the Finance

Minister. The Finance Minister does have a very important role to play. I think Commissioner Shea's question, Chairman Shea's questions, and also a couple of the other questions, touched upon fiscal policy and what role it can play in supporting rebalancing of growth.

My view is that the strengthening of the social safety net is going to be very important in terms of bringing down the household saving rate, which has actually declined a little bit as the ratio to disposable income over the last couple of years.

And there has been some progress, a little more expenditure towards health, a little more towards education, but still very limited. So, for instance, if you take health care, they have increased expenditure in health care, but catastrophic health insurance is still not provided. And if you think about a graying population that has only on average one child to support it, you can't quite rely on that child, what do you do? Especially if you're richer, you want more medical care. You save more. Many Chinese households where both people in the couple have retired are still saving money.

So I think broadening and increasing the expenditures on the social safety net, especially healthcare, is going to be important. Dr. Wu talked about pensions. There is still a problem with the portability of pensions, which are limited to the urban system, but even there portability across provinces is very limited. Plus the pension system is very significantly underfunded. So I think there is a lot that can be done in terms of reorienting fiscal expenditures and in terms of strengthening fiscal expenditures.

China does have fiscal problems looming in the future. There are unfunded liabilities in the pension system, contingent liabilities in the banking system, and one could argue that China is preparing for this. But in the short run, they do have a lot of fiscal room. Explicit--and I emphasize the word explicit--central government debt is about 17 percent of GDP, and the fiscal deficit is in the range of three to four percent of GDP. They have room in terms of fiscal policy in the short-run, and I think they can use it very wisely both to support economic growth rather than relying on monetary policy and in terms of rebalancing the economy.

My colleagues again have talked a lot about the expenditure reforms and the tax reforms that I think could support all of this, but let me leave it to them to say more.

DR. WU: Yeah, maybe I'll just briefly address your question on hukou, and I think that sometimes our understanding of hukou could be a little bit overstated. Actually if you go to small cities and towns, county seats, hukou really doesn't matter a whole lot anymore so up. Up to 1983 hukou was linked to the provision of food, certainly education. That is still--— The education part is still very much intact, especially in big cities. Of course, health care and employment; right? in the state sector.

So now, with the food part completely resolved, that hukou really doesn't matter for that, and you can actually, as a migrant, if you have enough resources, you can buy health insurance, you can buy a pension, especially if you are working in a state SOE or large enterprises that pay for it, and so mainly now what really matters now is actually education, particularly for children who want to go for the college entrance exam. It's a major barrier for migrant children not living in their origin. It's not just urban and rural; it's where you are.

And then also employment. There are still, particularly in the state sector, jobs that are not open to migrants with rural hukou. So far a lot of the debate has to do with disassociating some of these benefits with where you actually are registered.

DR. HOU: I'll focus on the three policy recommendations. As I put in my written statement, stage three of the fiscal reforms over China, number one, fundamentally change the intergovernmental fiscal relations from the center, provinces to localities. Do grant

localities a reliable, stable source of revenue, which is the real property tax, in particular on residential property.

And second is with the local property tax established, then change the landscape, the working mechanism for local debt. So that the whole country will be on a stable sustainable path.

Number three, with the local governments having a stable reliable revenue source, do provide adequately and efficiently the basics like education, public health, so that all people wherever you are in the country, rural, very remote, or big cities or small cities, you have very good access to quality services, education and public health in particular. So that not everyone has to go to a big city to get the services.

With these three tasks done, I think the landscape will be very different.

COMMISSIONER CLEVELAND: Do you see that happening?

DR. HOU: Yes. Actually these three are outlined in the 2013 book by the current, the sitting Minister of Finance.

CHAIRMAN SHEA: Thank you.

Senator Goodwin.

HEARING CO-CHAIR GOODWIN: Thank you.

I want to try to inject some additional excitement into our conversation by talking about the municipal bond market.

[Laughter.]

HEARING CO-CHAIR GOODWIN: Dr. Wu, you talked about in your testimony and in the written testimony that you submitted the need for municipalities and counties to unwind some of these extra-budgetary financing mechanisms that they now use and the local government financing vehicles and so forth.

I'm interested to hear how long will it take to unwind those measures and set up a system that Western bond investors would be familiar with in terms of assessing those provinces or localities in terms of actual risk and creditworthiness, especially given the lack of reliability in the data that we've talked about several times today with regard to governmental expenses and revenues and so forth?

DR. WU: Yes. So I'm not really an expert on municipal bonds, but I will try to answer in two ways. First is the unwinding has to do with making the bond ratings for localities based on the sovereign governments, not on the local government financing vehicles that are really one or two steps away from the sovereign because they actually don't really have the access to fiscal revenues that could be used when debts are accumulating for bond holders; right.

And so that part will require a bond rating, a municipal or local government rating system. So China now has a domestic source or two to do that, but most foreign investors don't really trust that because there is sort of conflict of interest: you are the auditor but you're also part of the system. So I think Beijing finally got a S&P rating maybe two years ago, and so whether that is going to be introduced into the local sort of credit rating system, a third source is going to be pretty important for really unwinding that as well, at least allowing access for a more certainty by foreign investors.

HEARING CO-CHAIR GOODWIN: And in terms of drilling down into the specifics of tax revenues and governmental expenses, what's your sense as not being an expert on municipal bond market, but how those new rating agencies would be able to discern the risk of in the individual province or county?

I know I'm from the state of West Virginia, and our state actually faced a

downgrade from S&P earlier this week--

DR. WU: Right.

HEARING CO-CHAIR GOODWIN: --because of falling revenues, a result from contracting energy markets. So based on what information, given again the lack of reliability that we've heard about of these tax revenues and these budgetary expenses, will they base their assessment on?

DR. WU: That's a really good question, and so in the sense, I think what's going to happen is also the sort of experimentation facing. So there will be certain cities now going on. There are ten cities and provinces that are allowed to issue municipal bonds. And that will gradually expand, and now, actually for awhile now the central government can actually issue municipal bonds on behalf of some local governments. So who's eventually responsible? Now there is a requirement for local governments to basically set aside certain fiscal revenues, be it whatever source they are from, to pay for debts.

And also an effort to try to clear, to clean up the current about 30 percent GDP worth of local debts. So there is a new balance sheet. What you're going to see is a new balance sheet hopefully, like what happened to SOEs in the 1990s, so that local governments are somewhat on a level playing field across different regions and different sizes of local governments.

So I think that's what I see as what's going on now, but the details really haven't been laid out in terms of how the rating system and how, what kind of indicators are going to be used for that. Yeah.

DR. PRASAD: May I after Dr. Wu's remarks, very briefly, the objective is, as Dr. Wu pointed out, to shift financing from these off-budgetary financing vehicles to on-budget, and to impose some degree of market discipline on the provincial governments. That's the principle. And it's not completely uncontrolled because the provincial governments can issue debts only up to the cap that is approved by the central government, and the central government approves caps based on the ability of those provinces to repay and on the nature of the projects that they bring before the provincial government.

So it's not entirely uncontrolled, but the reality in the bond market is you would have expected to see some differentiation across provinces with different abilities to pay, nature of projects. Virtually every bond yield in the initial stage is clustered around four percent. Why? Because there is still I think an implicit presumption in markets that the central government is going to stand behind these provincial government bonds.

DR. WU: Right.

DR. PRASAD: So the objective and intent I think are exactly in the right direction, impose market discipline, take these debts off the, off budget element, but whether in China markets will instill that discipline I think remains to be seen.

HEARING CO-CHAIR GOODWIN: Thank you. Thank you.

CHAIRMAN SHEA: Senator Dorgan.

COMMISSIONER DORGAN: Thank you very much and thanks to those who have appeared before us today. Just a couple of quick issues, and I'll just give you three of them and you can respond.

You mentioned the income tax in China. Someone mentioned that there is an income tax. Can you describe it without a lot of detail? Is it a substantial tax? Do they have significant compliance with it, number one?

Number two, restructuring of state enterprises. My expectation is you talk about

it being slow. My expectation is no central government, particularly a central government as powerful as that in China really rushes to see if they can restructure enterprises they own, and tell me what you think might come of that in the next plan?

And then third, we're talking about the growth of the economy of China and its participation in the international economy. China has a deserved reputation of allowing and in some cases even promoting the theft of intellectual property. I think, Mr. Prasad, you described the contract and property rights issues, as you said, are so important.

Do you see progress ahead? Do you see acknowledgement by the Chinese government that this issue of sanctity of intellectual property might play a role in their next plan so that they can become a fuller partner in the international economy?

DR. HOU: I'll start with the PIT. The personal income tax has been levied beginning from the starting from the late 1980s, becoming more significant in the 1990s. Now, it's a progressive tax structure with the top marginal rate at 45 percent. It's pretty high, but the problem is, there's a large informal sector of the economy so that a lot of the incomes are what we call gray. So it doesn't fall into the system. But it is it becoming better? Whatever you get paid from a government sector entity or university or enterprise, a certain amount of tax, according to the scheme, will be deducted. and withheld. So that's better.

Still the system is still lagging behind. Put it this way. By 2013, 2014 statistics, these are the most recently available, the total tax revenue for the whole country included only about a six to seven percent of its revenue from the PIT, which is very low. Why? Because a lot of that circumvented the loop. So PIT is a major tax, but as part of the, as an inherent part of the tax system, it still accounted for a low share. That's one.

Second, SOE, does the government have incentive to really restructure or change it? I think so. The reason is simple: they have to. There is no way out. Back in the 1990s, Premier Rongji did that once, and although in the 1990s, early 2000s, they missed another round. Had they done it with the great expansion of the higher education system, the job markets situation would not have been so dire nowadays. They missed one round.

So this time they realize they got to do it anyway. So the cost will be, at least for the current year to the next three years, will be 1.8 million jobs in the steel and coal sectors. It's a very challenging job for the central government, provincial governments. I think those are the two points.

DR. PRASAD: Well, state enterprises, progress has been made over the last decade. In fact, by some estimates, about two to two-and-a-half million workers from the state enterprises have been laid off over the last decade. It's in the last year-and-a-half or so that progress has been very limited. And I think that has to do to some extent with the economic circumstances as well. At a time of slowing growth, especially slowing employment growth, it's become very difficult to generate the reform momentum necessary, and in particular the anti-corruption drive has also kicked in at the moment, so that is muddying waters to some extent.

My impression is that the anti-corruption drive is being received very well in the heartland. I don't commune with the Chinese masses, but I hear from a variety of sources, including my students, many of whom have families back in their hinterland, that it is being fairly well perceived. There is certainly a political angle to it. But in terms of improving public governance, I think it is being perceived in a rather positive light.

So on the state enterprises, their difficulty right now is that some of the fat has already been taken off, but at this stage, it's going to be very difficult to proceed on the restructuring without having a significant effect on economic growth unless they take attendant

measures, which is to reform the financial system so it directs more credit to the services sector and to small and medium enterprises, unless they liberalize the services sector so that entry is more free there.

So it's not an undoable task, but taken in and of itself, the present economic environment makes it very difficult. The other problem is that over the last year, the turmoil in the currency markets and equity markets has set back those who are strong proponents of reform. So I think the reactionary forces have gathered strength to some extent, which is why I think we've seen very little progress done.

The state enterprise reform plan that was put out in November of 2015 was expected to be much more precise, lay out concrete steps, but it got watered down before it came out, again because of the internal machinations of the party.

On intellectual property rights, we hear the right things, and China seems to recognize that as it desires to move up the value added chain, to move to higher-tech manufacturing, it needs strong intellectual property rights, but my sense is that the Chinese industry is still in a state where they are absorbing technology, acquiring technology, rather than innovating a great deal themselves. So I suspect at this stage, there is a still a bit of conflict between those two impasses. So I don't expect to see huge progress.

COMMISSIONER DORGAN: Thank you.

CHAIRMAN SHEA: Okay. Well, thank you.

We have about 17 minutes left for this panel. It's almost over, but we do have a second round of questions, but we're going to have to get--we have four commissioners who have second-round questions so we're going to have to shorten things up a little bit for their responses. But we'll start with Commissioner Wessel.

COMMISSIONER WESSEL: Dr. Prasad, thank you for the testimony, and thank you for the recent paper. Very helpful.

Give us an update since the paper has come out and your comment about the integration of the renminbi in the SDR package. There are some who still believe that the renminbi is undervalued vis-a-vis the dollar. There are some who believe that if it was to be a freely floating currency because of the growth rates in China, it would be further devalued.

What has the last several months meant in terms of changing that nexus, if anything, and what's your view of whether it's under or overvalued?

DR. PRASAD: The appropriate value of the currency is subject to shifts in market sentiment, which are very difficult to predict, and although the fundamentals might suggest that the Chinese RMB should still appreciate over the medium term, the medium term is over three to five years. If you're a hedge fund, your horizon is next week or probably this Friday.

[Laughter.]

DR. PRASAD: If you're a longer-term investor, you have a much different horizon, but in the short run it is clear that capital flows are going to drive currency dynamics, and what we've seen is a combination of three types of capital flows. The distinction is not as clear as I'm making it out to be. The benign kind of capital outflows, which the government has tried to encourage so that there can be portfolio diversification by Chinese investors. There is the unwinding of the carry trade. Many Chinese corporations that have foreign currency debt are paying down that debt. That is going to end fairly soon.

Capital flight because of the anti-corruption drive and a variety of other reasons. That's what they've been clamping down on hard, and they feel if they can manage that, then

things become manageable in terms of the capital outflows because China is still getting net FDI inflows of about 100 to $150 billion in the month. In the last two quarters of 2015, China registered a trade surplus of about six percent of GDP, five-and-a-half to six percent, so they can manage this, and they think they can hold the currency at its current level.

And the pressures have clearly come off in terms of the currency, but if they were to do what the U.S. government and the IMF have been asking them to do for a very long time, which is let the currency float very freely right now, in the short run it would depreciate. In the medium term, by which I could mean even the next few months, I don't think there are strong forces pushing the RMB down.

The trade surplus, the fact that China still has a lot of reserves all suggest that China can hold the line on the currency. It's also worth noting that despite calls even by Japan for China to impose capital controls, because the Japanese are terrified about an RMB depreciation, the Chinese have done one very important thing. They've made it very clear both in word and action that they're not going to go back on the capital account opening measures. What they have done is take the administrative measures they already have in place and tighten them, especially to deal with the capital flight issue.

But in terms of progress on financial market reforms, on further freeing up of the RMB to be determined by market forces, there's been very little progress over the last four to six months, but the good thing is there hasn't been any retrogression.

CHAIRMAN SHEA: Okay. Vice Chair Bartholomew.

VICE CHAIRMAN BARTHOLOMEW: Thank you. And as usual, when we get a response, I have another question that comes up. Dr. Prasad, when you talk about managing the capital outflows of individuals, I'm still trying to understand what the incentives are to clamp down on it when many of the people who are engaging it are the families of people who are in power.

And so to me there's just always this conflict between what economists say should happen or fiscal people say should happen, but what we say then that the Chinese government wants to happen, but when you look at the people who are engaging in it, there's a direct consequence for them if it does happen. So can you untangle that for me? That's one thing.

And then the second thing is, S&P recently said their outlook was the possible downgrading of Chinese bond rating. And I just wonder how the Party deals with a phenomenon like that when it's something that is so completely out of their control. So?

DR. PRASAD: So the stark realities of the capital account has always been very open to the political and economic elite. A lot of money has already left the country. Right now because of the anti-corruption drive and fear of expropriation, more money is leaving the country. That's the capital flight that they are trying to control.

I was in Macao in November, and the casinos feel the pain because a lot of money was going out through Macao, and those are channels that they are trying to clamp down on. But I think again there is a finite amount of that kind of money that will go out.

In terms of allowing retail investors, institutional investors, corporations to take money offshore, those channels are still very much open. They're controlled in terms of timing and quantity, but those haven't changed. They haven't rolled those back yet. So you're right, there is a bit of tension. They do want the right kind of capital for portfolio diversification to flow out, but they want to stop the other types of capital flight, including through, you know, capital flight from Macao, through the shadow banking dens, through trade misinvoicing. That's where they are trying to clamp down.

In terms of the bond rating, China takes the approach of saying that it's your problem, that you're not assisting us properly, and that this is--essentially they don't care because a lot of their financing is still done domestically. The domestic saving rate is very high. They don't rely that much on foreign investors for the bond market.

They are very keen to counter Western perceptions that they're not well managed so they are sensitive to this issue. But whether they're going to respond in the right way by undertaking the reforms necessary to fix this or attack S&P, so far the evidence seems to be they are taking more of the latter strategy.

VICE CHAIRMAN BARTHOLOMEW: Okay.

CHAIRMAN SHEA: Okay. Dr. Tobin.

COMMISSIONER TOBIN: I can give you time for another, and I'll ask Dr. Wu in an e-mail a couple questions. Thank you.

CHAIRMAN SHEA: Okay. Colonel Wortzel. Colonel Doctor.

COMMISSIONER WORTZEL: I have to say that if I was going back to college, I'd be really happy to have any of you as my professor. I mean it's been very clear explanations that you don't need a degree in finance or economics to understand, and I appreciate that very much.

You were all apparently asked an entire series of questions, one of which relates to the Commission's main mandates, which is to provide recommendations for congressional action.

Now as I read your written testimony and heard your oral testimony, you've done a wonderful job of providing recommendations to the Chinese government about how they can solve their problems. I infer from the absence of any mention of the United States Congress in oral or written testimony that there's just not a thing the U.S. government can do. Is that a good inference?

In other words, there are no legislative measures--we don't report to the executive branch--but even executive measures that the U.S. government can take that can encourage these reforms other, Dr. Prasad, than pressures on currency?

DR. WU: I just want to say I think as we move on towards discussion more about domestic reforms and particularly very local level reforms, the diversity of situation in China is such like wild, wild West; right? It is pretty difficult to say come up with perhaps only a recommendation that should be a consistent set of institutional sort of rules. Maybe public-private partnership, maybe special legislation on the Chinese side to allow for more streamlined approval. Other than that--

COMMISSIONER WORTZEL: But not on the U.S. side.

DR. WU: Correct, not on the U.S. side.

COMMISSIONER WORTZEL: Nothing on the U.S. side, right.

DR. WU: It's really difficult, yeah.

DR. PRASAD: So one has to admit it's a little awkward when you've been telling the Chinese for years have a market determined exchange rate, don't keep the exchange rate stable, so when they finally do it to say, yes, have a market determined exchange rate, but don't, but keep it stable because you don't want it to depreciate too much.

My perspective on this is that unilateral measures tend to be somewhat less effective than multilateral measures. If one thinks about, you know, accession into the RMB basket, I think that was where the international community, including the U.S., could help the Chinese reformers push through certain very important reforms by the process of laying down

very clear markers of what need to be done.

But even there when it comes to unilateral measures, I'm less pessimistic than I used to be because if one thinks about progress on the green growth agenda, for instance, I think China has found it very useful to make these public statements along with the U.S.

So in China, I think it's very difficult to lecture them and say do this or do that, but there are reformers in China who do find external pressure useful in terms of generating support for reforms, not when it comes as a dictat from the outside or as part of a punitive legislative action, but as part of some sort of cooperative approach, and I think there are ways to do this.

It doesn't always work. It doesn't apply to all situations, but I think that's the one ray of hope.

DR. HOU: To me there is a lot that this side can do, and as I see it, the Chinese side has already taken a lot from this side, just in different ways. Sometimes the language from this side has been more on the negative side while the Chinese side has been using selective listening. They say oh, no, no, no, that's not right. But they may be doing it in a few days because they see what is good with it.

So if we can change the tone. For example, improve your governance capacity as I see it or as we see it from the history of development of this country, this is not good, if we do this way, it can be generating the following benefits. For example, the intergovernmental fiscal relations, the decentralization, the different 50 states vis-a-vis the federal government, the local governments under the states. There have been a lot of good lessons to learn from this country and from other advanced economies. China actually has been doing that quite a lot even though they may not be saying so.

COMMISSIONER WORTZEL: So there may be some educational things we can do.

[Laughter.]

DR. HOU: In other words--

COMMISSIONER WORTZEL: But not legislative.

DR. HOU: China has opened up so much, and there is no way to go back, and even the control of the website or anything, there's no way to control that. Everyone knows that. So it's a very, very wide open world. So I'm very optimistic on that side.

CHAIRMAN SHEA: Okay. Well, I want to thank all three of our witnesses for some great written and oral testimony, and we really appreciate your contribution to our efforts, and so thank you, and with that, we'll adjourn till 11 o'clock.

[Whereupon, a short recess was taken.]

PANEL II INTRODUCTION BY COMMISSIONER CARTE GOODWIN

HEARING CO-CHAIR GOODWIN: We'll go ahead and get started again. Welcome to our second panel, which will assess China's high-tech industrial policies and their impact on U.S. automobile, aerospace and semiconductor sectors.

We'll start with Dr. Crystal Chang, who is a lecturer in political science at Cal Berkeley where her current research focuses on the role of industrial policy and foreign direct investment in the development of China's auto sector and how emerging Chinese automakers will influence the competitive dynamics of the global auto industry.

Next, we will also hear from Chad Ohlandt, who is an aerospace engineer at RAND Corporation, specializing in foreign aerospace industrial policy and programs and the development and acquisition of advanced aerospace systems.

He was a contributing author to the Commission's 2009 contracted report, Ready for Takeoff: China's Advancing Aerospace Industry, and he's the lead author on the Commission's forthcoming report on Chinese investment in U.S. aviation.

Finally, we're happy to welcome Mr. Jimmy Goodrich, who is Vice President of Global Policy at the Semiconductor Industry Association here in Washington. Mr. Goodrich is also a member of the Executive Committee of the United States International Technology Office and has worked with Chinese and global stakeholders on technology policy issues for nearly a decade, serving as Director of Global Policy at the International Technology Industry Council and as Director for Greater China Government Affairs at Cisco Systems.

As we reminded the first panel, please try to keep your remarks to seven minutes, and Dr. Chang, we'll begin with you.

OPENING STATEMENT OF DR. CRYSTAL CHANG
LECTURER IN POLITICAL SCIENCE, UNIVERSITY OF CALIFORNIA, BERKELEY

DR. CHANG: Okay. Good morning. I'd like to begin by thanking the Commission, and especially Chairman Shea and Vice Chair Bartholomew and Senator Goodwin, and your wonderful staff for inviting me to testify today.

It is an honor to share with you my perspectives on the upcoming 13th Five-Year Plan and its implications for the Chinese and American auto industries. So what I would like to do is instead of rehashing my whole testimony just focus on Chinese operations of American automakers today, some implications of the 13th Five-Year Plan, implications for the American auto industry here at home, and finally a couple recommendations.

So first an overview of American companies in China. As you may know, GM, the largest American automaker, has made a huge investment in China. It today has 11 joint ventures, two wholly owned enterprises, and claims to have more than 58,000 employees in China now employed at all of its operations.

So last year, GM sold 3.6 million vehicles in China. That's 500,000 more than it sold here in the U.S. It is the leading market. It's the market leader in China right now. So China accounts for a third of its global sales. So it's very significant.

And most of their success I believe has to do with GM's willingness to share technology and work with its Chinese partner, which has curried favor with Chinese officials, and although it seems that GM has given a lot of control over its technology and operations to its Chinese partner, I think one of the reasons it's done so is because its Chinese partner, SAIC Motor, has not become a major competitor.

And in my testimony, I've explained sort of why the dynamics of the business model have sort of inhibited its Chinese partner from becoming a major competitor, but I actually do think it is unlikely to become a competitor in the coming years. Its own brands have not done very well in China, and its profitability and success depend on GM's continued success in China. So I also think it will protect GM's interest in China, at least for now it seems that way.

As for Ford, Ford came to China a little bit later. It sold 1.1 million vehicles in China last year so that's like something like 15 percent of its global sales. But China is becoming a lot more important in Ford's portfolio. It's expanding rapidly in China. In fact, on its own website, it says its expansion in China is the largest expansion the company has made in 50 years. So it is really seeing China as a big growth market.

Its Chinese partner, Chang'an Motors, is a major player in China and I think also depends on Ford for a lot of its profitability. Chang'an's own cars have really been barely break even. Okay. So, in that regard, American car companies have been doing very well.

Finally, Tesla Motors has entered China recently, but it has not done that well. It sold about 5,000 cars last year. As you know, Tesla cars are very expensive, and even with generous subsidies, Chinese consumers aren't jumping on the bandwagon.

Last year, the CEO Elon Musk said that he was in talks with Chinese officials to start production in China, but according to current regulation, Tesla would have to form a joint venture with China, and it's unclear what the conditions of such a joint venture would be, how much Mr. Musk would want to give up in terms of technology and control. So seven months later, nothing has happened, and so I'm skeptical of where that's going to go.

And plus I think the market for electric cars, as I'll talk about in a second, in

China, is going to be very different. It's not going to be rich people buying electric cars in China. And so I think Tesla will have a challenge there so we'll see how that goes.

So next I'd like to talk about the implications of the 13th Five-Year Plan. As I mentioned in my testimony, I think the Five-Year Plan these days is really more of a wish list and less of a crystal ball to see what will happen in China, especially in competitive markets. So the auto market in China today is highly, highly competitive with many, many Chinese automakers involved and their foreign partners.

And to Beijing's chagrin, of course, foreign brands still dominate the Chinese market, and I see that unlikely to change. The one place where the central government is sort of trying to put more emphasis is in new energy vehicles. So that's all electric cars and plug-in hybrids. And they will probably spend a lot more money to try to figure out how to build out infrastructure to support these types of cars and promote Chinese car companies that are working in this space. So we are likely to see some developments there.

However, I am still skeptical about whether a Chinese automaker or a Chinese firm will dominate this space in China or even globally, but I can answer that in the Q&A in terms of why I'm skeptical about that.

So what are some of the implications for the U.S. auto industry? Well, as I've said, I think GM and Ford are doing fine. Their sales in China are bolstering its profits worldwide. But in terms of what it means for the American auto industry, I think the outlook is a little bit more grim, and that's because as the global auto industries become more fragmented, a lot more of the parts are being built in China.

And so that trend really started in the U.S. with NAFTA where a lot of the offshoring of parts went to Canada and Mexico, but now China is becoming a bigger source of auto parts. And if you think about it, it's because so much more production is moving to China. I mean GM with Buick, the Chinese love Buicks. Who would have guessed?

[Laughter.]

DR. CHANG: And they sell five times, five times more Buicks in China than the United States. So in some ways it makes more sense. If you're making more Buicks in China, you know, there are companies that are making parts for you there, why not just import those parts into the U.S. when you already have large capacities? And that trend might continue if American car companies build more cars in China.

So the parts industry in the U.S., at least small and medium companies, have not done as well, and so employment in the parts industry has really gone down. And with automation and assembly, just the jobs in auto manufacturing have been on the decline, something like around 30 percent in the last ten years. So that's a place where it's worrisome in terms of the American auto industry.

And also that has worsened the automotive trade deficit with China because we're just importing so many more parts. Something like $18 billion in parts. So of course from a brand deficit, maybe that's a small amount. And the one thing I wanted to say, the one bright spot, is that the U.S. actually exports more American-made cars to China than it ever has, which is interesting.

And so one question might be, well, if they're building more cars in China, are they going to, are we going to see more imports? That's, of course, a big question. And there are the very first imports of Chinese-made cars last year by Volvo and by GM. This is probably a trend that's going to continue, but I don't know if those numbers are going to be huge going forward. I think American car companies are probably still going to assemble most of their cars

in the U.S., but, as I said, it's the parts issue. More of the parts are probably going to come from China.

So finally in my last few seconds, I just want to talk about some recommendations. The key one really is that I think that the American government should invest a lot more in new automotive technologies, and I can talk more about this in the Q&A, but there's a huge trend right now towards electric cars and even more so autonomous cars, driverless cars.

And the American firms can be a leader in that, and it's not just automakers. It's a lot of IT firms, Google, Apple, a lot of companies are sort of making a big push into these autonomous cars. But the adoption is really going to be limited by safety regulations and other issues. So if the American government can help solve those issues, work together with the industry, American companies can really be leaders, I think.

And the other thing is in terms of, you know, what to do with the unemployed auto workers, and this is a huge challenge, but I think we can't just wait, you know, tell them wait, wait around for auto jobs to come back. I'm just not sure that's going to work so I really think there has to be new educational opportunities and new training for these workers because auto jobs are probably not going to be what they're going to have to look forward to.

Okay. I'll keep my comments there. Thank you.

PREPARED STATEMENT OF DR. CRYSTAL CHANG
LECTURER IN POLITICAL SCIENCE, UNIVERSITY OF CALIFORNIA, BERKELEY

China's 13th Five-Year Plan: Implications for the Automobile Industry

Testimony before the U.S.-China Economic and Security Review Commission[1]
Hearing on China's 13th Five Year Plan
April 27th, 2016

Dr. Crystal Chang
Lecturer, Departments of Political Science and International & Area Studies
University of California, Berkeley

It would be a mistake to read the 13th Five Year Plan (FYP) as if one were reading oracle bones for clarity on China's economic future. Rather, it should be understood as the Chinese government's long-winded wish list of what they *would like* to see happen in the economy. The 13th FYP suggests that the Chinese government *would like* to see innovative Chinese-brands dominate the market for new energy vehicles (NEVs).[2] While there are new and interesting developments that should be monitored closely, the government's ability to realize their objectives are limited. Most NEVs on Chinese roads today are low-cost, low-tech models that were purchased by local governments looking to please Beijing and support local firms. The broader auto market in China is and likely to remain driven by sales of gasoline-powered vehicles, the majority of which are sold under the brands of foreign automakers.

The 13th FYP will probably not have a direct effect on American automakers, which are doing very well in China. In 2015, General Motors (GM) in conjunction with its local partners sold a record 3.6 million vehicles in China (36% of its global volume), making it the market leader. Meanwhile, Ford Motors and its partners sold more than one million units for the first time. The nationalist rhetoric in the 13th FYP may sound alarm bells, but the interests of American automakers will be buttressed by their large and politically influential state-owned partners, whose profitability depends on the continued success of their Chinese-made American cars.

An ongoing concern for the U.S. auto industry lies in declining employment at home, which is loosely tied to China's vast auto market but largely driven by the fragmented and automated nature of today's global automotive production networks. American automakers still tend to "build where they sell," even in the U.S. The problem is that the parts they use to build their cars are increasingly imported from places like Mexico and China, where American parts suppliers have set up large factories. This offshoring of auto parts production is why the record-breaking 17.4 million vehicles sold in the U.S. last year has not translated into more local jobs.

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[1] The perspectives presented in this testimony draw from Crystal Chang (2011), *Stumbling toward Capitalism: The State, Global Production Networks, and the Unexpected Emergence of China's Independent Auto Industry* (Doctoral Dissertation), which can be retrieved from the Proquest UCB Dissertations Database; and Crystal Chang (2013), "Center-Local Politics and the Limits of China's Production Model: Why China's Innovation Challenge is Overstated," in John Zysman and Dan Breznitz (eds.), *The Third Globalization: Can Wealthy Nations Stay Rich in the Twenty-First Century?* New York, NY: Oxford University Press.
[2] NEVs is a broad category which encompasses plug-in hybrid vehicles, all-electric vehicles, and hydrogen fuel cell-powered vehicles.

To more fully address these issues, the rest of this testimony is organized as follows:

I. Role of industrial policy in the development of the Chinese auto industry
II. Potential effects of the 13th Five-Year Plan on Chinese auto industry
III. Impact of China's growing auto market on the American auto industry
IV. Recommendations for Congressional action to support domestic innovation in autos

I. Role of Industrial Policy in the Development of the Chinese Auto Industry

China's auto industry is paradoxically large but weak. Chinese industrial policy has succeeded in creating the world's largest automobile market (24.5 million units in 2015)[3], but it has so far been unable to create a national champion the likes of Japan's Toyota or Korea's Hyundai that can effectively compete in global marketplace. In 2015, Chinese automotive exports totaled a modest 728,200 units[4] (less than 1% of global production), which was 20% lower from the previous year. Most of these low-priced exports are sold in emerging markets, with few going to industrialized countries. Meanwhile, the market share of indigenous Chinese branded vehicles in their home market has slowly declined from over 50% in 2005[5] to 41% in 2015[6].

There are two main reasons why China's large auto market struggles to produce a globally competitive automaker. The first has to do with China's joint venture (JV) policy, which has ironically made state-owned enterprises (SOEs) profitable while hampering their motivation to develop their own branded cars. The second reason has to do with the fragmented and fiercely competitive nature of the Chinese auto industry, which has dampened the ability of China's more entrepreneurial independent automakers to build market share, invest in innovation, and achieve economies of scale. Each of these will be explained in further detail below.

The Diminishing Returns of China's Joint Venture Policy

When Chinese leaders decided to open their auto industry to foreign investment in the early 1980s, they had several goals in mind. They believed that the capital and technological expertise of foreign firms would help establish an automotive supply chain in China and jumpstart the country's passenger car production, both of which were essentially non-existent at the time. Imported cars were expensive and put pressure on the little hard currency China had. More importantly, they hoped that by forcing international automakers into 50-50 JV partnerships with China's SOEs, foreign firms would have no choice but to help modernize backward automakers. The hope was that after absorbing the know-how of leading international automakers, one or two of these SOEs would be ready for the global marketplace.

In the early 1980s, passenger car markets in the industrialized world were nearing saturation.

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[3] International Organization of Motor Vehicle Manufacturers (OICA), 2015 Production Statistics, http://www.oica.net/category/production-statistics/ .
[4] China Association of Automobile Manufacturers, "The market share of Chinese brand passenger cars increased," Jan 20, 2016. http://www.caam.org.cn/AutomotivesStatistics/20160120/1305184264.html .
[5] Keith Bradsher, "China's Embrace of Foreign Cars," *The New York Times*, Apr 8, 2014, http://www.nytimes.com/2014/04/09/business/international/chinas-embrace-of-foreign-cars.html .
[6] China Association of Automobile Manufacturers, "The auto imports & exports yearly down," Jan 20, 2016. http://www.caam.org.cn/AutomotivesStatistics/20160120/1305184262.html .

This worrisome trend prompted global automakers to seek growth in emerging markets. The alluring market potential of China's large population intrigued some international automakers, which partly explains their surprising willingness to enter 50-50 JV partnerships, share technology with would-be competitors in China, and to work with a government that was not yet well-versed in the language of markets and Western-style capitalism.

The Chinese government believed, perhaps naively, that the 50-50 JV arrangement would limit foreign dominance of the domestic market. Establishing a wholly foreign-owned enterprise to assemble vehicles in China was not an option and to this day is prohibited. What Chinese leaders neglected to do, however, was to require that vehicles produced by JVs be sold under new Chinese brand names. This proved to be a fatal flaw of their strategy. China's first domestically-produced passenger cars carried the logos of well-established foreign brands. Given their unfamiliarity with consumerism, it is not difficult to see why Chinese leaders overlooked the importance of brands in a market economy.

China's JV policy has achieved some but not all of the original goals of the early reformers. On the one hand, the country boasts the largest automotive market in the world served largely by cars produced domestically. Foreign firms have invested tens of billions of dollars in China. The auto sector has created hundreds of thousands of jobs, spawned a flourishing domestic auto parts industry with export capabilities, and contributed to rapidly growing consumer economy. By that account, Chinese auto policies have been a resounding success.

On the other hand, to the great chagrin of Chinese leaders, foreign-branded cars continue to dominate the domestic market three decades after the first JV was formed. Unlike Japan and Korea, China failed to shield fledging Chinese automakers from foreign competition in the domestic market, with severe if unintentional consequences. The Japanese and Korean governments forced domestic firms to compete against one another at home but protected them from foreign competition, giving them time to build up their capabilities. It was only after Toyota and Hyundai established brand identities in their domestic markets that they began exporting to other markets like the United States.

China's so-called "Big Four" automakers, Shanghai Automotive Industry Corporation (SAIC), Dongfeng Motor, First Auto Works Group (FAW), and Chang'an Motors each boast annual production in the millions of units. Yet the vast majority of those vehicles carry the brand names of their foreign partners. Sales of their own branded-cars have not been successful and mostly unprofitable, except for Chang'an Motors which is close to breakeven.[7]

SAIC, the largest and often considered the most well-managed of the Big Four, has seen declining popularity of its main Roewe and MG brands. Between 2013 and 2014, Roewe and MG sales dropped from 230,000 units to 180,018 units respectively. SAIC-branded cars accounted for only 7% of the vehicles the company produced that year. Meanwhile, its JV operations with GM and Volkswagen accounted for 59% and 31% of the vehicles produced in SAIC-run factories.[8]

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[7] Author interview with a China-based editor of *Automotive News*, April 13, 2016.
[8] Chinese Association of Automotive Manufacturers website, 2014 Automobile Market Share Data by Brand, http://www.caam.org.cn/zhengche/20150116/1505144999.html .

For the most part, JV partnerships are structured such that the Chinese firm is in charge of auto assembly operations and the foreign firm is in charge of new car designs and branding. So while Chinese SOEs have learned a great deal about state-of-the-art manufacturing, they have not been privy to the R&D and marketing aspects of new product development, much of which takes place in the home country of their partners. Foreign automakers have closely guarded the development of their intellectual property and cutting edge technologies. When pressed by the Chinese government to share technology with their JV partners, they tend to pass on second or third generation platform technologies.

In addition, SOE managers are mostly Communist Party officials focused on their next career assignment rather than the long-term prospects of the companies they run. They prefer to stay profitable and maintain full employment rather than take on expensive and risky projects like designing their new platforms and building new brands. It is both less risky and more profitable for them to focus their efforts on the production of market-proven cars with their foreign partners, even though those cars are sold under foreign brands.

To address these shortcomings of existing JV policies, Chinese leaders are now pressuring foreign firms to help their JV partners develop new Chinese brands when they apply for capacity expansion. Baojun, a new brand launched between SAIC and GM, is one such example. It is unclear whether this strategy will bear fruit, as foreign firms are weary of investing their latest technologies and scarce marketing funds into these co-owned brands. Most will do the minimum to keep Chinese officials happy while focusing on their own brands. Furthermore, new Chinese brands must face a fiercely competitive and fragmented Chinese marketplace.

Origins of China's Fragmented Auto Industry

In the 1950s, Mao Zedong believed that every province in China should have its own truck factory. If one part of the country under enemy attack, vital truck production could continue. At its peak, China had 1,950 small-scale factories producing trucks, motorcycles, parts, and a few cars.[9] Even though Beijing has repeatedly encouraged consolidation of the industry, provincial and local governments continue to prop up their automakers by procuring their vehicles and giving them access to credit and tax incentives, even if their volumes are small. They do so to retain jobs in not only assembly, but in the supply chain that supports local production. Today, China still has over one hundred state-owned and independent auto assemblers.[10]

As the Chinese government began to open the sector to outside investment, a decision was made to pair different SOEs with different foreign firms. The first JV in 1984 was between American Motor Corporation and Beijing Automotive Works, today known as Beijing Automotive Industry Corporation. The second was formed in 1984 was between Volkswagen and Shanghai Automobile Assembly Plant, today known as Shanghai Automotive Industry Corporation (SAIC). The third in 1985 was established between Peugeot and Guangzhou Automotive Manufacturing Plant, today known as Guangzhou Automotive Industry Group.

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[9] Eric Harwitt (1995), *China's Automobile Industry: Policies, Problems, and Prospects*, (Armonk, NY: M.E. Sharpe), p.21.
[10] ibid, p.209.

This trend continued through the 1990s and 2000s, with even a greater number of Chinese SOEs and foreign automakers forming partnerships and opening assembly operations across the country. Instead of a single Detroit, China has a number of regional auto manufacturing hubs in northern China, the central coast around Shanghai, southern China, and western China. In each region lies one to two SOEs with JV operations, each with one to two foreign partners.

Local government support has been crucial to the success of JVs with operations in their region, but it also makes it difficult for any single JV to be successful across regional markets. It is common to find many of the cars on the roads of a Chinese city made by firms with manufacturing operations close to that city. In Shanghai, for example, one finds more cars produced by SAIC's joint ventures with GM and Volkswagen, but far fewer cars produced by Ford, whose JV operations are in Chengdu or by Toyota whose JV operations are in northern and southern China.
The three notable mergers between FAW and Tianjin Xiali, SAIC and Nanjing Auto, and Guangzhou Auto and Changfeng Motors have actually done very little to change the competitive environment. Even the rumored merger of the number two and number three SOEs, Dongfeng Motors and FAW, is unlikely to alter the dynamics of the passenger car market. The vast majority of the passenger cars produced by these two SOEs carry the foreign brands of their JV partners. FAW and Dongfeng produced only 288,000 and 440,000 self-branded cars in 2014, amounting to 11% and 17% of their total annual production.[11] This amounted to a combined 3.6% of the passenger car market, hardly enough to worry the competition even if these firms could overcome the political hurdles to a merger.

China's Struggling Independent Automakers

As if the the mosaic of SOEs and JVs was not confusing enough, there are also dozens of independent automakers sprinkled throughout the country, many of which were started by enterprising local officials and a few of which were started by private sector entrepreneurs. These firms are *independent* in the sense that they are newcomers to the industry rather than legacy state-owned factories of the pre-reform era. Until recently, most have been left behind by China's industrial policies, especially the coveted JV partnerships with foreign firms which require Beijing's approval. Despite being latecomers, they have become the bearers of China's leading automotive brands. Once the darlings of the domestic industry, these firms continue to struggle to gain market share from the leading foreign brands.

The most prominent local government-owned automaker is Chery Auto. In the late 1990s, Chery got its start producing low-cost mini-cars that were essentially knock-offs of the Chevrolet Spark subcompact. Although the price was right (less than $10K), the quality of Chery's QQ model was abysmal. In 2005, Chery announced that it had teamed up with Malcolm Bricklin's Visionary Vehicles and would soon begin importing 250,000 Chinese-made cars in the U.S. Its partnership with Visionary Vehicles quickly fell apart and Chery has yet to export a car to the U.S. In 2012, Chery was permitted to form a 50-50 JV partnership with Jaguar Land Rover, now owned by India's Tata Motors. The partnership has struggled to get its factory up and running. While Chery can claim to be China's leading exporter, most of their cars are sold in emerging

[11] Alvin Ybanez, "Why the Dongfeng-FAW merger is likely to fail," *Yibada News*, http://en.yibada.com/articles/31838/20150509/dongfeng-faw-merger-likely-fail.htm .

markets and volumes are low (87,000 units in 2015). Furthermore, its overall sales volumes have been pretty stagnant for the last few years (550,100 units in 2015).[12]

BYD Auto and Geely Auto are amongst the most well-known independent automakers in the private sector. In 2008, BYD shocked American investors when Warren Buffet decided to invest $230 million in the company because of the firm's potential leadership in electric cars. Although BYD struggled for a few years, it has recently re-emerged a stronger company. In 2012, it was granted a rare approval by the Chinese government to form a JV with Germany's Daimler to produce electric vehicles for the Chinese market. Shenzhen Daimler began selling its new Denza all-electric car in late 2014, but its price tag of $60-65 thousand (including subsidies) and somewhat limited range of 200 miles has made the car a tough sell so far.[13]

BYD has made modest inroads into the U.S. market. It has a factory in Los Angeles, California, where it produces rechargeable electric buses to American transit agencies. That factory is expected to produce 300 electric buses in 2016. It has also launched small test fleets of plug-in electric taxis in Chicago and New York City. BYD likes to boast that it sold more NEVs (61,722 units) than any other automaker in the world in 2015, including Tesla Motors (50,580 units).[14] This figure, if accurate, must be qualified. The majority of BYD's sales are from its low-cost plug-in hybrids, not its all-electric models. Less than 9,000 of the vehicles BYD sold were all-electric, which is less than 20% of Tesla's annual sales. And BYD's electric cars are far less sophisticated and shorter range than the Tesla Model S sedan. Furthermore, most of BYD's sales have been to their hometown, Shenzhen. Local officials have been supportive of its homegrown automaker and have purchased over 4,000 electric buses. BYD will have to invest heavily in new car designs and branding if it is to succeed as a mass market consumer producer of electric cars.

Geely made headlines in 2010 when it purchased Volvo from Ford for $1.5 billion. That was a risky and very expensive move that has yet to bolster the profits of Geely. Though an internationally-recognized brand, Volvo has not won over Chinese consumers who prefer BMWs, Audis, and Buicks. Geely, known as a low-cost producer, has struggled to raise the brand awareness of its Volvo models as well as its own branded vehicles. While Geely cars are not likely to be seen on American roads anytime soon, the company has begun importing Chinese-built Volvos to the U.S. Roughly 1,000 units of its Chinese-made S60 Inscription sedan were imported to the U.S. in 2015. Geely's own brands have also struggled to take hold in China, where they continue to be stigmatized as low-end. Overall, the company only sold a paltry 509,000 units in 2015, on par with Chery.[15]

The emergence of these independent automakers was not the result of targeted industrial policies. These firms were not allowed to form JV with foreign firms. That was a privilege reserved for SOEs. Instead, their emergence was an unintended consequence of China's rapidly growing auto

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[12] Chery International website, http://www.cheryinternational.com/news-news.jsp .
[13] Joey Wang, "BYD-Daimler Denza EV launched on the Shanghai car market in China," *Car News China*, Sept 29, 2014, http://www.carnewschina.com/tag/denza/ .
[14] Associated Press, "China-Electric Car Dreams," reported in the *Philadelphia Tribute*, Apr 21, 2016, http://www.phillytrib.com/news/state_and_region/correction-china-electric-car-dreams-story/article_e8ce19e4-13da-5ba9-a5c7-3cdc5770538b.html .
[15] Geely Auto Press Release, "Geely Automobile Holdings Limited 2015 Sales up 22% YoY to 500,000+ Units," August 1, 2016, http://global.geely.com/news_info.php?76.

industry. With very little capital and technology, these firms were able to quickly launch and ramp up their production of passenger cars by leveraging the modularization of global production networks and China's own rapidly expanding automotive supply chain. These companies started off by copying the designs of foreign branded cars, often buying the very same parts used in those cars from local parts suppliers. As these automotive start-ups gained experience and a foothold in the Chinese market, many started to work with global parts suppliers with operations in China who were also looking to grow their business.

However, as discussed above, independent automakers have struggled to compete against the cars produced by the JVs, which are of higher quality and have better brand recognition. These firms continue to flourish only in the low-end of the market (under $12,000 per unit), where the foreign-branded cars cannot compete. Most of their consumers are in the countryside and second and third tier cities, where incomes are lower than in first tier cities. While the low-end of the market is large, it is not very profitable. Comparatively speaking, sales volumes for these firms have been very low. Sales of Buicks, just one of many GM brands sold in China, exceeded one million units in 2015.[16]

Low volumes and meagre profits have created a business model where most of these firms have little money to invest in R&D and branding. Many continue to rely on copying foreign car designs while others outsource design and engineering to foreign automotive consulting firms like Britain's Ricardo. They have little proprietary technology and many middle class Chinese continue to associate their brands with poor quality and poor reliability. The efforts of independent automakers to compete in the mid-range and high-end of the market have been fruitless and money-losing.

The 11th FYP (2006-2010) was the first to contain the words "indigenous brands" (自主品牌). The government called for one or two enterprises with production capacity of at least 2 million vehicles, 50% of which would be indigenous brands and 10% of which would be exported. The plan also called for several other auto groups with capacities of 1 million vehicles. The overall message of the 11th FYP was that automakers would now be judged not only on their annual production, but also on the development of Chinese intellectual property that could eventually free the Chinese auto sector from reliance on foreign technology.[17] With the rollout of the 13th FYP, the government's goal of creating an innovative indigenous brand with annual sales of 2 million vehicles remains elusive.

II. Potential Effects of the 13th Five-Year Plan on Chinese Automotive Industry

As China has slowly embraced a more market-based economy, the FYP has been transformed from a long list of specific production targets to a long list of strategic priorities. The full text of the FYP has 80 chapters and more than 50,000 characters.[18] The change in the plan's orientation was first reflected in the 11th FYP (2006-2010) when the characters for "plan" (计划) were

[16] Buick Pressroom, "Buick Sets Third Consecutive Global Sales Record", Dec 21, 2015 http://media.gm.com/media/us/en/buick/news.detail.html/content/Pages/news/us/en/2015/dec/1221-buick-sales.html .
[17] Anderson (2012), p.82.
[18] Full version of the 13th FYP in Chinese can be accessed here (English version not yet available as of April 20th): http://news.xinhuanet.com/politics/2016lh/2016-03/17/c_1118366322.htm .

replaced with those for "guideline" (规划). With the maturation of the market mechanism in the Chinese economy, the FYP has far less impact on competitive sectors like autos. The fact is that today's Chinese automotive market is shaped more by supply and demand than government policies related to the FYP. The one area where the 13th FYP may have some influence is in the area of new energy vehicle adoption.

Declining Influence of Chinese Industrial Policy in A Competitive Marketplace

Since the 2009 Automotive Industry Readjustment and Revitalization Plan, the government has not announced a sector-specific policy, which is perhaps an indication that the government is generally satisfied with the growth of the industry. That was, after all, the year that China overtook the U.S. as the world's largest auto market. Since the 11th FYP, the central government has shifted its attention from overall growth to certain aspects of the auto industry that intersect with high level priorities, especially innovation, the development of indigenous brands, and the adoption of NEVs. The 12th FYP (2006-2010) and now the 13th FYP, the full text of which was released on March 17, 2016, continue to emphasize these same goals.[19]

Over the past decade, government incentives to promote NEVs have taken many forms, including direct subsidies to automakers that produce NEVs, subsidies to local governments who purchase green fleets, and a combination of tax breaks and free registration for consumers who buy green cars. In Shanghai, for example, buyers of NEVs could save up to $28,600 by taking advantage of free license plates and other rebates.[20] Direct subsidies to automakers have recently come under intense scrutiny because of media allegations that some automakers have inflated NEV deliveries to obtain bigger subsidies. Beijing has launched a probe into fraud at regional automakers while several provinces and municipalities including Shanghai have reduced subsidies for the production of NEVs.[21]

Opportunities and Challenges in China's New Energy Vehicle Industry

The international news media has been humming with news that China has become the world's leading market for green cars. While there is some merit to this claim, most of these vehicles are low-cost and low-tech, and most have been purchased by the local governments, not Chinese consumers. In 2015, production of all NEVs in China totaled 340,471 units, of which 152,172 units or 44% were all-electric passenger vehicles.[22] Although year-on-year growth has been impressive, NEVs as a whole only comprised a meagre 1.4% of total vehicle production in China last year.

The majority of these vehicles are not particularly sophisticated and have limited ranges. The Kandi EV is a perfect example. The best-selling electric car in China in 2015 (16,736 units), the Kandi EV looks like a cheap knock-off of a Mercedes Smart ForTwo mini-car with a range of 75

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[19] Full version of the 13th FYP in Chinese can be accessed here: http://news.xinhuanet.com/politics/2016lh/2016-03/17/c_1118366322.htm .
[20] Jake Spring, "'From bit to strong': China sees competitive edge in green cars," *Reuters*, http://www.reuters.com/article/us-china-autos-green-idUSKCN0RB0OP20150911 .
[21] Automotive News China, "EV sales growth slows as Beijing probes subsidy fraud," Apr 15, 2016,
[22] China Association of Automobile Manufacturers, "New energy vehicles enjoyed high-speed growth," Jan 20, 2016, http://www.caam.org.cn/AutomotivesStatistics/20160120/1305184260.html .

miles and a top speed of 50mph.[23] Like BYD Auto, Kandi's main marketing strategy has been to work with local governments to create publicly-run electric car share automated garages that run like vending machines. Its largest customer is Hangzhou, the biggest city in its home province of Zhejiang Province. Hangzhou has plans to expand its car share capacity to 100,000 cars. The rental price is $3.25 per hour, while the MSRP for the Kandi EV is roughly $6,317.[24] These cars are produced by a JV between Kandi and Geely, which is also headquartered in Zhejiang. Kandi's potential lies not in its cutting edge technology, but rather in its business model and ability to build low-cost electric mini-cars. However, there is nothing proprietary about Kandi's cars and China has dozens of other carmakers pursuing similar strategies.

Many Chinese and foreign automakers alike have announced large investments into NEVs, but the sticker price of the more sophisticated models and paucity of public charging stations have deterred potential Chinese consumers. A large number of Chinese car owners live in apartment buildings, and it remains unclear how many of the country's plug-in hybrids are ever actually plugged in. Widespread adoption of NEVs may also depend on what interface standard the Chinese government decides to adopt for public fast-charging stations. Whether the Chinese government decides to adopt one of the global standards or one that could benefit local automakers will have significant consequences for the industry.

A new and interesting area of development in China is the so-called "Internet of Vehicles." According to a new report by the Mercator Institute for China Studies, the Chinese government is heavily promoting new aspects of vehicle connectivity, between the driver and the vehicle as well as vehicles and transportation systems, the Internet, mobile networks, and satellites.[25] The government believes the Internet of Vehicles may offer domestic firms a chance to be leaders in a new industry and at the same time reduce China's reliance on foreign technology. Most of China's leading automakers have announced investments in Internet-enabled cars.

Many Chinese companies across different industries have become actively involved, including domestic tech giants like Baidu, Alibaba and Tencent. Baidu has even announced that it will start testing its autonomous cars in the U.S., with the target of introducing a commercially viable model by 2018.[26] Baidu's chief scientist is Andrew Ng, an artificial intelligence scientist and professor at Stanford University who has previously worked at Google. Hired by Baidu in 2014, Mr. Ng leads a team of 160 people in the Silicon Valley, the majority of whom are working on the driverless car project. In 2015, Alibaba and SAIC announced a $160 million JV to develop Internet-connected cars. Tencent and Taiwan's Foxconn have also announced a coalition to explore opportunities in smart electric vehicles.

While the Mercator report suggests these developments could lead to "the end of the road for international car makers in China," it is important to recall that some of the Chinese

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[23] Pictures of Kandi models can be found on its website: http://en.kandivehicle.com .
[24] Mark Rogowsky, "Kandi Crush: An Electric-Car Sharing Vending Machine From China Could upend the auto industry," *Forbes.com*, Dec. 28, 2013. http://www.forbes.com/sites/markrogowsky/2013/12/28/kandi-crush-an-electric-car-vending-machine-from-china-could-upend-the-auto-industry/#435ffc0f3cc3 .
[25] Mirjam Meissner and Jost Wübbeke, "End of the road for international car makers in China?
How digitisation will reshape the automobile market," MERICS China Monitor No.31, Apr 19, 2016,
http://www.merics.org/en/merics-analysis/analyseschina-monitor/end-of-the-road-for-international-car-makers-in-china.html .
[26] Mike Ramsey, "Baidu to test autonomous cars in the U.S.," *The Wall Street Journal*, Mar 16, 2016,
http://www.wsj.com/articles/baidu-to-test-drive-autonomous-cars-in-the-u-s-1458160570 .

government's past efforts to corner new technologies and shut out foreign companies, such as in mobile telephony, have not been successful. The government threw its weight behind TD-SCDMA, a 3G mobile standard, which as been a very costly commercial failure.[27] The most effective way for Chinese leaders to promote the blossoming field of vehicle connectivity would be to focus on setting national safety standards and transportation-related regulations while letting the market decide which technologies and services are best suited to consumer needs. Too much government intervention and favoritism toward SOEs could ruin the potential of the more innovative and Internet-savvy technology companies in the private sector.

On the whole, the 13th FYP is unlikely to have a significant impact on the auto sector. Despite the government's call for innovation and development of indigenous brands, progress on these fronts will be difficult for all the reasons discussed in the previous section of this testimony. The one area that may see some growth is in the adoption of low-cost electric vehicles by local governments. New business models like the Kandi car share which take advantage of China's low-cost production and local government incentives, as well as help solve real problems like traffic congestion and pollution, may have a future in other emerging markets. The Internet of Vehicles is in its nascent stages and it is far from clear which firms will emerge as leaders.

III. Impact of China's Growing Auto Industry on the American Auto Industry

American automakers GM and Ford Motors are doing very well in China. The 13th FYP is unlikely to change their sales prospects going forward. The broader impact of Chinese auto market growth on the U.S. domestic auto industry, however, is more complicated. This section discusses the history of American automakers in China, the changing patterns of automotive trade between the U.S. and China, and the way in which China's expanding auto market has contributed to the divergence of interests between American automakers, parts suppliers, and autoworkers. One of the key takeaways is that while the U.S. market is unlikely to be inundated with cars produced in China, it is already being flooded with parts imported from China.

Overview of American Automakers and Their Operations in China

In 1997, GM formed a JV with SAIC (Shanghai GM), committing $1.5 billion to the new venture, which at the time was the largest single JV investment by a foreign firm. Shanghai Volkswagen laid the groundwork for Shanghai's emergence as a major automotive manufacturing hub, which greatly benefited GM when it entered China years later. Although Shanghai GM entered the market more than a decade after Shanghai VW, it has become Volkswagen's biggest competitor in China. For several years now, GM has been the market leader in China, accounting for roughly one-third of its sales worldwide.

There are more Buicks sold in China than anywhere else in the world, including in the United States. In 2015, the company sold 223,000 Buicks in the U.S. compared with 1 million units in China.[28] Its product line aims covers a wide price range, ranging from the $5,000 Wuling

[27] Qin Min, "China Mobile's Deadend on the 3G highway," *Caixin Online*, Dec 15, 2014, http://english.caixin.com/2014-12-15/100762382.html .
[28] Greg Gardner, "Buick shows photos of Chinese-made Envision SUV for U.S.," USA Today, Jan 10, 2016, http://www.usatoday.com/story/money/cars/2016/01/10/buick-shows-photos-chinese-made-envision-suv-us/78587970/ .

Sunshine, a barebones minivan wildly popular in rural areas, and luxurious Cadillacs that sell for well over $100,000. Most of the GM cars sold in China are produced in China, with a few imports from the U.S. Shanghai GM has plants all over China, and recently opened a $1.2 billion Cadillac plant, which will lower the cost of Cadillacs in China and increase sales. The company plans to roll out 13 new vehicles in China in 2016, and before the end of the decade plans a total of 60 new and refreshed models in the country.[29]

Shanghai GM has succeeded in part because of GM's willingness to contribute capital and share technology with SAIC. As part of their JV agreement, GM invested in a joint research and development center called Pan-Asia Technical Automotive Center (PATAC). The team at PATAC, composed of mostly local engineering talent and a few expatriates, has been responsible for designing new Buick, Chevrolet, and Cadillac models for the Chinese market and other regional markets. In 2009, just after it went through bankruptcy proceedings, GM agreed to sell 1 percent of the JV to SAIC for $84 million, giving its Chinese partner majority ownership (51%) in the JV and theoretically the ability to make all decisions for the venture independently.

Although such an arrangement would appear to make GM's China operations vulnerable, the relationship is still considered one of the most congenial in the industry. One Shanghai-based GM executive said of the venture, "This is more than a partnership; it's a marriage. A partnership maybe expires at some point, but a marriage is for life…We are truly committed and we think SAIC is as well."[30] General Motors has perhaps made a lot of concessions because China has become its primary market. Steven J. Girsky, now a member of GM's board of directions, said back in 2010 that "China's a big piece of the value of the company…And since we pull cash out of China, it helps fund investments in other parts of the company as well."[31]

At this point, GM does not appear concerned that SAIC will become a major competitor. As mentioned earlier, most of the cars built at SAIC factories carry the logos of GM brands while its own brands have done very poorly. This would explain why GM continues to oblige the Chinese government when it pressures GM to share technology and intellectual property with SAIC. GM's calculus is unlikely to change as long as SAIC's profitability hinges on the success of GM brands in China and its business model remains unchanged.

In contrast to its Detroit rival, Ford Motors was late to the Chinese market. In 2001, Ford formed its first 50-50 JV in China with Chang'an Motors in Chongqing, a city located in China's interior. In 2006, Japan's Mazda purchased a 15 percent stake in the JV, a partnership which lasted until 2012, when the American and Japanese companies decided to part ways. Today, each company has a separate JV with Chang'an Motors. Although it has taken nearly a decade for Ford's operations in China to take root, the company's China sales started to take off after it split from Mazda.

From 2012-2014, the Ford Focus was the best-selling car in China in any segment (391,781 units in 2014). The accumulated sales of the Focus in China has exceeded 2 million units.[32] In 2015,

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[29] ibid.
[30] Qtd in Anderson (2012), p.120.
[31] David Barboza and Nick Bunkley, "GM, Eclipsed at Home, Soars to Top in China," *The New York Times,* Jul 21, 2010, http://www.nytimes.com/2010/07/22/business/global/22auto.html.
[32] Ford Online, "Changan Ford Focus is Number One in Sales for the Third Consecutive Year," Jan 22, 2015,

the company's China sales exceeded 1 million units. Ford has announced that it plans to continue expanding capacity and sales channels in China, particularly for its Lincoln premium brand. The 806,000 cars produced by Chang'an Ford in 2015 accounted for more than 30% of Chang'an Motors total production and an even larger share of its profits. For this reason, Chang'an Motors is likely to defend Ford's interests in China.

Chrysler, now owned and operated by Fiat Chrysler Holdings in the United Kingdom, has been the slowest of the Big Three to gain traction in China. Just last year, Fiat Chrysler started production of Jeep Renegades with is JV partner Guangzhou Automobile Corporation. By 2018, the JV hopes to sell 850,000 units, compared with the 130,000 units it sold in 2013. Fiat Chrysler also hopes to export more models to China in the next few years, including the Wrangler, the Grand Cherokee, the Grand Wagoneer, the Town & Country, and the Grand Voyager.[33] These models have probably been selected because the SUV and minivan market are growing rapidly in China; however, Fiat Chrysler will have to invest heavily in marketing their brands to an increasingly demanding and savvy consumer base.

Although the 13th FYP emphasizes the NEV market, the Chinese government may still decide to boost sales of gasoline-powered vehicles if economic growth remains sluggish. During the recent global financial crisis, for example, the government offered a variety of incentives in the 2009 Auto Industry Adjustment and Stimulus Plan, including tax and subsidy measures to stimulate auto sales. Such measures were effective in increasing annual sales volumes in 2009 and 2010. If such measures were adopted during the 13th FYP, GM and Ford's JVs in China could see their sales grow further.

Tesla Motors has been the latest American automaker to enter the Chinese market. Although Tesla Model S exports have been modest (less than 5,000 units) because of their high sticker price, the company is in discussions with the Chinese officials about producing its $76,000 and up vehicles cars in China. Tesla CEO Elon Musk has said that local production could cut sales prices by one-third.[34] Tesla will need to find a local partner because the Chinese government still prohibits wholly-foreign owned operations in vehicle assembly. It will be interesting to see which of China's firms will be selected by Chinese officials to work with America's leading all-electric car producer. Until it can get its costs way down, Tesla is unlikely to gain a foothold in China.

Shifting Patterns of U.S.-China Automotive Trade

The growing popularity of American brands in China has actually led to growing exports of American-made cars to China. U.S. vehicle exports to China have grown from 25,065 units ($636 million) in 2009 to 307,425 units ($9.7 billion) in 2015.[35] This trade surplus in assembled

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http://www.at.ford.com/news/cn/Pages/Changan%20Ford%20Focus%20is%20Number%20One%20in%20Sales%20for%20the%20Third%20Consecutive%20Year.aspx .

[33] Charles Child, "Fiat Chrysler targets 850,000 vehicle sales in China in 2018," Automotive News, May 6, 2014, http://www.autonews.com/article/20140506/GLOBAL/140509863/fiat-chrysler-targets-850000-vehicle-sales-in-china-in-2018 .

[34] Rose Yu, "Tesla Aims to Build Its Electric Cars in China," *The Wall Street Journal*, Oct 23, 2015, http://www.wsj.com/articles/tesla-plans-to-produce-electric-vehicles-in-china-within-two-years-1445602222 .

[35] U.S. Department of Commerce Office of Transportation and Machinery, "Trends in U.S. Vehicle Exports," August 2015, http://trade.gov/mas/manufacturing/OAAI/build/groups/public/@tg_oaai/documents/webcontent/tg_oaai_004086.pdf .

vehicles was an unusual bright spot as the overall merchandise trade deficit with China ballooned to new high of $365.7 billion last year.

Meanwhile, vehicle imports from China have only begun in earnest in 2015. In addition to Volvo, GM has also started importing small numbers of its Chinese-made Buick Envision SUV, which infuriated the United Auto Workers who objected to the decision. Data analysis firm, IHS Automotive, forecasts that the Buick range will shift to seeing about 65 percent of its U.S. sales imported from China, South Korea and Europe.[36] This is largely because China is the largest market for Buicks while the brand's market share in the U.S. is shrinking. In contrast, Chevrolet sales in the U.S. are likely to stay strong enough to support domestic manufacturing.

Although the trend of importing Chinese-made cars to the U.S. will increase in the future, IHS Automotive predicts that Chinese-produced vehicles will comprise at most 1% of sales in the U.S. by 2021.[37] And most of these imports will probably come from the JV operations of American automakers rather than from China's independent automakers. Geely's Volvo models are currently an exception, but then again Volvo has a long-established reputation in the U.S. Not only are the majority of Chinese firms unfamiliar with American consumer preferences, they have also discovered that their low-cost cars face significant and costly hurdles as they strive to pass American crash test standards and comply with stringent safety regulations.

In order to succeed in the U.S., Chinese automakers would have to commit to designing models specifically for the American market rather than exporting excess capacity from their Chinese factories. Chinese vehicle exports as a whole are very modest, totaling 728,200 units in 2015, down 20% from the previous year. Meanwhile, China imported 991,200 units.[38] Future export growth from China will likely be to other emerging markets where vehicle safety standards are similar to those in China and consumers are price-sensitive.

Growing U.S.-China Trade Deficit in Auto Parts and Impact on American Jobs

Beginning in the late 1990s, American and other international parts suppliers opened manufacturing operations in China in order to better serve the international automakers like Ford and GM and their JV operations in China. Unlike in vehicle assembly, the Chinese government did not force auto parts suppliers to participate in JVs to enter the Chinese market. Without the cumbersome bureaucratic hurdles associated with establishing a JV, parts suppliers were able to get their factories up and running more quickly. Once established in China, parts suppliers then began using their expanding capacity in China to supply parts to assembly plants worldwide and in the aftermarket. Michigan-based Visteon, for example, has 23 manufacturing, technical and customer centers in China and its Asia-Pacific regional headquarters located in Shanghai. This trend in offshoring has coincided with ever increasing imports to the U.S. of Chinese-made auto parts.

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[36] Stephanie Brinley, "Why U.S. Imports Of Chinese-Made Buicks Will Be The Exception, Not The Rule," *Forbes.com*, Dec 15, 2016, http://www.forbes.com/sites/stephaniebrinley/2015/12/07/why-chinese-made-buicks-are-the-exception-not-the-rule/#4118e8ec4c0f .
[37] ibid.
[38] Chinese Association of Automotive Manufacturers, "The auto imports and exports yearly down," Jan 20, 2016, http://www.caam.org.cn/AutomotivesStatistics/20160120/1305184262.html .

Auto parts imports from China have grown from $7.2 billion in 2009 to $18.0 billion in 2014. China now accounts for about 13% of auto parts imports, second only to Mexico, which accounts for 34% of imports ($46.6 billion in 2014). In contrast, auto parts exports to China in 2014 totaled only $2.5 billion in 2014.[39] The growth of parts imports has left the U.S. with a growing deficit with the world in overall trade in cars and parts.

Thus, even though American vehicle sales hit an all-time record of 17,470,659 units in 2015, these vehicles are increasingly built with auto parts produced abroad. This trend has been detrimental to American manufacturing jobs in the sector. According to a recent Wall Street Journal article, "In 2014, employment at car-parts makers averaged about 537,000, down 36% from 2000. At manufacturers of completed vehicles, employment fell 32% over that period, despite the recent boom in output—a decline due in part to productivity improvements including automation."[40]

While imports of Chinese-made auto parts is contributing to this downward trend in auto-related employment, it is important to note that the majority of outsourcing in both assembly and parts manufacturing has been to Canada and Mexico – a result of the North American Free Trade Agreement of the 1990s. According to a prediction made in *Knowledge@Wharton*, the online business school journal of Wharton Business School, "by 2020, almost 25% of all North American vehicle production will take place in Mexico, compared with only 10% in Canada and 65% in the United States."[41]

IV. Recommendations for Congressional Action

Unfortunately, the interests of automakers and autoworkers are not always aligned. As American automakers and parts suppliers look to increase productivity and quality while controlling costs, they are increasingly turning to automation and offshoring. Neither trend bodes well for manufacturing jobs in the U.S. This section offers several policy recommendations for Congressional action to support the interests of American automakers, parts suppliers, and autoworkers.

Support for American Firms Operating in China

Congress should continue to monitor and support the export of U.S.-produced vehicles and auto parts to China by making sure that the Chinese government does not enact unfair trade barriers that violate World Trade Organization (WTO) rules. Back in 2008, the WTO determined that China's regulations on auto parts were inconsistent with its WTO obligations.[42] In 2014, the WTO once again sided with the U.S. in a dispute against China over duties on imported

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[39] U.S. Department of Commerce, Bureau of the Census, Foreign Trade Division, http://trade.gov/mas/manufacturing/OAAI/build/groups/public/@tg_oaai/documents/webcontent/tg_oaai_004047.pdf .

[40] James Hagerty and Jeff Bennett, "U.S. car-making boom? Not for auto industry workers," Wall Street Journal, Mar 23, 2015, http://www.wsj.com/articles/u-s-car-making-boom-not-for-workers-1427154627 .

[41] Knowledge@Wharton, "NAFTA, 20 Years Later: Do the Benefits Outweigh the Costs?", Feb 19, 2014, http://knowledge.wharton.upenn.edu/article/nafta-20-years-later-benefits-outweigh-costs/# .

[42] This was the first time that the WTO found a Chinese measure to be inconsistent with WTO rules. According to the U.S. Trade Representative, China repealed the measures in 2009. More information about the WTO dispute can be found in the Congressional Research Service's 2013 Report entitled "U.S.-Chinese Motor Vehicle Trade: Overview and Issues," R43071, https://www.fas.org/sgp/crs/row/R43071.pdf .

American vehicles. While these types of battles have yielded few if any tangible benefits for American companies and workers, they do keep the pressure on the Chinese government to stay WTO-compliant.

Support for the Development and Deployment of New Automotive Technologies in the U.S.

Congress should work with the next administration on legislation that raises fuel and emissions standards for cars sold in the U.S. Pushing for higher standards would not only reduce carbon emissions and other air pollutants, but have the potential to improve the competitiveness of American cars abroad. Such cars will be welcome in many markets where governments and consumers are concerned about pollution and climate change.

Congress should increase support the development, production, and adoption of plug-in all-EVs in the United States. Government support could take the form of R&D tax credits for the development of electric cars (particularly in the area of batteries), incentives for the building out of fast-charging infrastructure across the U.S., and purchase rebates and tax breaks for American consumers of EVs. With a strong base in the U.S., American automakers that produce EVs and their suppliers could become the leaders in this growing segment of the global auto market. In 2015, China with extensive government support surpassed the U.S. as the largest market for EVs with vehicles largely produced domestically.

Congress should consider working with the next administration to set national safety standards for fully autonomous (driverless) vehicles, which are likely to become a major segment of market in the coming decade. While GM and Ford are working on semi-autonomous technologies, American technology firm Google want to transform the automotive industry by making car ownership obsolete by enabling a convenient smart phone-enabled mobility service that can pick and drop off customers on demand. There is room for cooperation between American carmakers and tech firms. After all, Google has no expertise in car production. Widespread adoption of driverless car platforms will require close partnership and coordination between firms in this space and the government to establish the national safety and transportation standards required to put such cars on the road. The U.S. cannot afford to let China become the leader in electric cars or vehicle connectivity.

Support for Displaced American Autoworkers

Rather than stemming the import of auto parts to address unemployment, Congress should instead focus its efforts funding educational opportunities and new skills training for unemployed autoworkers. In the long run, these people cannot afford to wait until elusive auto manufacturing jobs – which are likely to be poorly paid – come back to the United States. They are better off going back to school now to learn new skills that can be transferred to new trades and services that reflect the America’s increasingly knowledge-based economy.

We simply cannot afford to leave behind the great numbers of Americans (roughly 70%) who do not have bachelor’s degrees but cannot afford the rising cost of tertiary education. According to the National Center for Education Statistics, young adults with a bachelor's degree earn more than twice as much as those without a high school diploma or its equivalent and 62 percent more

than young adult high school completers.[43]

[43] National Center for Education Statistics website, Fast Facts: Back to School Statistics, http://nces.ed.gov/fastfacts/display.asp?id=372.

OPENING STATEMENT OF DR. CHAD J.R. OHLANDT
AEROSPACE ENGINEER, RAND CORPORATION

DR. OHLANDT: Thank you, Chairman Shea and Commissioner Goodwin, for the opportunity to testify today on China's aerospace industrial policies.

The government policy of the People's Republic of China directly strives to create aerospace national champions that not only support their domestic market but are also globally competitive. Given that in 2015, the United States exported more than $125 billion of aerospace products, resulting in a trade surplus of $66 billion from the U.S. aerospace manufacturing sector, the creation of a strong Chinese global competitor has the potential to affect the U.S. economy and employment.

Aerospace technology plays a critical role in defense and national security. And the success of PRC government policy would have national security implications as well.

China's recent 13th Five-Year Plan on National Economic and Social Development identifies aerospace as a core technology for whole-of-government support and development as well as a sector for promoting international cooperation in manufacturing.

It specifically refers to a new generation of aviation equipment and world-class aviation hubs. None of this is new. Aerospace has long been identified as such in the PRC's high-level five-year plans. Existing lower level Chinese government policies are far more specific about developing globally competitive commercial aviation and space industries.

Nonetheless, while the PRC has steadily improved its aerospace technology base, the effort has not yet resulted in globally competitive products or major companies, and to date has had limited impact on the U.S. aerospace sector.

So beyond those facts, there are a couple of takeaways that I want to highlight from my more detailed written testimony. First, global aerospace markets are different than typical export markets. Commercial aviation manufacturing trends towards a duopoly in each class of commercial aircraft due to the demands from airlines for the safest and most cost efficient aircraft in the context of an annual production rate of a few hundred aircraft per year.

This creates a challenges for the PRC's aviation industrial policies. But it also means that if they were to succeed, it would have much greater significance on the global aviation market. Second, while China has a significant defense aviation industry and is projected to be 15 to 20 percent of future global demand for commercial aircraft and has invested in significant effort in developing a commercial aircraft manufacturer, they have a long way to go before they will be competitive in the commercial aviation market.

After over 15 years of development, the ARJ21 regional jet has just begun deliveries, and the C919 single-aisle large commercial aircraft has yet to see first flight. COMAC, the commercial aircraft company of China, has yet to demonstrate a proven record for safety or operational cost efficiency in its products.

Nonetheless, to limit the resulting market distortions from these policies, U.S. policymakers should do the following, and there's three points here:

One is engage foreign nations, particularly the European Union and its members, on aerospace industrial policy norms toward establishing a common understanding which implicitly does not exist clearly at this point.

Number two, work towards improving the transparency of Chinese aviation actors, and there's a number of subpoints to that. One is having Chinese state-owned airlines provide more clarity on their aircraft purchase plans. Number two, implementing more

intellectual--or the second part of the second part--implementing more intellectual property safeguards in the context of safety certifications by organizations such as the FAA and increasing voluntary reporting by U.S. suppliers that have China-based operations on how their investment decisions have been influenced by PRC industrial policy.

And then the third overarching recommendation is to continue to monitor PRC aerospace industrial policy and work through bilateral and World Trade Organization forums to eliminate, in general, industry-specific policies, but in particular to prevent these industrial policies from supporting the entry of the C919 or future COMAC aircraft into foreign markets.

Thank you.

PREPARED STATEMENT OF DR. CHAD J.R. OHLANDT
AEROSPACE ENGINEER, RAND CORPORATION

Implications of China's Aerospace Industrial Policies

Testimony of Chad J. R. Ohlandt[1] The RAND Corporation[2]

Before the U.S.-China Economic and Security Review

Commission April 27, 2016

Thank you, Chairman Shea and Vice-Chairman Bartholomew, for the opportunity to testify today on China's aerospace industrial polices. The government policy of the People's Republic of China (PRC) directly strives to create aerospace national champions that not only support their domestic market but are also globally competitive. Given that, in 2015, the United States exported more than $125 billion of aerospace products, resulting in a trade surplus of $66 billion from the U.S. aerospace manufacturing sector,[3] the creation of a strong Chinese global competitor has the potential to affect the U.S. economy and employment. Aerospace technology plays a critical role in defense and national security, and the success of PRC government policy would have national security implications as well.

The PRC's recent 13th Five-Year Plan (2016–2020) on National Economic and Social Development identifies aerospace as a core technology for whole-of-government support and development, as well as a sector for promoting international cooperation in manufacturing. It specifically refers to a new generation of aviation equipment and world-class aviation hubs. None of this is new; aerospace has long been identified as such in the PRC's high-level five-year plans. Existing lower-level PRC government policies are more specific about developing globally competitive commercial aviation and space industries. Nonetheless, while the PRC has steadily improved its aerospace technology base, the effort has not yet resulted in any globally competitive products or major companies and has had limited impact on the U.S. aerospace sector.

The rest of this testimony provides market context to understand the impact of the PRC's aviation policies, background on those policies, and suggestions for U.S. policy options. These

[1] The opinions and conclusions expressed in this testimony are the author's alone and should not be interpreted as representing those of the RAND Corporation or any of the sponsors of its research.
[2] The RAND Corporation is a research organization that develops solutions to public policy challenges to help make communities throughout the world safer and more secure, healthier and more prosperous. RAND is nonprofit, nonpartisan, and committed to the public interest.
[3] Aerospace Industries Association, "U.S. Aerospace Trade Balance," 2015. As of April 20, 2016: http://www.aia-aerospace.org/assets/Series_08_-_Balance.pdf

comments are based on two RAND publications, *Ready for Takeoff: China's Advancing Aerospace Industry* and *The Effectiveness of China's Industrial Policies in Commercial Aviation Manufacturing*, available on the RAND website.[4]

Commercial and General Aviation Manufacturing

Aerospace broadly includes both aviation and space industries. Those two categories can be further divided into manufacturing and services (e.g. airlines, satellite communications.) PRC aerospace industrial policy is more likely to affect U.S. commercial and general aviation manufacturing than other components of the aerospace sector. Although there is a vibrant global private space sector, the satellite and space launch industry remains dominated by government defense and civilian scientific funding. Regardless of the success of PRC industrial policy, it is unlikely that the PRC will capture significant space-related revenues from foreign governments. The airline transportation industry requires government permission to fly in sovereign airspace, and the government allocates landing slots. This generally results in reciprocal treatment between countries; approved international routes between China and another nation will have roughly the same passenger capacity available to airlines based in each, and industrial policy impact will be greater on the domestic market. Given the very significant roles of government in those aerospace sectors, PRC industrial policy alone is unlikely to have a major impact on space industries or airlines. In contrast, the manufacturing of aviation vehicles is a highly competitive global market that could be affected by PRC industrial policy.

Commercial aviation refers to all scheduled passenger airlines, while general aviation is everything else. From an economic perspective, commercial aviation is far more significant. Commercial aviation manufacturing is further divided into two segments, large commercial aircraft (LCA) and regional jets. LCA includes narrow-body and wide-body aircraft, or single- aisle and multi-aisle aircraft, respectively. Two commercial companies, Boeing and Airbus, currently dominate LCA manufacturing. Similarly, the regional jet market is primarily split between two competitors, Bombardier and Embraer. Other regional jet manufacturers exist, but they have historically produced less than 10 percent of the aircraft that the two leading manufacturers have. Boeing and Airbus currently each produce more than 600 aircraft per year, while Bombardier and Embraer each produce 50–100 aircraft annually.

The large investment required to design an LCA and the years necessary to develop global supply chains and sustainment partners are significant barriers to entry. Airlines also prefer the cost-efficiency of operating the minimum number of aircraft models (e.g., the Southwest Airlines model of operating only Boeing 737s.) Lastly, the LCA production rate is relatively low in comparison to, say, automotive or semiconductor manufacturing, suggesting that even moderately greater production rates lead to significant efficiency advantages. All of these

[4] Roger Cliff, Chad J. R. Ohlandt, and David Yang, *Ready for Takeoff: China's Advancing Aerospace Industry*, Santa Monica, Calif.: RAND Corporation, MG-1100-UCESRC, 2011 (www.rand.org/t/mg1100); and Keith Crane, Jill E. Luoto, Scott Warren Harold, David Yang, Samuel K. Berkowitz, and Xiao Wang, *The Effectiveness of China's Industrial Policies in Commercial Aviation Manufacturing*, Santa Monica, Calif.: RAND Corporation, RR- 245, 2014 (www.rand.org/t/rr245).

factors in combination drive the aircraft manufacturing market toward a duopoly structure. Although there are other regional jet producers and a half-dozen business jet manufacturers worldwide, they are unable to capture enough market share to achieve significant scales of efficiency to be competitive with the market leaders; thus, they remain niche providers of aircraft to those who do not operate large aircraft fleets. Those efficiencies include manufacturing advantages and technology development. Boeing and Airbus maintain manufacturing and technological leads over the regional jet leaders, who in turn have similar advantages over business jet manufacturers. In both cases, those advantages create barriers to entry for potential competitors. Realistically, significant disruption in the existing commercial aircraft business is likely only if those leaders fail to maintain their advantages and create an opportunity for competitors.

The nature of aviation manufacturing supply chains is more varied and complex. Subsystems and components of commercial aircraft can sometimes be produced by a large variety of industrial companies, such as with interior fittings, or by only one or two companies, such as with jet engines, depending on the complexity involved.

China and Commercial Aviation

Boeing and Airbus both annually produce 20-year market outlooks for commercial aircraft. While the outlooks are understandably optimistic, they are reasonable projections of the market based on straight-line projections of current trends. In 2015, Boeing projects an average total demand of 1,900 commercial aircraft of all sizes annually over the next 20 years, roughly 23 percent more than the combined current production rate of 1,542 in 2015.[5] Of that total demand, 38 percent is projected to come from Asia, including 17 percent from China alone. Boeing projects that China would purchase more than 300 commercial aircraft annually over the next 20 years on average, which would triple the size of the fleet in China. Airbus projections are slightly less optimistic but similar.

China has a significant aviation manufacturing industry that produces military aircraft for the People's Liberation Army (PLA), but it has limited experience with commercial aircraft. In order to advance the Chinese aviation manufacturing industry according to five-year plans, the PRC historically has promoted joint ventures with Western companies and encouraged domestic assembly of aircraft. Both Airbus and Embraer perform final assembly of some jets in China today. While China's aviation manufacturing industry has advanced and matured, these joint ventures have had limited success. One possible reason is that the Chinese economic advantage of cheap labor has limited utility, because aviation manufacturing requires highly skilled labor.

In 2008, the PRC established a "national champion," the Commercial Aircraft Corporation of China (COMAC), for the purpose of designing and producing commercial aircraft. COMAC is in the process of developing and launching a regional jet, the ARJ21, and a single-aisle LCA,

[5] Boeing, *Current Market Outlook 2015–2034*, 2015. As of April 20, 2015: http://www.boeing.com/resources/boeingdotcom/commercial/about-our-market/assets/downloads/Boeing_Current_Market_Outlook_2015.pdf

the C919. COMAC is funded by loans from state-owned banks, and state-owned airlines have been compelled to order these aircraft. Foreign suppliers to the C919 must enter into joint ventures in order to participate.

However, both aircraft programs are years behind schedule. The first ARJ21 regional jet was just delivered in 2016, after more than 15 years of development. It lacks both U.S. Federal Aviation Administration (FAA) and European Aviation Safety Agency (EASA) certification, although approved by Chinese authorities in 2014. Recent comments on the C919 suggest first flight in 2017, with possible deliveries the following year[6]; it is hard to know how realistic those dates are. There are more than 300 orders for the ARJ21 and more than 500 for the C919, but those orders are not contractually binding, leaving firm demand unclear. The orders are primarily from PRC airlines and aircraft leasing companies.

One important uncertainty about the future success of these new systems is that neither aircraft, nor COMAC, has any established history of operating costs or safety records. At best, the ARJ21 and C919 are comparable with aircraft already in production and being widely operated today. The cost of operating an aircraft over its lifetime is significantly more than the purchase cost. So, even if the COMAC aircraft are cheaper to produce or are subsidized, the likely greater operating costs can be a serious disincentive to prospective customers. Before the C919 sees first flight, let alone production, both Boeing and Airbus are likely to be delivering aircraft that are more cost-efficient than those used today. Without additional safety certifications, the aircraft cannot fly outside the domestic Chinese market. While the ARJ21 is now in production, Boeing projects that only 3 percent of the 300 commercial aircraft that China demands annually are regional jets, barely ten per year.

While the PRC protectionist industrial policies are designed to support PRC domestic demand for the ARJ21 and the C919, domestic routes are flown by domestic airlines, mostly state-owned companies, which will have to bear the expected greater operating costs. Domestic airlines will seek to minimize operating costs across their fleets. If the ARJ21 and C919 are expensive to operate, they will be used only when there is no alternative aircraft. When the aircraft are used, Chinese airlines will be less competitive, primarily with alternative domestic transportation, such as traditional and high-speed rail, which already have an advantage in China because of the high population density. For LCA, even if the C919 meets expectations and PRC industrial policies allow it to corner the Chinese domestic market, it would, at best, amount to 17 percent of the anticipated global market for commercial aircraft, not enough to deny Boeing and Airbus their competitive advantages on the global market. Nonetheless, COMAC can continue on this path as long as the PRC continues to subsidize COMAC through either bank loans or industrial policies.

Policy Options for the United States

While there is no immediate expectation that China will achieve its goal of being a viable global competitor in the commercial aviation market, U.S. policymakers can take several steps

[6] Siva Govindasamy, "China's Comac Aims for First C919 Flight by Early 2017," Reuters, February 23, 2016. As of April 20, 2015: http://www.reuters.com/article/us-coma-china-c-idUSKCN0VW110

to minimize the potentially distorting impacts of PRC industrial policies. Such steps include the following:

- Engage the European Union to establish a consensus on aerospace industrial policy norms. Although beyond the scope of this testimony, there are unresolved disagreements about government support to Boeing and Airbus. Without consensus, it is hard to hold China accountable to any standards.
- Work toward improving transparency of Chinese aerospace actors, by providing more clarity on aircraft purchases by Chinese state-owned airlines, implementing more intellectual property safeguards in the context of component certifications by the FAA or EASA, and increasing voluntary reporting by U.S. suppliers that have China-based operations on how investment decisions have been influenced by PRC industrial policy.
- Continue to monitor PRC aerospace industrial policy and work through bilateral and World Trade Organization forums to eliminate, in general, industry-specific policies and, in particular, to prevent these industrial policies from supporting the entry of the C919 or future COMAC aircraft into foreign markets.

Thank you for the opportunity to provide testimony today. I look forward to supporting the commission in its important work.

OPENING STATEMENT OF MR. JIMMY GOODRICH
VICE PRESIDENT, GLOBAL POLICY, SEMICONDUCTOR INDUSTRY ASSOCIATION

MR. GOODRICH: Thank you, Chairman Shea and Senator Goodwin, for the opportunity to be here on behalf of the semiconductor industry. Again, we're welcomed to talk about our industry and the challenges and opportunities that we see with China's 13th Five-Year Plan and the implications that has for semiconductors.

As you might be aware, I think it's pretty appropriate that we have autos, aviation and semiconductors, the top three manufactured exports in the U.S. It's relatively unknown that semiconductors are number three and the top manufactured electronic export out of the U.S.

A 335 billion global market. U.S. industry roughly has 54 percent of global sales. We're the leaders in technology, in particular, some of the semiconductor design space--that's the design but not the production--we have around 63 percent of the worldwide market. So the industry today is relatively strong, and we have a leading position in many areas of the technology.

The China market for us is extremely important. It's the single largest and the fastest growing market for--in devices like computers, laptops, even planes, automobiles that have imbedded semiconductor devices. In many different product categories that our devices are sold to, such as smartphones, laptops and PCs, Chinese demand oftentimes encompasses roughly a third of the worldwide market. So being able to sell in the China market and compete with Chinese semiconductor companies on a fair and level playing field is critical to the industry.

China also, as part of their 13th Five-Year Plan, has made the development of the ICT industry and demand for ICT-enabled goods, like semiconductors, to grow in their plan. They talk about cloud computing, the Internet of Things, automobiles and other, and so on, that all will rely on semiconductors and devices that U.S. semiconductor firms are going to be able to sell, and so the opportunities are tremendous.

At the same time, the Chinese 13th Five-Year Plan, and, in fact, they have an independent State Council national strategy for semiconductors, has also highlighted the need for China to develop its own semiconductor industry, including semiconductor design, device, production, fabrication, assembly/tests, and so on.

And, in fact, their national plan calls for China to become the worldwide leader in semiconductors by 2030. We've heard plans to be a leader in various different industries by China many, many times over and over, but, as I'll talk about in my remarks today, the plan that we see in semiconductors is far more comprehensive, organized, and well-funded than many other plans they have put together to date.

And for the U.S. semiconductor industry, what we see is China also, you know, for them to develop their industry, we welcome them to develop a semiconductors trade, but we want to see that it happens in a way that's fair, equal and based upon the global norms that we've seen other countries grow their industry as well, which is fair and open markets, protection of intellectual property, investment into R&D, talent and so on. We're unafraid to compete with any company in the world as long as the rules are the same and the playing field as fair.

And to go into a little bit more depth in terms of what the challenge could be in the long-term for the U.S. semiconductor industry is we've seen industrial plans in China in sectors like LED, wind, solar, where non-market-based investment that creates overcapacity can contribute volatility to markets and lead to the destruction and value of the economics of those

industries alone.

And at the end of the day, that's not beneficial for China where we've seen in some industries, for example, solar and wind, China did create a solar and wind industry, and LED industry, but it's not a fairly effective, efficient industry, and many of their own firms are struggling and seeking bailout support from the Chinese government.

So what we see forward for a path for China is for them to invest and grow their industry in a way that looks like the norms that we grew our industry, which is investment into R&D and commitment to open markets. More specifically, though, which might be benefit to the Commission today to learn about China's plans for the semiconductor industry, is, again, this is one of the most well-funded initiatives that we've seen. The 13th Five-Year Plan mentions briefly semiconductors, but stepping back a year-and-a-half, almost two years ago, the State Council released a national strategy for the promotion of the integrated circuits industry, the National IC Guidelines.

As part of the IC Guidelines, they also set up a national task force that's chaired by their Vice Chair Ma Kai, and the goal is to, again, by 2030, become an industry leader in all aspects of the semiconductor industry from design to production, to assembly and tests, to equipment and materials. Their goal is to have an end-to-end completely indigenous semiconductor ecosystem within their country.

Again, those plans have been made before in their 12th Five-Year Plan and their 11th Five-Year Plan, but the differentiator this time around for our industry is the massive government funding in equity that has been introduced into this industry. In 2014, China established a US$ 21 billion National Integrated Circuits Investment Corporation. This is a state owned and state run investment company that's investing into the domestic Chinese semiconductor industry.

At the local level, we've seen more than 11 semiconductor specific funds for a total of $25 billion. There's a new $11 billion semiconductor capital equipment fund and so on. The financing now is quite significant, at a level that we don't see in many other industries across this space.

And what are those funds doing? Well, they're enabling Chinese companies to invest, for example, the National IC Fund has made US$ 7 billion in equity share purchases of domestic semiconductor firms allowing them to expand capacity, hire talent, invest in R&D. The funds are also enabling Chinese companies to go abroad and acquire global semiconductor companies and intellectual property.

Since 2014, we've seen more than 30 individual cases of proposed or finalized semiconductor M&A deals by Chinese headquartered firms. Many of those were financed through the state-owned investment companies for a total of nearly $20 billion in finalized or proposed semiconductor M&A activity since 2014.

In addition to government supports in China, the research development by Chinese commercial semiconductor firms in the form of government grants. Now these are not, as we see in the U.S., pre-competitive academic-based research programs, rather R&D grants designed for commercial advantage, subsidizing commercial product development, not research.

Finally, we also see a number of challenges regarding the slew of broader policies that impact not just semiconductors but the whole ICT industry in general from China's secure and controllable cybersecurity policy, the National IC Guidelines talk about secure and controllable semiconductors, guiding the procurement of state-owned enterprises to support domestic demand, and securing reliable semiconductors policies that might induce or force the

transfer of intellectual property as a condition for market access, government procurement, indigenous standards and so on.

All those combined are sort of a broader toolbox, but for semiconductors specifically, we see again a very well funded national program that's already executing a number of investments, financing M&A activity, expanding capacity and local semiconductor producers.

All of this is certain to change the game for Chinese semiconductor companies in the long-term, but the way upon which many of this is non-market based and has the government deciding where these investments should be made, not the market, and so the risk for non-market overcapacity in the long term is certainly there, and we want to China to avoid the same fate that other industries have seen in flat panel displays, LED, and solar, because at the end of the day that's not good for our industry, it's not good for the other incumbents inside the global semiconductor industry, and it's not in the interests of China as well.

And so the way for the recommendations that we have for both U.S. government and governments worldwide, because again this is a global industry, and there are significant stakeholders in the industry in Japan, Taiwan, Korea, Europe and others, and so this needs to be a global conversation with global industry stakeholders regarding how the U.S. government and others can have a dialogue with China to encourage them to adopt global approaches, play in the global value chain, as opposed to building a self-contained industry that ultimately could be destructive for China and also harmful for the global industry as well.

So I'll close there and happy to answer questions on any of those specific details. Thank you.

PREPARED STATEMENT OF MR. JIMMY GOODRICH
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China's 13th Five-Year Plan Opportunities & Challenges

For the U.S. Semiconductor Industry

April 26, 2016

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1. Introduction

Semiconductors (sometimes referred to as integrated circuits, ICs, or chips) are the foundational enabling technology of modern electronics and play a key role in communications, computing, transportation, health care, energy, and many other sectors at the forefront of global technological innovation. Today's $334 billion semiconductor industry is truly global and interdependent, enabled by a complex global semiconductor value chain based upon a commitment to international collaboration, deep investments into R&D, free and open markets, the protection of intellectual property, talent development, and other complimentary policies.

Indeed, according to the World Semiconductor Trade Statistics (WSTS) organization, China is the fastest growing and single-largest market for finished semiconductors, totaling nearly 27% of global demand. Global companies must participate in China's vast market, and Chinese companies must participate in the vast global semiconductor supply chain, in order to succeed globally. Continuing access for U.S. semiconductor firms to the China market is vital to our overall competitiveness. The primary factor behind the size of China's electronics market should be of no surprise: China's burgeoning domestic demand for products bristling with semiconductor devices. For example, according to Gartner and IDC:

- China represents 20% of Global PC unit consumption
- China represents 29% of Global Smartphone unit consumption
- China represents 17% of Global Tablet unit consumption
- China represents 27% of Global Auto unit consumption
- China represents 23% of Global Telecom capital expenditures (equipment)

In addition, China is an integral part of and deeply embedded in the semiconductor and electronics industry global supply chain. In 2015 China exported nearly $600 billion in electronic goods that are powered by semiconductors, representing nearly a third of all Chinese exports. Many U.S. semiconductor firms have also invested in the China market, including semiconductor design, fabrication, and assembly/test. These investments have allowed the U.S. semiconductor industry to take full advantage of China's unique electronics industry supply chain, in particular the ability to foster closer partnerships ith the growing number of domestic Chinese original electronics manufacturers (OEMs.)

The recently released Chinese 13th Five Year Plan aims to capitalize on these market conditions, and further spurring domestic demand for ICT goods and services, and will present new opportunities for the U.S. semiconductor industry. For example, the 13th Five Year Plan includes
initiatives to promote the construction of 5G wireless networks, accelerating the adoption of internet and e-commerce platforms, expanding the use of big data and cloud computing, and promoting, the digitalization of traditional and manufacturing industries through the "Internet Plus" and "China Manufacturing 2025" initiative. U.S. semiconductor firms are poised to reap the benefits from all of these policies and programs.

China's most recently published 13th Five Year Plan also highlights the need for China to develop strategic emerging industries, including semiconductors. China has legitimate interests in developing its economy, including a domestic semiconductor industry, and their participation in the global semiconductor value chain is welcomed.

Recognizing the benefit of the semiconductor industry, the Chinese Government is implementing policies to develop a robust semiconductor capability with the goal of establishing a leadership position in all major segments of the semiconductor industry by 2030. No other Chinese industrial development program for the information technology (IT) sector is supported with the financial resources and central government attention given to the IC industry plan. This plan is backed by billions of dollars in investments and a range of policies covering intellectual property, cybersecurity, procurement, standards, antimonopoly, and others. To date, Chinese policies have called for aquiring resources from, not integrating into, the global semiconductor value chain.

However, industry experts have observed that some of China's policies and actions may depart from market-based principles and may discriminate against foreign multinational companies.The problematic impact of Chinese industrial policy in sectors -- such as high-speed rail, aviation, LED lighting, wind, and solar panels -- is well known. Non-market based industrial policy in the semiconductor sector has the same potential to distort the global market and impede innovation, to the detriment of both Chinese and global semiconductor companies. This negative impact can be avoided if China works with the global industry and other stakeholders to develop its industry in a manner that is market-driven, globally integrated, non-discriminatory, transparent, and consistent with international obligations.

2. The Importance of the Global Semiconductor Value Chain

The key to ensuring the success and growth of its industry is its further integration into the global semiconductor value chain. The global semiconductor industry operates in a vibrant global ecosystem that has helped facilitate the remarkable advancements in the industry in ways that distinguish it from virtually all other industries. Participation in this broader ecosystem is essential to the success of the industry as a whole and every individual firm within it. Indeed, no firm has ever thrived outside of it.

This ecosystem is an essential foundation for success in the semiconductor industry and encompasses the following:

- Pre-competitive, collaborative research and technology road-mapping to achieve advancements in basic science and overcome technology challenges facing the industry.
- The development of scientists and engineers with unique skills, through the funding of research programs.
- Cooperation to develop manufacturing improvements, including partnerships among device manufacturers, tool suppliers, and materials suppliers to develop new manufacturing processes and equipment, process chemicals, and other innovations.
- Integration of the global supply chain, including research labs, design centers, fabrication facilities, assembly and test facilities, and suppliers of specialized manufacturing equipment and materials around the world.
- Open, consensus-based international standards to promote interoperability, safety, and other aspects of product development and manufacturing.

These conclusions are consistent with the experience of Chinese Taipei, the European Union, Japan, South Korea, and the United States: integration into the global semiconductor ecosystem is essential for firm-level and country-level success. The scale, complexity, and pace of semiconductor industry innovation make global collaboration in this industry essential. The semiconductor industry has also recognized that protectionism is counterproductive to the competitiveness of the downstream industries (i.e. OEMs), which constitute our markets. For this reason, the semiconductor industry has strongly backed the expansion of the WTO Information Technology Agreement and immediate duty-free treatment for our own products.

3. China's New IC Industry Development Strategy

As the world's largest and fastest growing market for semiconductors, China has placed a sweeping initiative in motion to build its own homegrown industry. The Chinese leadership at the highest levels has made it a priority to develop and produce semiconductor technology.
While many countries engage in stimulating domestic industry and technology development, some of the policy tools employed by China are likely not based on market forces and the

model of global integration that has enabled the success of this vital industry in other parts of the world. China's strategy to promote its indigenous semiconductor industry includes: (1) semiconductor- specific policies, as outlined in the IC Promotion Guidelines; and (2) a broader range of incentive policies that are used in other sectors as well.

This effort is already underway through government funded and directed investment activity, specifically targeting companies and technologies at all levels of the semiconductor development and fabrication lifecycle. In addition, multiple Chinese government investments in "national champions" – each billions of dollars in scale – are being bolstered to rapidly expand domestic IC manufacturing capacity.

China's national IC policy structure is now in place to facilitate these goals, featuring three key pillars:

1. High-Level Government Task Force:
   China has established a leading small group (LSG) for IC development, led by Vice-Premier Ma Kai, with senior MIIT participation and other leaders included, to oversee industrial strategy and set development "targets." There is also a newly created experts group that includes industry representation, although foreign stakeholders have not been invited to join. The highest levels of Chinese leadership have made it a priority to develop, produce and control semiconductor technology.

   Ma Kai has stated: *"Our government places great importance on…promoting the program of replacing foreign technology with leading, secure, indigenous domestic products."*

   Chinese President Xi Jinping, who now chairs a special party committee on cybersecurity and said *"that for China to build a strong cyber country, [we] must have our own [Chinese] technology, and have technology that is up to scratch."*

2. National Strategy
   In June 2014, China released the Promotion of a National IC Industry Development Guidelines that call for the development of an entire semiconductor industry ecosystem within China, with the goal of becoming the global leader in all-major segments of the industry by 2030. These Guidelines are consistent with efforts underway in China to indigenize the broader ICT sector and establish "secure and controllable" technology. The Guidelines encourage the adoption of so-called "secure and reliable" technologies.

3. Massive Government Funding
   Key to China's IC Promotion Guidelines is the massive central and local Chinese government and/or state-directed investment funds designed to build or acquire a leading semiconductor industry. To date, $21 billion has been raised by the National IC Fund, and $26 billion has been raised by local government funds. The majority of investment capital comes from government and other quasi-government "societal" (i.e., chiefly SOE) funding. These funds are already active and have been used to finance

investment, merger, and acquisition activity, targeting companies and technologies at all levels of the semiconductor development and fabrication lifecycle.

For example, the national and local funds have supported overseas mergers and acquisitions (M&A) by domestic Chinese IC firms as a tool to rapidly gain access to key semiconductor technology and intellectual property (IP). Since 2014, there have been more than 34 cases of completed and or pending international M&A deals by Chinese headquartered firms in the semiconductor industry (many of which received government financing), for a total investment of more than $20 billion. These funds are also being used to invest in domestic firms, enabling the hiring of talent, development of new products, and expansion of domestic IC manufacturing capacity. The National IC Fund alone has invested more than $7 billion into domestic IC firms in the form of equity share purchases. The Chinese government reportedly intends to have "the visible hand of government join with the invisible hand of the market."

i. State-Controlled Procurement Orders

The IC Promotion Guidelines explicitly seek to leverage government control over key economic sectors to create demand for its local semiconductor industry. The IC Promotion Guidelines call for public and SOE procurement decisions in sectors such as telecommunications and internet service providers (major consumers of ICs) to be "based on projects aimed at expanding domestic demand" and "based on secure and reliable" software and hardware products -- similar to the "secure and controllable" standard China has sought to adopt in relation to ICT products used in the financial, insurance, and telecoms sector.

ii. R&D Grants

The IC Promotion Guidelines complement existing Chinese government applied semiconductor research and development (R&D) programs. These include "national megaprojects" that fund product development undertaken by Chinese semiconductor companies and special grants from government agencies that allow Chinese semiconductor firms to fund and operate their R&D programs with direct government support through a "national enterprise technology center program." Chinese R&D is oriented toward applied rather than basic technology, designed to achieve commercial advantage.

B. Broader Indigenous Innovation Policies Affecting the Semiconductor Sector

China is supplementing these IC specific policies with a series of complementary policies that are applied across the ICT sector. These policies are part of a comprehensive strategy to develop industries deemed "strategic." Some of these policies may either by design or accident impose market restrictions on foreign companies, potentially forcing them to transfer technology and intellectual property as a condition to access the Chinese market and/or to qualify foreign products as indigenous – all of which generally distort the commercial marketplace. These additional policies affecting the semiconductor sector include:

i. *Mandating or Inducing Technology Localization*
ii. *Technology Transfer*
iii. *China-Unique Standards*
iv. *Limits on Encryption*
v. *Security Testing and Licensing*
vi. *Cybersecurity Trade Barriers*
vii. *Potential patent pooling*

4. Implications and Recommendations for the U.S. and China

Again, access to the China market is critically important to the success of the U.S. semiconductor industry. China's commitment to further economic development, innovation, and liberalization will continue to provide tremendous market opportunities for U.S. semiconductor firms as demand for semiconductor products continues to grow. Done appropriately, China's support for the semiconductor industry is a welcome development, and will aid China in their economic and social transition.

Yet, some aspects of China's semiconductor industrial policy may potentially create new challenges for the U.S. semiconductor industry. Some of these policies have the potential to: (1) force the creation of market demand for China's indigenous semiconductor products; (2) gradually restrict or block market access for foreign semiconductor products as competing domestic products emerge; (3) force the transfer of technology; and (4) grow non-market based domestic capacity, thereby disrupting the fabric of the global semiconductor value chain.

Proactively promoting the alignment of China's efforts in the semiconductor space in a way that embraces, not separates from global semiconductor value chain should be viewed as a top priority for all market-oriented firms in the ICT sector and their governments. China must ensure the protection of intellectual property, proper market access, maintain the vibrancy of the global value chain, and avoid non-market based distortions to the semiconductor industry. In order to achieve this, governments and industries should work with China's leadership to ensure market-based principles consistent with China's international obligations are applied, and that cooperation within the global value chain is embraced.

PANEL II QUESTION AND ANSWER

COMMISSIONER WESSEL: Thank you, all, for being here, and thank the Chair and Vice Chair for having this panel because of the economic importance of these three sectors to our own economy, and Dr. Chang--for all three witnesses. Thank you, Dr. Chang. The tail end of your testimony focused on what it means here, is very helpful because, again, we are an entity that advises Congress what happens in China is having a clear and direct impact on us.

It seems to me in the auto area, in the aerospace area, maybe a little less in the semiconductor area, that it's activities of the U.S. that may be contributing to China's success. So our WTO accession agreement didn't limit the ability of China to demand JVs. So that is how we operate. I would have tried to have done it differently.

GM when they went over there committed to, I believe, it was a billion dollar investment and also agreed that it would, I think it was a period of five years, that it would source almost all of its parts out of the China market, and it would help Chinese suppliers reach ISO 9001. So we will not only invest there. We will share technology. We will teach you how to do platform integration on how to build world-class autos, and we will make your auto parts suppliers world class.

So that by 2020, the 18 billion you talked about is supposed to be over $40 billion trade deficit in auto parts.

In aerospace, the U.S. and China reached an MOU, as I understand it, on FAA certification, not that--we would want, of course, all planes to be safe anywhere in the world, but with what we've done on transfers of avionics by GE to COMAC or AVIC, AVIC, I guess it was, the FAA certification, the movement of many aerospace through offsets and other requirements, aerospace production lines in China, we're helping them to advance the development of their industry, understanding it's not yet world class. Semiconductors, a little less even though there is second-generation fab, et cetera.

Are those policies in our interest? Sure, we want China to succeed, but I want us to succeed first. Are there things we should be pulling back on in the auto area? Should we say that in the auto parts area for certain high-value components to reach your emission and, you know, CAFE and emission standards, turbochargers, advanced batteries, that should be done here? We're not going to have Tesla going over there, and aerospace, we're going to make sure that hot engine technology never goes there. So that we can continue to keep that part of the market.

And in semiconductors, which CFIUS seems to be doing a fairly good job of from Lattice to Fairchild Micron, sending signals that we're not going to dismantle domestic industry and sell the crown jewels. What more can we do?

Dr. Chang, you want to start?

DR. CHANG: Sure. Well, I do think that if American policymakers can help push emission standards on American automakers, you know, to have stricter standards and hopefully some of those high-end parts, as you were mentioning, will be made here, that in that way of raising our standards is a way to sort of increase the content of American parts. But it is probably a lot of the lower-end parts that get made in China, and so the high-value ones--

But, you know, car makers, they're not going to make higher standard cars if they're not pushed to. So I think that's one way. And then American cars will be more competitive worldwide, I think, because I think the standards are going to continue to go up. So that is one way.

I don't know all of the specific trade compliant policies to push local content. I don't, I'm not as familiar with those, but certainly any ways we can to enhance the local content, at least the valuable aspects, in the United States, would probably be good.

COMMISSIONER WESSEL: But what's happened in China is, again, acts of commission by us in the sense of saying with the WTO agreement, yeah, JVs are fine.

DR. CHANG: I know. It's a strange thing. But, so, I do want to point out, it's true, we have contributed to the sophistication of the auto parts in the supply chain there. But, interestingly, the JV policy, the Chinese government initially thought the JV policy would create world-class automakers of its state-owned companies, and it has not done that, and I think it will not do that. So that's the kind of funny thing, and it turns out brand is very important, and the Chinese state-owned automakers don't know how to do that very well. It's a different kind of market than maybe some of these other ones.

So, in that sense, we have enabled the supply chain. We haven't enabled global competitors yet from China, and I don't think we will do that soon.

DR. OHLANDT: I would respond that a balance needs to be struck in that, and you mentioned FAA and safety certification MOU. One of the recommendations from the RAND report is to use FAA safety certification in even parts, not just whole aircraft, but parts to help enable that intellectual property is not stolen and then resold back into the U.S.

Now as I'm sure you all know, intellectual property controls is not the FAA's primary mandate, and so there's an interagency challenge of how you do that, but that, in my mind, that's a perfect example of the balance. It's not to say that we don't certify the planes, but it's like if we're going to certify their aircraft, then we also make sure that they play by other rules that keep the playing field level.

COMMISSIONER WESSEL: I'm sorry--but on those other rules--because you're right--I mean that does go into safety because if you don't have the quality in those parts--

DR. OHLANDT: Yeah.

COMMISSIONER WESSEL: --so it could be something integrated potentially with FAA.

MR. GOODRICH: I would just add in the semiconductor space, if you look at the, you know, one of the primary reasons behind 54 percent market leadership is that from a trade perspective, we're zero tariff worldwide, zero in and zero out on what we sell, so--thanks to the WTO Information and Technology Agreement--and China's Accession Agreement to the WTO allows for 100 percent wholly- owned foreign entities in the IT space.

And so many of our companies are able to sell in that market but still headquarter their companies here. Many of our companies have their very high-end fabrication facilities in the U.S. Roughly of the U.S. semiconductor industry, 50 percent of the manufacturing in the front end is still in the United States. And that's the majority of the very leading-edge 14 nanometer logic chip fabrication. The majority of that is all here.

And that's because there are government regulations and requirements in other markets that force us to do that. There might be firms that choose to license or sell technology to firms worldwide for partnership reasons, to co-share R&D costs, but that's a business decision, not a government regulatory decision. And that's where we see an advantage for the industry to be able to have flexibility to not have the government tell us how we should enter a market such as in China. But we're certainly concerned that that could be changing.

COMMISSIONER WESSEL: Thank you.

HEARING CO-CHAIR GOODWIN: Chairman Shea.

CHAIRMAN SHEA: Well, thank you all for your testimony, and I have a question for Dr. Chang, and Dr. Ohlandt, you're going to be relieved on this one, and I have a question for Mr. Goodrich.

I really enjoyed your written testimony, Dr. Chang. I thought it was very comprehensive, and you mentioned something called Internet of Vehicles, which sort of intrigued me, and then I'm watching CNBC coincidentally yesterday, and there's a Chinese Internet entrepreneur businessman who is saying it's going to revolutionize the auto industry, and this idea of making the car a digital platform that just happens to have four wheels and moves. And I said, oh, my God, so we're going to have more screen time, you know. All our--

So could you just--is this the next big thing, this Internet of Vehicles, if you could just answer that question?

And then Mr. Goodrich, I enjoyed your oral testimony, and I know you're from a trade association. I just got a sense from your written testimony that you're kind of pulling punches a little bit because you say, for example, industry experts have observed--not us--but industry experts have observed that some of China's policies and actions may depart from market-based principles, and then you say some of the policy tools employed by China are likely not based on--and then you talk about the potential for market barriers, and so I got the sense that you were carefully calibrating your testimony, your written testimony.

So my question to you is am I wrong or were you pulling a punch or two in your written testimony? And just let it out. That's what I would suggest.

[Laughter.]

CHAIRMAN SHEA: Dr. Chang.

DR. CHANG: So the Internet of Vehicles is the next big thing, but it will encounter a lot of sort of regulatory hurdles because these cars carry people, and so there's a lot of regulations. There is even one sort of funny regulation, which is today cars have to have a steering wheel, and the next, builders of next generation of cars don't want to have a steering wheel. So this is the kind of funny things. They seem minor, but they're very important.

So that's why I was saying Internet of Vehicles for American companies to be leaders will require very close coordination with the policymakers around those kind of regulations, but it really has the potential to be the leadership of the future. It is a funny thing, you know. Are they just going to be iPhones with wheels? Maybe. I mean Apple is working on a very secretive electric car project. You all know Google is working on it.

So this is an area where IT firms could actually really be the next big leaders. American automakers are mostly focused on step by step. You know, step by step autonomous capabilities. So first the cars can park itself and then maybe it can open the garage door. I don't know. One step at a time because I think they see that fully autonomous is still a few years out.

So this is--

CHAIRMAN SHEA: A few years. That's not that long.

DR. CHANG: Well, exactly how many years--because the problem is, is that any kind of semiautonomous or autonomous car is going to have to share the roads with drivers. So this transition period is a tricky one. I don't think it's going to happen very quickly. Just as electric cars haven't been taken over, taken over the market yet.

So this is a gradual thing. Exactly how many years it will be before we see significant numbers is I'm not sure. But, again, it fully depends on these regulatory hurdles--the fully autonomous ones anyway. The semi-autonomous ones, we'll see more and more; right? There are these cars now that can park themselves and things like that. So we'll see. But it is a

big trend.

In terms of the Chinese company, in China, in any country, they face these regulatory hurdles so he's trying to get a lot of media coverage right now. Whether he's going to be the leader or not I doubt he has the capital or the technology of Apple or Google at this point, so--you know, they have actually Baidu, the Google of China, does have an engineering team in the Valley in California with 250 engineers now, which I was surprised to learn. I didn't know that. And their lead engineer is a Stanford professor, leading AI researcher, who used to work at Google. So this is, this is a real team it has, but, again, you know, it's not just the software. It has to integrate with the car and all these things. So it will be some time before those things mature.

CHAIRMAN SHEA: Thank you.

MR. GOODRICH: If I could just add on before I answer your question, Chairman Shea--

CHAIRMAN SHEA: Sure.

MR. GOODRICH: --about the testimony, but also on the connected automobile space, semiconductors are going to play one of the integral roles. It's the fastest growing segment for the semiconductor industry at eight percent growth. Roughly two or $300 of a car is semiconductor content. And that's--if you think about the sensors that you need to be able to detect automobiles is based off of radar and radars are semiconductor enabled, the controller to enable the autonomous driving is based off of microprocessor. There's going to be up to a terabyte of data in every car so there's a lot of memory that's going to be there. So as a worldwide leader in the semiconductor industry, we're going, wherever those cars are going to be sold, semiconductor industry is going to benefit from that, and we're leading a lot of the innovation.

NVIDIA, for example, is innovating a new driverless car platform that is a supercomputer in your trunk essentially. So there's a lot of really fascinating and interesting things that are happening here.

As to sort of what our view is of the semiconductor industry in China and what we see playing out, I think the reason why we take a little bit of a middle ground is that this is still playing out. It's very new. A lot of the investments are just being made, just as of last week or last year. They just stood up their Investment Fund company. So it's hard to see where this could go. But what, the reason why I mentioned steel, solar, LED, aluminum and other industries is that we're very clear in that we've seen what happens in other industries where similar policies are deployed.

So what we can do is look back and try and learn from those different instances where, for example, in LED or in solar and wind, as Chinese non-market capacity went up as a share of global capacity from say zero to 25 percent of global capacity, the average operating margins of those industries decreased from say 25 percent to five percent.

So you have a global industry where a value economics, the value is destroyed, and it's very difficult for a firm to operate when their operating margins are so that they can't sustain the company, and you've seen some areas in LED industry, for example, where those companies then find themselves selling themselves to Chinese buyers because they can't compete in the industry that was destructed by non-market based overcapacity industrial policy.

So we're very cognizant of the potential for what could happen. It's just very soon and hard to say how this will play out. And also in the semiconductor industry, the barriers to entry are very high. We're the most R&D intensive industry, period. 19 percent of our profits

are reinvested back into R&D. That's higher than pharmaceuticals.

And so far what we don't see in China is a very strong investment into research and development. So we still think China has a number of things that they need to do in order to enable themselves, but they're still only three percent of worldwide share of the semiconductor industry and they are roughly able to supply nine percent of their own, their own demand.

So we're still cognizant that China has a long ways to go, and that this policy is still in the early stages of establishment, but very aware of what the potentials are.

CHAIRMAN SHEA: Okay. Thank you very much.

HEARING CO-CHAIR GOODWIN: Senator Dorgan.

COMMISSIONER DORGAN: Thank you very much.

Well, first of all, I thought the testimony was really interesting and appreciate your being here. I would, Dr. Chang, ask, you know, the Japanese and the South Koreans have been fairly successful for decades selling cars in the United States market. You indicated, I think, that the Chinese are not ready with respect to the quality of cars that would compete particularly well with Chinese exports to the United States.

In the last trade agreement we had with China, Senator Levin from Michigan was apoplectic, sending a notice to all colleagues about the agreement we made on bilateral automobile trade. My understanding is that after a phase-in period, the agreement provided that in bilateral automobile trade, the Chinese could levy a 25 percent tariff on U.S. automobiles sent to China, and the U.S. would levy a tariff of two-and-a-half percent on Chinese automobiles sent to the United States.

So that would be a ten-to-one advantage in tariff in the bilateral trade, and so the assumption and concern was then, well, you've set up a circumstance for failure for the United States. I mean if you have a 25 percent tariff going that direction, you wouldn't produce American cars in America and send them to China; right?

First of all, is that your assumption of what the arrangement is as negotiated in the previous discussions with the Chinese, and if so, doesn't that in the longer term, if China is able to produce a domestic automobile industry that is export-oriented, and my understanding is they've talked a lot about wanting to do that, doesn't that set us up for further difficulty with respect to competing with a domestic Chinese automobile market that would begin to get some traction because of additional quality when they want to enter the U.S. market?

DR. CHANG: That's a great point. On the first question about that, the specifics of that trade agreement, I don't, I would have to do more research to know exactly. But based on what you told me in terms of the differential in the duties, that could have some effect.

But I wanted to say a little bit more. You know, I began my research with this question, can China create the next Toyota; right? If you look at Toyota or Honda or the Japanese automakers and the Korean automakers, why couldn't China do that? And I will have to say one of the big differences is that Japan and Korea were very careful to protect their domestic markets from foreign competition; the American government kind of let them do that. It was Cold War era. We didn't really force it. They weren't big markets.

So Japanese and Korean car makers grew up in a protected domestic market. They could develop their brands. They had to compete with one another.

COMMISSIONER DORGAN: That remains the case, isn't it? It's still the case?

DR. CHANG: So the Japanese use kind of clever ways to keep out foreign cars, you know, in terms of high emission standards, right? They sort of say we have very high emission standards, and American cars, they can't, they don't meet those standards in Japan. So

they have clever ways. They don't use quotas or tariffs, but they sort of say we care about our air quality standard, and so if you can't meet those, you can't sell your cars here.

So, yeah, it does remain that way, but they had a head start, and Chinese car makers didn't do that. So that's the funny thing. With the JV policy, and maybe it's because, you know, socialist era China didn't know enough about brands and these kinds of things. So when the JV started, they didn't force the foreign automaker to sell cars in China under Chinese brands, and that has killed them. I mean Chinese brands are--I mean--sorry--foreign brands are dominant in China. Every aspiring middle class Chinese wants to own a foreign car, not a Chinese-made car.

COMMISSIONER DORGAN: Made in China.

DR. CHANG: Actually the wealthy all want imported cars. Okay. They don't want the Audi that's made in China. They want the Audi that's made in Germany. And it's a status symbol. And so for that to change I actually don't think that will change. They love to boast. If they have to pay an extra 25 percent, they're like, hey, you want to know how much I paid for, you know, my Audi that was made in Germany? It cost this many hundreds of thousands of dollars. It's a thing.

So in terms of, you know, in the future, I'm still skeptical that any Chinese car company will become a major exporter. So they've talked about this for a long time. The Chinese today still export only less than 100,000 cars. They're all very low end, and they're mostly to emerging markets, and I frankly don't see that changing.

You know, the Chinese companies cannot compete in China against foreign car companies. So, you know, is it in the long, long, long term from now? I'm not sure, but I'm less concerned about Chinese car companies exporting here.

The bigger concern is foreign car companies producing in China and exporting from China. That's the thing that's going to potentially have an impact, but in terms of us buying Chinese branded cars, they've been saying that for ten years; they're nowhere closer to making it happen.

COMMISSIONER DORGAN: Thank you for that.

I was just going to observe the last time I was in China, I think I saw all one million of the 2015 production of Buicks.

DR. CHANG: I know.

[Laughter.]

DR. CHANG: Were you in Shanghai?

COMMISSIONER DORGAN: It is--Shanghai--it is unbelievable when you drive down the street and see these Buicks. Probably reason for another investigation. Why a Buick brand preference?

DR. CHANG: You know, can I say one thing about that? It's because, and this is what I'm saying about how smart GM was in terms of the government relationships, so its partner is in Shanghai, its main partner. And what it did was it sort of said, well, let's make a car that Shanghai government officials would want to drive, which was this big fancy Buick. And that kind of set the standard. It's like, okay, well, Chinese officials are driving Buicks so then other people sort of looked to that as an aspirational vehicle.

You know, it carries government plates and all this kind of stuff. So it was a funny thing that that set certain market--I don't know--cache.

COMMISSIONER DORGAN: Thank you. And let me just make one comment. The point that Commissioner Wessel made about JVs, that and several other things put us in the

position of it's success for our car companies and good for them, but it's a circumstance where China wants those cars produced in China, and the automobile parts produced in China, and regrettably, it's a disadvantage to us with respect to our trade relationship.

DR. CHANG: Yeah.

HEARING CO-CHAIR GOODWIN: Commissioner Bartholomew.

VICE CHAIRMAN BARTHOLOMEW: Thanks very much.

Again very interesting testimony. I'll start--Dr. Ohlandt, this high barrier to entry in the aviation industry is really important, and I don't know how much people think about that every time they get on an airplane that we have very high standards for the material, for the parts, for the plane, for the production of the plane. And I thought that I heard you raise some questions about safety compliance--did I hear that correctly--in China?

I guess what I'm interested in is are they as they're trying to produce material for planes, as they're trying to produce parts for planes, and as they're trying to produce planes, are they going to reach this high standard that exists or are the aerospace companies, including Boeing and Airbus, under any sort of pressure to maybe accept a standard that's not quite what it has been? That's one thing.

And also is there corruption in the aerospace industry?

DR. OHLANDT: All right.

VICE CHAIRMAN BARTHOLOMEW: And then I have some auto questions.

DR. OHLANDT: So the safety standard question, so I mean that's an ongoing issue for--I mean no, no aircraft company wants unsafe parts in their airplanes; right? And so companies like Boeing have global supply chains. That's the way the business works. And regardless of whether it's in China or somewhere else, they need to guarantee that the quality assurance needed to meet those safety standards are there.

And so, but, nonetheless, you can still find partners, even in China, that will meet their standards on occasion for--there are parts. I mean China does produce parts for Boeing airplanes in the end. So the real safety, the real issue is, is that the COMAC, the national champion for aircraft, it does not have a safety record. It does not have previous aircraft. All right. It is now, it has the new ARJ21. It has been safety certified in China, and even though there are agreements with the U.S. and the FAA to do additional surveys, it is not yet certified by the FAA or by the European counterpart either, to my knowledge; right?

And so the issue, I mean, first, they have to get the hurdle of just simply getting it certified. But then number two, they have to establish a long-term safety record. I mean these barriers, one of the barriers to entry into the commercial airline market or aircraft market, no one wants to fly on the third-safest kind of aircraft.

[Laughter.]

DR. OHLANDT: Okay. That's just a non, you know--regardless of why you are, whether you're Chinese or you like U.S. brands or whatever, it doesn't matter. That's very important, and so that's just a constant concern, and I think as we all understand how the Chinese system works, quality control and quality assurance, it's an ever-going issue even in U.S. industry, but you can see why their system might struggle with it even more than ours.

VICE CHAIRMAN BARTHOLOMEW: So would Chinese airlines flying Chinese airplanes have to meet U.S. safety standards in order to fly into the United States or operate here?

DR. OHLANDT: Yes. Yep, yep.

VICE CHAIRMAN BARTHOLOMEW: All right.

DR. OHLANDT: And so now they're--yeah.

COMMISSIONER WESSEL: But not to fly in Chinese airspace; correct?

DR. OHLANDT: Correct, correct.

COMMISSIONER WESSEL: Right.

DR. OHLANDT: Yeah, every nation controls their own airspace and they set the standards. And the agreement that was mentioned earlier by Commissioner Wessel, what happens is, is that there's usually some sort of reciprocal acceptance, and so the FAA certifies something, and then European authorities ask for a few more boxes to be checked, and then they're okay with it, and to some degree vice versa. If there's a European aircraft, the European authorities eventually approve it, and then the FAA just simply has a few--either because we have different priorities or different requirements or whatever. China is not yet--the Chinese certification authorities have not done that in the past, so they don't have a track record and so they're trying to work through that process.

VICE CHAIRMAN BARTHOLOMEW: Well, I hope that they continue that the issue is a few more boxes to check and not a few less boxes to check.

On automotive, just two observations. First one is I don't know how much people focus on the fact that when we have driverless freight trucks on our roads, and some people believe that that's going to happen prior to us having driverless cars, because they can go 24-hours a day, but it's going to have a huge impact on America's rural communities, and I just hope that this is one of those issues that people identify and work on as the progress is unfolding.

Many of America's freight truck drivers live in rural areas. Their salaries, their income is supporting all sorts of things--tax base in rural communities, and so it's going to have a huge impact when it happens.

The second thing, Dr. Chang, I just wonder with this, that it looks like the American industry is moving slowly into things. I think that part of that transition has to be a period where American drivers get accustomed to this. There was recently a video of a man who took his mom, put her in the driver's seat of a driverless vehicle, and it was not a pretty sight. I mean she, I would actually recommend that people go look for that. It was just kind of interesting.

So, but to get to my questions, does China have any sort of CAFE standards for its cars, CAFE-like standards for its cars?

DR. CHANG: It does. It does have standards, but to what extent are they enforced, I think it's hard for us to know.

VICE CHAIRMAN BARTHOLOMEW: Right.

DR. CHANG: Because they have this ongoing conflict of interest in most of the big state-owned--most of the automakers, the large ones are state-owned. So it's the government trying to police and enforce standards on state-owned automakers. It's the same thing across so many industries. Why does China have so much pollution when they have--they do have emission standards for air quality. So they do have those standards. They are making them more stringent. But again compliance I think that there might be some challenges.

VICE CHAIRMAN BARTHOLOMEW: And then on electric vehicles--

DR. CHANG: Yeah.

VICE CHAIRMAN BARTHOLOMEW: --which, you know, again, the wave of the future.

DR. CHANG: Yes.

VICE CHAIRMAN BARTHOLOMEW: I'm just wondering what the incentives,

and by that I don't necessarily mean government subsidies, but the incentives are for the promotion of electric vehicles in China? Two points come up about that. One is, is the infrastructure there? You need a lot of infrastructure.

DR. CHANG: Yes.

VICE CHAIRMAN BARTHOLOMEW: Charging stations and things like that. And the second one is if the theory behind electric cars is that they reduce emissions--

DR. CHANG: Uh-huh.

VICE CHAIRMAN BARTHOLOMEW: --and reduce pollution, how is that going to happen in China if the electricity continues to be produced by coal power?

DR. CHANG: By coal? It's a great question.

VICE CHAIRMAN BARTHOLOMEW: Coal-fired power plants.

DR. CHANG: It's a great question. So in terms of the charging infrastructure, the government has earmarked a lot of money to invest in charging infrastructure, but they still have to iron out the standards for the interfaces of chargers, and they're still working that out. They haven't, they haven't solved it.

In terms of the impetus, I don't even know that the government is fully committed to a consumer-driven electric vehicle market. I think that they see fleets as a big opportunity. So--and also there's a new development in China, and this is where I think China could be a leader, is really low cost electric cars--okay.

So they have a model--I was noticing today in Washington the bikes that you can rent. Well, there's a town in China, Hangzhou, China--I don't know if any of you have been there--but they are now--they have a big automated garage, and it's like a giant--I haven't seen it, but I just read about it. It's like a giant vending machine with little electric cars, cheap ones, plugged in.

So as a visitor to Hangzhou, you would just go into these automated garages, $3.50 an hour, you can rent an electric car. And then you, you know, then you just return it to the same place. And that car retail is only about $6,000. It's like a glorified golf cart. I mean it's not a Tesla. But it serves its purpose; right? You just want to get around the city or maybe you want to drive to Shanghai for the day. It only will cost you maybe 20 bucks to drive that car.

So that's where China kind of has a future, and theoretically speaking, in the long run, if these are, you know, controlled by software, then you could also reduce congestion. You have the possibility of reducing the fatality. China has the highest fatality. If you can imagine, there's tens of millions of people learning how to drive every year. It's a challenge.

So if you can somehow control these through software on the Internet, you could reduce congestion, you could reduce fatalities--perhaps--in the long run. So I think in terms of the emissions, you're right, they're being fueled by coal, coal-fired electricity plants, but in the long run China would also see, like to see more of its electricity produced by non--you know, cleaner fuel. So in the long run, hopefully it will be able to help with the emissions.

But China is also very wary because it's a huge oil importer, right, so importing oil not only contributes to emissions, but it's a security issue, yeah. So I think electric cars have a big promise plus they hope it will be Chinese car makers that are the leaders in electric cars.

VICE CHAIRMAN BARTHOLOMEW: Yes, we'd certainly like to see the opportunity for American electric car makers to get into the Chinese market.

DR. CHANG: Exactly. Exactly.

HEARING CO-CHAIR GOODWIN: As an aside to Commissioner Bartholomew's question, I will say I've spotted one Tesla in Charleston, West Virginia with

personalized tags that read "COAL-POWERED."

[Laughter.]

HEARING CO-CHAIR GOODWIN: There are some that are very happy about it.

Dr. Tobin.

COMMISSIONER TOBIN: Great. Thank you all.

I have a question for you, Dr. Ohlandt, and then for Mr. Goodrich. Dr. Ohlandt, you contrasted the military aircraft and the civilian or commercial aircraft, noting that China produces its own military aircraft, and then we just spoke about through the questioning the fact that they haven't moved into the commercial area.

So two questions regarding that. Would you say that they have--because they've got such good deals with the Boeings and the Airbuses of the world that they haven't bothered to try to do it? Also can you make any inference about the safety of the military aircraft if--are they not meeting standards there? If you could comment on that?

And then, Mr. Goodrich, I think I have a similar feeling that you did, Chairman Shea, in reading it. I even read parts of your testimony twice. I could not figure out why we, the U.S., care about integrating China into the global semiconductor value chain. Probably before you were born this country, this country in semiconductor area had to fight pretty mightily to retain semiconductor power against Japan. So I am missing something, and I do not understand that so I'll let you expand on that.

But Dr. Ohlandt.

DR. OHLANDT: So you make a very good point bringing up the difference between military and commercial aircraft. And while it is both aviation and aerospace technology involved, they're quite different. Okay. The advanced stealth and high-performance engines and sensors and fusion and all that, commercial companies don't need any of that. All right.

So, on the other hand, commercial aircraft, one, an interesting fact is that of your plane ticket whenever you fly on an aircraft, less than 20 percent of it goes to the acquisition or leasing of that aircraft. 80 percent of your plane ticket goes to operating the aircraft. And so if you were a commercial airlines, and you're flying an inefficient aircraft in any way, shape or form, you're losing money. That's potential profit off the top, and that is--so I mentioned safety being a primary thing, and the next thing after that is cost efficiency; right?

And that is huge, and that is fundamentally why the Chinese have a military aviation industry that is quite significant and large, but they have not focused on the efficiency issues to get in there. So to the safety of their military planes and aircraft, you know, military standards are different. I mean I think we hear, you know, even United States military loses military aircraft more often than we see commercial aircraft go down, and that's because both they're operated in very different environments, and the safety regulations are quite different.

And once again in the commercial world, if you're not one of the safest aircraft out there, people don't fly you, and what's the point if they're not getting on the airplane--the first point.

And so the--I would argue that there is evidence in the Chinese system that they do have the quality assurance problems all through their, the production of military aircraft as well as their operation of them. But obviously we don't have, you know, they don't share the details of those challenges with us.

COMMISSIONER TOBIN: Thank you.

MR. GOODRICH: Yeah, excellent question. I think what from our perspective, what we're looking at is--

COMMISSIONER TOBIN: From your association.

MR. GOODRICH: From our association's perspective.

COMMISSIONER TOBIN: Okay.

MR. GOODRICH: The Chinese are going to build semiconductors so they're going to invest, and they are investing. This is a top priority from President Xi Jinping down. Just last week, he chaired a meeting on national cybersecurity and the IT industry, and he spent ten minutes talking about why they needed to have core technology semiconductor chips and other things, and so we don't see in any way someone being able to convince them that they're not going to grow their industry, and there's very little--

COMMISSIONER TOBIN: And I'm not thinking that.

MR. GOODRICH: Right. And there's very little that we can do that is going to prevent them from growing the industry.

COMMISSIONER TOBIN: Sure.

MR. GOODRICH: But what we want to do is ensure that, for example, China has a growing expertise in the area of smartphone component design. They should focus their efforts on areas where they have maybe some comparative advantages and they can play in the industry in the same standards that we have. But you can juxtapose that with, for example, state directed non-market capacity.

For example, a month ago China announced they were going to invest $24 billion to create a national memory company where most of their demand for memory chips is sourced from the global market. There is no need for more demand than China is already able to source globally. So what we want to see is more investment and grow from the areas where China might have a comparative advantage globally, thinking about global markets, not just closing off their market, but talking about selling products overseas or competing with us with the same level of market access that we have globally and other markets.

COMMISSIONER TOBIN: So let me interrupt to just say so with the 19 percent reinvestment, very high, in high-tech--

MR. GOODRICH: Right.

COMMISSIONER TOBIN: --what would you recommend because we have an edict to report to Congress, what would you recommend thinking about our semiconductor industry to keep it competitive with all that investment going on there, not just integrating them? What can we do to keep us competitive? And we've had to protect this in the past, and I believe we strongly have to protect it now and going forward.

MR. GOODRICH: One of those critical factors has been government support for pre-competitive R&D, back to the--certainly this is before my time, but in the 1980s with the Japan challenge in the semiconductor space, the SIA worked with the Department of Defense and the U.S. government to help establish SEMATECH, which is a research and development--

COMMISSIONER TOBIN: Right. I know it well.

MR. GOODRICH: --alliance, and today still, for example, there's strong partnerships between the National Science Foundation, DARPA and others with the semiconductor industry to support long-range research that's five, ten years ahead of the commercial R&D development track.

COMMISSIONER TOBIN: Do you know the current funding? Has it come--for quite a long time, it was quite low.

MR. GOODRICH: It's still relatively low as compared to industry commercial investment into R&D, but it's investment into long-range pre-competitive R&D that no one else is doing, and so the theory is that if we invest here, then the U.S. semiconductor industry is going to benefit and be able to take advantage of that from U.S. academic institutions before other countries.

And so, for example, in high-performance computing, exascale supercomputing, the ability to continue to have Moore's law advance. We need to be able to have material science chemicals, physics, investment into R&D is critical, and we've been making a number of proposals to increase a bunch of specific programs that DARPA and the NSF are funding. It's, you know, I think for one thing, while our programs certainly don't compare in size to China's programs, qualitatively they're certainly much more effective.

And so we do punch fairly above our weight for the size of the programs that the federal government supports. So even a modest increase we think would have a significant impact on enhancing competitive R&D by U.S. semiconductor firms.

COMMISSIONER TOBIN: Commissioner Goodwin, Senator Goodwin, you had a comment about semiconductors that you were sharing with me earlier.

HEARING CO-CHAIR GOODWIN: Oh, I got a question for him.

COMMISSIONER TOBIN: Okay. Good. Good. All right. Thank you.

HEARING CO-CHAIR GOODWIN: Dr. Chang, I don't want to belabor this point, but I would like to return back to a conversation about branding when the JVs initially went into China's market. In your testimony, both written and oral, today you characterize it as the Chinese leadership overlooking the importance of marketing and branding, an assertion I think is certainly correct. I wonder whether it understates the value of those American brands when they enter that market?

The Chinese company whose name has now escaped me acquired a pork producer in Virginia a couple years ago.

COMMISSIONER WESSEL: Smithfield.

HEARING CO-CHAIR GOODWIN: Smithfield, I know. But I couldn't remember the name--

COMMISSIONER WESSEL: Shuanghui.

HEARING CO-CHAIR GOODWIN: Yeah. And what the Commission heard was that a key motivation for the acquisition was not to gain access to the U.S. market necessarily or even to import pork products into China, it was rather to use that Smithfield brand for Chinese domestic consumption. It was important. It carried a cache, as you suggested, that people would want to rely on and use.

So I suppose my question is, did, undoubtedly, perhaps, they overlooked the importance of marketing and brand, but would it have mattered given the value of a Buick or a Cadillac? I mean if they had required these cars to be sold under a new brand name, obviously that could have had a significant impact. But given the inherent value of the American brands and auto manufacturers and now having gone on for three decades, how do they capitalize on it?

To turn the conversation back to the topic of the hearing, the fifth year plan, you say later in your testimony that the reality is a lot of these goals, including the call for the development of this, of indigenous brands, is not going to have a significant impact on the global auto industry.

DR. CHANG: So if I understand your question correctly, would it have made a difference if the Chinese government had required the joint ventures--

HEARING CO-CHAIR GOODWIN: I suppose I would acknowledge that it would have made a difference. I guess the question is now given the strength of the American brands--

DR. CHANG: Right.

HEARING CO-CHAIR GOODWIN: --and given the three decade history of--

DR. CHANG: Right.

HEARING CO-CHAIR GOODWIN: --of them producing under those American brand names in China--

DR. CHANG: Uh-huh.

HEARING CO-CHAIR GOODWIN: --is the fifth-year plan going to make any difference?

DR. CHANG: To that, I don't think so. Now, but you did bring up a point, though, that I want to emphasize, which could matter in the future, because what you said about the pork, it could be one day that the Chinese state-owned firms end up buying American brands, just like there have been Chinese part suppliers who have bought American part suppliers so that they could sell parts under an established brand, just as the Chinese company Geely has bought Volvo so that it can sell Volvos.

So Geely, a Chinese company, was actually the first company to really import Chinese made cars. There were I think a thousand Volvos that were made in China last year that were brought here. I don't know how many they sold, but that works because, of course, Americans are accustomed to Volvos, and they probably have no idea that it was made in China.

So, you know, could Chinese car companies one day go that route? And I'd say if the American government hadn't bailed out GM, you know, Buicks might be Chinese Buicks. Who knows? But that is something in the future, you know, they could leverage an American brand that they then own, and that's an interesting potential there. So like Lenovo, for example, may buy IBM so a lot of people have Thinkpads now, but that's a Chinese company. So that, that is a place where they could enter kind of through a backdoor.

But in terms of their own brands, no, I don't think the 13th Five-Year Plan will have any impact on Chinese brands doing any better worldwide than they currently do.

HEARING CO-CHAIR GOODWIN: But what about domestically in China?

DR. CHANG: I'm very, very, very skeptical, and because the Chinese market is so competitive, it's so competitive, and a funny thing is, is that regional governments, especially the ones that are home to one of these big joint ventures, they're perfectly happy. So, you know, we were talking about the Buicks, they're perfectly happy that Buicks are doing well because it's the Shanghai company of that joint venture that's making money from that, and they're proud. They're actually proud that it's a Buick. They're like "but this Buick is built here." Right? And so there's a lot of conflict. This is a place--

HEARING CO-CHAIR GOODWIN: So a Toyota from Buffalo, West Virginia or a BMW from Spartanburg, South Carolina, I mean the same sort of phenomenon.

DR. CHANG: It is. And so that's the funny thing, is that when you go in different parts of China, you'll see different cars. So in Shanghai, you'll see Buicks, but in the south is where you'll see the Japanese cars because that's where their joint ventures are, and so in the south, they'll be like, oh, well, this Toyota, it's built here; right? And they're not as tied to the brand thing. It's the central government that wishes more of the brands were Chinese, but they can't really force that to happen, as far as I can tell.

I just don't think that they can, so they've been saying it for decades, and it still

hasn't really helped. And so, you know, the domestic brands do have some market share, of course, but it's mostly in the low end, which is a large market, but Chinese buyers are not buying them because of Chinese brands. They're buying them because they can't afford cars that are more than $10,000 so they're forced, but it's been seen that once they want to upgrade, they always want to buy something, you know, they want to buy a Ford Focus or a GM branded car.

HEARING CO-CHAIR GOODWIN: Thank you.

Let's start a second round with Commissioner Wessel.

COMMISSIONER WESSEL: I want to pick up on Commissioner Goodwin's comment, and as I look at all this and going back to the Shuanghui purchase of Smithfield, to me this is a major affront to capitalism. We tried for years to try and get our pork into China; we couldn't do it. When their income rose to a point where the propensity or desire for protein hit a tipping point, rather than opening their market, they buy our top firm, and it wasn't just the brand name, it was also they got all the genetic stocks so they could enhance factory farming of pigs.

They wouldn't as part of the WTO Accession Agreement allow us to have 100 percent. They had to share in the profits for the auto sector. And the result was while our companies are getting enhanced profits, not all of it is going to U.S. firms. Increasingly, the parts are Chinese sourced. We're losing jobs here as a result. We're screwing a lot of cars together, but we are decimating our auto supply chains, and we're facing this in sector after sector.

In the aerospace area, going back as far as the '80s, McDonnell Douglas was putting kits together in Shanghai because China said you had to do that. We now have, as you know, maintenance facilities there because they're demanding it. I'm sure when the C919 is airworthy, when United Airlines asks for the rights to get new landing slots in Beijing, the Chinese are going to say give us a list of which airframes you're using. United will get the message that if it wants those landing slots, it's probably going to have to do, if they're ever allowed to operate within the market, they're going to probably have to buy C919s, right, for regional use, et cetera.

We're not giving China credit for what they're doing. Haier is a low-level brand, and my daughter at Syracuse is using one of their little mini-frigs. Well, they buy GE because they know that's the only way they're going to access Western markets and be able to get the cache and the profits they want.

13th Five-Year Plan facilitates all this. The Internet of Things is the next major thing, whether it's in vehicles, whether it's in industrial design, et cetera, and China may be able to capitalize on that with the standards they're developing for the IoT, which are different than Western standards.

When are we going to wake up? I mean when are we going to realize that China has the 13th Five-Year Plan, we got to believe them? And, yes, we may be able to still skim some profits off the top as GM and others do, but it's an affront to capitalism. Any comments?

DR. OHLANDT: I mean I would jump on, I mean you step back. The aircraft manufacturing market functions in a globally competitive environment, and so China is not the only one that tries things like this. You mentioned landing slots and that is more important to the airlines themselves. Those are usually traded back and forth, but you're right, they could try something like you suggested, and so the key is, is that we establish international norms. WTO being the obvious headliner of that; right?

And the goal should be for the government, the U.S. government, to establish those norms such that it is a level playing field across the board, and obviously, as you were

suggesting, the Chinese prefer an unlevel field, and they make all reasons and excuses why it should be that way or not. And so the key is just to engage on that, and particularly in the aerospace industry, I make the side point that we haven't fully sorted that out with the EU and the people who can actually compete with us although we're obviously much--we're much closer than we are with these Chinese policies.

Right now we can--essentially, the U.S. in terms of the aircraft/aerospace sector can to some degree ignore some of the more egregious policies that we talked about earlier, but eventually that may not be true, and so anyway the argument to me is, is that you continue to work to create a worldwide global competition with the rules that are acceptable, and you continue to strive to bring China into that, and the more stake they have in the system, the more willing they are to play by those rules.

MR. GOODRICH: I would add one example as well in there, if you look at the standards issue, which is important, we've seen in the ICT space many examples where China has pursued indigenous standards with WAPI or with the TDS-CDMA 3G communication standard. You know, I think the fact that China Mobile is now shutting down their 3G network because nobody is using it is a testament that they realize that they essentially created a Galapagos Island of their own telecommunications network that consumers didn't want to use the devices that were supporting the Chinese indigenous standard because they were outdated and bulky and they all wanted the nice smartphones that Apple and Huawei make that are built on global standards.

And now for 5G, China is adopting a position where they're not going to necessarily go towards an indigenous standard. Rather they want to develop a standard globally with peers inside those global organizations but that's going to be effective for them because that's what's been effective for others. But they're recognizing that sort of the China-for-China indigenous approach isn't going to work when they need to sell to global markets. I think in the IT space, we're seeing examples where China has recognized that.

COMMISSIONER WESSEL: Dr. Chang, any comments?

DR. CHANG: Yeah, I just wanted to reiterate that point, which is that a lot of what the Chinese government hopes to do doesn't always mean it's able to do it, and so these industries are globally competitive, they can't try to corner it as such, and in the Internet of Things, if they try to do that, I think it will be a colossal failure. I actually quoted the TDS-CDMA case in my testimony.

So I think that the opportunity for American firms really is in sort of keeping at the forefront of the technological edge, and in the Internet of Things, we'll have to do that, too. But you're right, there's this sort of tension between technology leadership and jobs, and I do think in the jobs area, yes, this is a place where we struggle, and I don't have great ideas on that unfortunately, you know, but in terms of promoting the leadership of our companies, I think that there is a lot of potential there, and the ability of Chinese firms to compete in that really valuable high-end of it in the technology, I still think they're going to struggle with that even if they put together the widgets, you know.

So next generation cars I think will look a lot like Apple iPhones, you know, a lot of the value and the design will be here, yes, maybe it will be assembled in China, but they don't capture as much of the value. Maybe they employ more people. So I don't know. Maybe cars is going that way.

COMMISSIONER WESSEL: Thank you.

HEARING CO-CHAIR GOODWIN: Chairman Shea.

CHAIRMAN SHEA: Yes. This is for Dr. Ohlandt. I--just more of a factual question--I understand the ARJ21 first delivery was this year--

DR. OHLANDT: That's my--

CHAIRMAN SHEA: --but it's not FAA certified.

DR. OHLANDT: Right.

CHAIRMAN SHEA: And the C919 is not delivered yet.

DR. OHLANDT: Right.

CHAIRMAN SHEA: So obviously not FAA certified. But I recall that President Obama made a deal or signed an MOU with Hu Jintao to expedite FAA certification of the--is that correct--several years ago? And I was wondering if you--I recall actually meeting with--they brought an FAA--they had FAA people in Shanghai--

DR. OHLANDT: Uh-huh.

CHAIRMAN SHEA: --I believe working to--

COMMISSIONER WESSEL: With the Chinese.

CHAIRMAN SHEA: --assist--with the Chinese to assist them in expediting the certification process. Do you know anything? Obviously it has not succeeded yet, but is that effort still ongoing on the U.S. side? I always sort of--why we'd want to help a competitor sort of surprised me, but--

DR. OHLANDT: So I mean we are, I mean what that's really about is establishing a working relationship because, as I said, you've got European safety aviation experts and American, and U.S. aviation safety experts. They've worked with each other for years and gone back and forth, and so there is, you know, whenever an aircraft gets certified in Europe, there's a number of things that need to be done, but they otherwise trust that the data and the standards and the test methods are adequate to meet FAA standards; right?

Well, in China, that trust does not exist in any way, shape or form. More importantly, the Chinese don't even understand what those standards are for FA--I mean, you know, the, you know, aviation travel is one of the safest modes of transport, and there's a reason for that--because of these safety efforts.

And so really what it's about is to help them understand that, and I assume it's part of a larger whole-of-government effort with China is that, look, we're going to commit to developing this relationship. You're still going to have to meet U.S. safety standards before your plane will be allowed to fly in U.S. airspace. But it's about a commitment to that government relationship, and I assume that the expectation from the government was some sort of reciprocal on some other issue. I don't know the full scope of the negotiations, but that would be my presumption.

But it's very real. I mean the bottom line was to say our government agencies are going to work together to come to a common understanding so that China truly does understand what it means to make a safe airplane so that it can fly in the U.S.

CHAIRMAN SHEA: All right. Thank you.

HEARING CO-CHAIR GOODWIN: Mr. Goodrich, I have a quick question for you in an effort to continually amaze my colleagues with my ability to turn any conversation back to West Virginia and West Virginia coal.

[Laughter.]

HEARING CO-CHAIR GOODWIN: I did want to ask you--

COMMISSIONER WESSEL: We're no longer amazed.

HEARING CO-CHAIR GOODWIN: They're no longer amazed. If you had seen

the recent study done by MIT where researchers at MIT found that coal-based electronics could be much more affordable option to the raw materials currently used to manufacture semiconductors, and I just wanted you to educate me a little bit on the manufacturing process of these chips, whether access to raw materials plays a significant role in a country's and company's competitiveness, and you in your earlier testimony alluded to a continued commitment to R&D, whether this would present the sort of opportunity that would allow American companies to maintain competitiveness in the global economy?

MR. GOODRICH: That's a great question, and there's a lot of exciting things going on, but I mean looking at the supply chain, basically the process to build a chip, you have the--you know, the majority of our chips are still based off of silicon raw material. And we have no lack of sand so it's not really a supply chain problem for the industry.

But throughout the process where you bake different chemicals onto this silicon wafer and then you start cutting it up and putting the wires and the circuitry on the chip, which can be billions of different transistors on one silicon wafer, and we start using a lot of different chemicals and processes and high temperatures, and increasingly really new materials in that space because the ability for us to move atoms around at a nanometer level on silicon is increasingly limited with that silicon material.

And so we're looking to new materials, like carbon-based materials, such as graphene, or also gallium arsenide, gallium nitride, different compounds on compound chart, to be able to put that into the process to be able to continue to shrink our chips, to continue to decrease the power consumption that our chips make, and, for example, in the production of some types of new memory technology, we'll be sourcing up to 200 different types of materials from places all around the world. Some of those might have, because our customers demand them, we need to have second sourcing for those materials as well.

The majority, though, again, is silicon-based, and so from a supply chain perspective, it's not a huge challenge to industry, but there are some unique and raw materials that we do use in our processes that we have had some challenges in the past. For example, in the '90s, a chemical plant that provided--it was roughly 40 percent of the chemicals for parts of the semiconductor fabrication process in Japan exploded, and we had a worldwide shortage in semiconductor supply.

So the supply chain is fragile at some points. In Thailand, there were floods that impacted part of the electronics industry that a lot of the hard drives are manufactured in Thailand so there are nodes that are critical to the supply chain.

Or, for example, earthquake prone areas, a lot of the industry is in Asia, and Japan, Taiwan, and so on, easily prone to earthquakes, but the industry has invested in technologies that allow the facility to go offline immediately on the detection of vibration and so on. So there was a 7.3 I believe earthquake in Japan two weeks ago. Sony, other facilities have major plants. They were actually able to survive most of the damage because of the engineering they've put in place to prevent that.

But back to your question, R&D, there's a lot of exciting research going on in MIT in graphene. That's the technology you mentioned. There's also research into gallium nitride and arsenide and other materials that are going to enable us to find the next switch and continue innovation in the future, and again a lot of that is supported through the National Science Foundation, through DARPA, through Department of Energy programs that are thinking about what are the materials that we need for this industry for ten, 15 years down the road?

That's something that from a business perspective very hard to think a decade out

and make those investments, but that's something the government can do to help support because at the end of the day, it's going to enable our advantage for the U.S. military and others to be able to use those advanced semiconductor chips in their supply chain. They're designed here. That's the fundamental R&D and research so hopefully I was able to answer your question.

HEARING CO-CHAIR GOODWIN: Yes. Thank you.

CHAIRMAN SHEA: But you didn't bring it back to West Virginia.

[Laughter.]

VICE CHAIRMAN BARTHOLOMEW: It was an implication.

MR. GOODRICH: I mean definitely from a carbon material standpoint, graphene does have significant potential. It's right now hard to be able to control the voltage in graphene. I think researchers have been able to control the properties needed for a semiconductor device for up to a couple of milliseconds. Certainly we need to have a lot longer ability to control the voltage in a device for anything that's commercially viable.

VICE CHAIRMAN BARTHOLOMEW: So is that G-R-A-P-H-E-N-E?

MR. GOODRICH: Correct.

VICE CHAIRMAN BARTHOLOMEW: Okay. It sounds a little bit too much like fracking when you say it.

MR. GOODRICH: Oh. No, it's definitely different than fracking.

VICE CHAIRMAN BARTHOLOMEW: Thank you.

HEARING CO-CHAIR GOODWIN: Well, it sounds exciting, and I know just enough about semiconductors probably to be exceedingly dangerous.

[Laughter.]

HEARING CO-CHAIR GOODWIN: But Dr. Chang at the end of her testimony alluded to the challenge of retraining displaced workers and what happens to these towns and states and regions that have been heavily dependent on a single industry, and it's a challenge because training only goes so far as an available job will take you, and even if the job is available, you need economic mobility to get there, and when I saw that study, I was really looking forward to talking with you about it because it may present an opportunity where that industry in my state and around the entire country is facing real challenges when it comes to electricity generation now, not only from a regulatory standpoint but certainly from competition with cleaner burning fuels and the exhaustion of available identified reserve.

In any event, thank you all for the time.

MR. GOODRICH: And the materials market is sizable and there is a whole lot of specialized companies that provide into that, many of them that are headquartered in the U.S. In fact, companies like Dow Corning and others have semiconductor materials divisions--gases, slurries, and other types of things. And there's a lot of industry here in the U.S. that supports that.

HEARING CO-CHAIR GOODWIN: Thank you.

Unless my colleagues have any more questions--

VICE CHAIRMAN BARTHOLOMEW: No.

HEARING CO-CHAIR GOODWIN: --I think that will do it. Thank you all for your time, and we will break until 1:30. Thank you.

[Whereupon, at 12:26 p.m., the hearing recessed, to reconvene at 1:30 p.m., this same day.]

PANEL III INTRODUCTION BY CHAIRMAN DENNIS SHEA

CHAIRMAN SHEA: Good afternoon. We'll reconvene. Our final panel today will explore how the Chinese government is seeking to improve its citizens' quality of life by addressing pollution, unemployment, income inequality, and the accessibility and affordability of healthcare services. This panel further examines the implications of China's focus on urbanization, healthcare, and environment on the United States or for the United States.

First we'll hear from Ms. Deborah Seligsohn. Ms. Seligsohn is a Ph.D. candidate at the University of California San Diego. Her research focuses on China's energy and environment reforms, specifically air pollution regulations, and broader developments in environmental governance.

From 2007 to 2012, she worked as the principal advisor to the World Resources Institute's China Energy and Environmental Program. She has more than 20 years of experience at the State Department working on energy and environmental issues in China, India, Nepal, and New Zealand. She regularly publishes articles for ChinaFile, ChinaFAQs, China FAQs, and the Huffington Post, and is a contributing author to the forthcoming Commission-contracted report, "Planning for Innovation: Understanding China's Plans for Technological, Energy, Industrial and Defense Development."

Ms. Seligsohn, welcome.

MS. SELIGSOHN: Thank you.

CHAIRMAN SHEA: Thank you.

Next we have Damien Ma. Mr. Ma is a fellow and Associate Director at the Paulson Institute and an adjunct lecturer at the Kellogg School of Management at Northwestern University.

Previously, he was a lead analyst on China and Mongolia at Eurasia Group, where he specialized in energy, industrial policy, social policies and U.S.-China relations. His articles and papers have been published in numerous outlets, including Foreign Affairs, the New York Times, The Atlantic online, among others. He is a member of the Council on Foreign Relations, and in 2012 he was named a "99 Under 33" foreign policy leader by the Young Professionals in Foreign Policy. It's nice to be--I remember those days.

[Laughter.]

CHAIRMAN SHEA: I wasn't one of the "99" though.

He is a co-author of In Line Behind a Billion People: How Scarcity Will Define China's Ascent in the Next Decade.

Welcome.

MR. MA: Thank you.

CHAIRMAN SHEA: And finally, we have Dr. Yanzhong Huang, Senior Fellow at the Council on Foreign Relations. He is also a Professor and Director of Global Health Studies at the School of Diplomacy and International Relations at Seton Hall University. Still in the Big East, I think.

DR. HUANG: Yes.

CHAIRMAN SHEA: He developed the first academic--which a plus--he developed the first academic concentration combining both foreign policy and security aspects of health issues at U.S. professional schools of international relations.

Dr. Huang has written extensively on global health governance, health diplomacy, and health security and public health in China and East Asia. He recently wrote a book that

assessed China's healthcare reforms and the government's ability to address disease outbreaks and food and drug safety entitled Governing Health in Contemporary China.

Doctor, thank you very much for being with us.

DR. HUANG: Thank you.

CHAIRMAN SHEA: It's our practice for witnesses to keep their oral remarks to about seven minutes, and then we'll pepper you with what hopes to be lots of questions.

So, Ms. Seligsohn, we'll start with you, please.

OPENING STATEMENT OF MS. DEBORAH SELIGSOHN, PH.D CANDIDATE, UNIVERSITY OF CALIFORNIA, SAN DIEGO

MS. SELIGSOHN: Thank you. Good afternoon, and thank you for the opportunity to speak with you today on China's newly passed 13th Five-Year Plan.

Simply put, the 13th Five-Year Plan represents a step-change in efforts to rein in energy growth and improve the environment. It builds on ten years of effort in China which has begun to show real and documentable results. We can expect more, particularly in terms of greenhouse gas and air pollution control. But real challenges remain, especially in other areas, such as soil and water.

There are some business opportunities as China gets more serious about measuring, monitoring and enforcing its regulations, but overall the energy industry is a very domestic industry.

To elaborate further, there is no denying that China suffers from its heavy use of coal and legacy of poor energy planning and environmental regulation. 1.2 million people die each year of air pollution. China itself rates most of its rivers and lakes as poor quality in terms of pollution. Energy intensity is still four times that of the United States, and it's higher than in other developing countries in Asia, such as India and Indonesia.

But there are several positive trend lines. The most dramatic is new information that came in an academic paper last year looking at NASA satellite data that shows that China's air pollution levels on the North China Plain, the most polluted part of China, have been dropping steadily since 2011.

Greenpeace also examined that NASA data for the whole country and found that almost every city in China has seen a drop in air pollution since 2011. It's from a very high level so it's not good; it's just going in the right direction. And this is really good news, not only because it's an improvement in air pollution but because it also corroborates China's own nationwide system of air pollution monitoring.

On energy, we also see progress. Energy intensity is declining. In the last Five-Year Plan, it declined by 18.2 percent, and it did about the same or a little more in the previous five years. We've seen a remarkable growth in non-fossil fuel power generation, particularly hydro, but also nuclear, and China is the world leader in newly installed wind and solar power.

We have seen ten years of progress, and it's built on the adoption in 2006 for the first time of hard targets in the 11th Five-Year Plan--hard targets meaning those that are absolutely required--a national policy of "Energy Efficiency and Pollution Abatement" in 2007, and then the elevation of environmental protection to ministry status in 2008.

But this 13th Five-Year Plan once again raises the bar. More than half of the hard targets in the plan are about energy and the environment. Moreover--so its goals are comprehensive, and enforcement is also going to increase. Premier Li Keqiang stated in his Work Report to the National People's Congress that those who violate environmental regulations and those who fail to report violations will be, in his words, "severely punished."

Trends in the larger economy combined with the effort to meet planned targets augur well, both for reducing air pollution and for slowing the growth and ultimately peaking greenhouse gas emissions. China's Paris commitment is to peak greenhouse gas emissions in 2030 and to make best efforts to peak earlier. This five-year plan's energy goals make early peaking more likely.

Moreover, since the plan was announced, the Chinese government has moved to

close unnecessary coal plants and to address the problems at State Grid, the national grid company, that have prevented the optimal use of renewable energy on the grid.

China's coal use actually peaked in 2013 and has already been declining for the last two years. Whether this is the ultimate peak in coal is hard to say yet. Two years don't make a trend, but significant increases seem very unlikely.

Despite all this progress, significant challenges remain. Global attention tends to focus on air pollution and climate gases, but water problems, both of pollution and of scarcity, and soil pollution are at least as serious problems for the Chinese people. A water consumption cap was one target that the Chinese did not meet in the 12th Five-Year Plan. There is a new cap, and it's somewhat less ambitious than the previous one.

There are plenty of opportunities in China for further water conservation, even though the Chinese have made advances in everything from drip system irrigation to using air cooling for some of their power plants. Water quality is also an enormous challenge.

The Chinese reported progress on both the water metrics it had in the 12th Five-Year Plan. Whether that is really as good as it says I'm not sure because monitoring water quality is actually much more difficult, and it's far less comprehensive than for air quality. I think to tell what the long-term trajectory is is going to take a little more time.

Soil pollution is even a greater challenge because once there's pollution in the soil, removing it is very difficult. This plan calls for a number of experiments actually to try to see if they can figure out how to get pollution out of the soil.

Both soil and water pollution have a higher priority in this five-year plan, and I think this is because of the ever-growing public concern about food safety. Both have been shown to contribute to the food safety problem in China, and that's of enormous concern to the public.

So these commitments do bring with them some opportunities for business. One is where there are new technologies. I think everybody knows about the Westinghouse AP1000 sales to China. When there is topnotch technology, the Chinese are often interested. There are other synergistic industries, like solar, where Chinese companies do buy U.S. manufacturing lines, and of course U.S. companies then buy a lot of their intermediate product from China.

But the area I think where there may be some real opportunities is in measuring and monitoring. The Chinese are very serious about looking at more careful enforcement, and they will want more technology. They've already been adding a lot of technology to their enforcement.

So overall, I think the five-year plan--does it contribute to an improvement in quality of life for Chinese citizens? The reductions in air pollution and climate change certainly have global benefits, but there's an awful lot more, and there are certainly many challenges that the Chinese still face.

Thank you.

PREPARED STATEMENT OF MS. DEBORAH SELIGSOHN, PH.D CANDIDATE, UNIVERSITY OF CALIFORNIA, SAN DIEGO

How China's 13th Five-Year Plan Addresses Energy and the Environment

Deborah Seligsohn
PhD Candidate, Political Science and International Relations,
The University of California, San Diego

Testimony before the U.S.-China Economic and Security Review Commission
Hearing on China's 13th Five-Year Plan
Panel III: Quality of Life Priorities

April 27, 2016

Thank you for the opportunity to contribute to the deliberations of this Commission. My name is Deborah Seligsohn, and I am both a current PhD student at the University of California, San Diego, focused on Chinese environmental governance, and a long-time observer of China's energy and environmental performance, with over 17 years' experience living in China over the past thirty years.

I am delighted to speak with you today about China's plans for energy and environment contained in its 13th Five Year Plan, released at its National People's Congress last month. The 13th Five Year Plan represents the Chinese government's most significant commitment to addressing China's energy and environmental challenges to date. Of the 33 major targets listed in the document, 16 of them concern the environment and resource use. These cover a broad range of environmental issues from those that are frequently covered in the international press, particularly air pollution, to equally critical issues for Chinese people's health and livelihood, including forest cover and water quantity and quality. China's international climate change commitments are also embedded in the plan with a five year target for carbon intensity, as well as the key measures to reach that goal, energy intensity and non-fossil fuel development.

While this Five Year Plan devotes more attention to environment and resource issues than previous plans, it follows a clear policy trajectory that has developed and strengthened over the past decade. China first adopted what it calls "hard targets" for key energy and environmental indicators in the 11th Five Year Plan (2006-2010), and then added more such targets in the just-completed 12th Five Year Plan (2011-2015). 2006 marked a significant change in Chinese environmental policy. In addition to imposing hard targets for the first time, the Chinese government named "Energy Efficiency and Pollution Abatement" as a "National Policy." This put "Energy Efficiency and Pollution Abatement" on the same level as other key national policies, including "Reform and Opening," the overarching policy that has framed China's reform era since 1979, and the Birth Limitation Policy (often called the one-child policy). As in these other cases, naming a national policy signals to local governments and industry the central government's serious intention to implement. Moreover, the government followed up in 2007 by raising the level of its environmental enforcement apparatus to full ministry status.

Major Improvements in the Past Decade

This new seriousness was followed by results. The most dramatic has been in the reduction in sulfur dioxide pollution, which began to be regulated rigorously in the 11th Five Year Plan (other air pollutants were added in the 12th). The latest NASA satellite data analyzed by a team led by Dr. Nickolay Krotkov at NASA's Goddard Space Flight Center shows that sulfur dioxide pollution over the North China Plain (the most polluted area in China) peaked in 2007 and has now fallen by fully half.[1] The same scientific paper shows that nitrogen oxides peaked in 2011 (coinciding with their inclusion in the 12th Five Year Plan), after having risen rapidly over the preceding years, and are now back to the level they were in 2005. Indeed, Greenpeace examined NASA's data, not just for the North China Plain, but for the entire country, and found that air pollution has improved steadily since 2011 in almost all parts of the country. Greenpeace found for the nation as a whole PM 2.5 declined by 17%.[2] China has experienced similar success with other energy and environment targets, as shown in chart 1 below.

This information may seem new or surprising to many. The reality is simply that China is starting from a very low baseline – air, water and soil quality are all poor. Before 2005 China's energy efficiency had actually worsened for several years. Turning such a large ship around is neither easy nor quick. But the clear trends over the past decade, particularly in both air pollution and in energy policy, have been toward improvement. Some of this progress, such as the major improvements in energy efficiency that have driven most of China's climate-related policies to date, are not observable to the public. Others are simply masked by daily variability and the poor baseline from which China starts. On bad days, for example, air quality in some of China's cities can be twenty times a truly clean level. It is not easy for the general public to observe the difference between ten and twenty times good air quality. This is the work of multiple five-year plans. There are clear indications that this 13th Five Year Plan is designed to make significant progress on both the energy and environmental fronts.

Increasing Accountability

As I'll discuss further below, many of the targets in the 13th Five Year Plan take the next expected step from the previous five year plans – new targets for various pollutants, greater ambition in pollution reductions and in shifting to cleaner energy. But two aspects of the plan point to intensified scrutiny of local governments as institutions and of the officials themselves. Localities now face hard targets not just for specific pollutants, as had been the case in the 11th and 12th Five Year Plans, but for overall ambient air quality improvements. One of the most remarkable aspects of China's progress, as Greenpeace outlined in advocating Chinese-style air pollution policies for India, has been the network of air quality monitoring stations in over 400 cities.[3] There is simply no other country in the developing world with this level of capacity to

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[1] Krotkov, N. A., et al. "Aura OMI observations of regional SO 2 and NO 2 pollution changes from 2005 to 2014." *Atmospheric Chemistry and Physics Discussions* 15.19 (2015): 26555-26607. http://www.atmos-chem-phys.net/16/4605/2016/acp-16-4605-2016.pdf

[2] Greenpeace India, "Clean Air Action Plan: The Way Forward," February 2016. http://www.greenpeace.org/eastasia/Global/eastasia/publications/reports/climate-energy/2016/Clean%20Air%20Action%20Plan,%20The%20way%20forward.pdf

[3] Ibid.

track its own emissions. As a result Chinese policy is able to move from one of the key building blocks of an effective air pollution control system, namely regulating sources (like vehicles and power plants) to also regulating the overall mix of pollutants in the air and holding localities responsible for adjusting limits to respond to weather changes. In other words, on "bad air days" cities are required to do more. The new target in the Five Year Plan, which requires cities to meet "good" or "excellent" standards, defined as scoring below 100 on China's 0-500 Air Quality Index (AQI), builds on the Regional Air Quality regulations announced in May 2010,[4] and the specific plan under those regulations, which was issued in September 2013.[5]

I can tell you from field visits I've conducted in several provinces over the last three years that the new air quality regulations have resulted in substantial upgrades in pollution abatement equipment, particularly in power plants. At the same time they have also challenged local governments to develop much more sophisticated air quality management modeling and program design. To reduce pollution when the weather is exacerbating the production of secondary pollutants in the air – the pollutants we really care about, PM 2.5 and ozone – requires a sophisticated understanding of both the sources and the potential abatement strategies. Many of China's best academic experts are involved in helping localities develop this capacity. It is not easy, and it isn't clear that all localities will be able to do so by the 2017 deadline contained in the 2013 plan. Nonetheless, the pressure to do so is resulting in material improvements, as we can see from the data I cited above.

But this plan goes beyond holding localities responsible to emphasize the responsibility of individual polluters and officials. In his Work Report[6] to the National People's Congress Premier Li Keqiang stated that both those who violate environmental regulations and those who fail to report violations will be "severely punished." This is the first time such a statement has been made at the National People's Congress, and again serves to underscore the seriousness with which the central leadership is addressing environmental issues.

Capping Dirty Energy

The Five Year Plan delivers a comprehensive set of targets for controlling the growth of carbon emissions and ultimately peaking them. In China's Independently Determined National Contribution (INDC), submitted to the United Nations Framework Convention on Climate Change in June 2015, the Chinese government promised to peak carbon emissions by 2030 and also make "best efforts" to peak earlier as well as to lower greenhouse gas emissions per unit GDP by 60-65% below 2005 levels. This follows on the Copenhagen commitment to lower emissions by 40-45% below 2005 levels by 2020. The 13th Five Year Plan target embeds the 2030 commitment and actually increases its ambition for 2020 as shown in figure 1 below.

Perhaps the most striking aspect of the Five Year Plan is that it also sets a total cap on energy

[4] A full translation of the regulation is available at http://www.chinafaqs.org/library/chinas-new-regional-air-quality-regulation-translated.
[5] "The State Council Issues Action Plan on Prevention and Control of Air Quality Introducing Ten Measures to Improve Air Quality," Sept. 12, 2013. http://english.mep.gov.cn/News_service/infocus/201309/t20130924_260707.htm
[6] http://www.nytimes.com/interactive/2016/03/05/world/asia/china-li-keqiang-work-report-full-text.html?_r=0

consumption, at 5 billion tons coal equivalent (or TCE)[7] in 2020. 2015 energy consumption was 4.3 billion TCE, a rise of less than 1 percent from the previous year. Thus, while setting an outside limit on energy consumption growth is an important policy step, this particular target aligns with reforms already well underway, in particular the dramatic decline in coal use. Coal consumption actually peaked in 2013, and fell 2.9% in 2014 and 3.7% in 2015. Indeed some observers believe that China's carbon emissions may have actually fallen in 2015. Robert Jackson of Stanford University and fellow researchers estimate that Chinese emissions fell 3.9% in 2015 with a margin of error that still shows a decline, with a range of -1.1% to -4.6%.[8] It is still too early to tell whether this is the ultimate peak for both coal and carbon. More likely, we will see fluctuations for several years before we see a steady trend. Nevertheless, the most recent figures do suggest merit to the argument by analysts, such as Dr. Jiang Kejun at China's Energy Research Institute, who suggest that early peaking is likely.[9]

The 13th Five Year Plan's energy policy is to continue to increase energy efficiency (measured by energy intensity, energy consumed per unit GDP) and to increase the use of non-fossil energy. Energy efficiency improvements have been the major portion of China's reductions in carbon intensity to date. These have mainly focused on upgrading technology in heavy industry and the power sector. Because industry has been China's dominant energy consumer, that strategy has been effective, and indeed, there continues to be room for efficiency gains here. China's vehicle efficiency standards are also comparable to those in the United States.[10] To continue to improve efficiency, the Chinese are going to need to make gains in areas where consumption is more dispersed. This includes small-scale manufacturing, buildings and commercial users, all of which are mentioned in the current five-year plan.

While heavy industry can benefit from efficiency improvements, the real gains in energy efficiency and greenhouse gas and pollution reduction in this sector will come from cutting overcapacity, in other words, not operating unnecessary plants. There are some indications that the Chinese government has become serious about overcapacity. Reuters reported just this past week that the Chinese government has announced plans to cut capacity in both steel and coal, including a fund of RMB 100 billion ($15.45 billion) for those made unemployed.[11] In late March, the National Energy Administration also halted construction of power plants in 15 regions that were experiencing power oversupply.[12] If the Chinese government can maintain these policies, the goal of peaking greenhouse gas emissions earlier than the 2030 target becomes realistic.

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[7] TCE is the metric the Chinese use to capture energy consumption from all sources, similar to the use of total oil equivalent used by the World Bank and most other institutions as a measure of primary energy use. Because China relies heavily on coal, it has always used coal equivalent, rather than oil equivalent for these metrics.

[8] Jackson, Robert B., et al. "Reaching peak emissions." *Nature Climate Change* (2015).

[9] Fergus Green and Thomas Spencer, "Models of China's future emissions have got it wrong," *China Dialogue*, August 12, 2015. https://www.chinadialogue.net/article/show/single/en/8422-Models-of-China-s-future-emissions-have-got-it-wrong-

[10] Hui He and Anup Bandivadekar, "Passenger car fuel-efficiency, 2020-2025; Comparing stringency and technology feasibility of the Chinese and US standards," The International Council on Clean Transportation, August 2013, document that the Chinese and US standards are similar, although because Chinese cars are smaller on average, meeting the standard is less challenging. http://www.theicct.org/pv-efficiency-standards-china-us-2020-2025

[11] David Stanway and Ruby Lian, "Update 1-China to strictly control credit for new coal, steel projects," *Reuters*, April 21, 2016. http://www.reuters.com/article/china-overcapacity-idUSL3N17O2DY

[12] Diarmaid Williams, "China tackles overcapacity by halting coal power plant construction," *Power Engineering International*, March 28, 2016. http://www.powerengineeringint.com/articles/2016/03/china-tackles-overcapacity-by-halting-coal-power-plant-construction.html

Looking to the future, fuel switching becomes a much more important part of the total effort to reduce carbon intensity and an important part of the pollution reduction story. The 13th Five Year Plan follows on the pattern in previous plans in encouraging development of all non-fossil sources. While much international attention has focused on solar and wind power, where indeed China is now the top producer and installations are growing at a prodigious rate, it is worth noting that hydropower continues to be the largest non-fossil source in China, and nuclear is growing rapidly. Figure 2 below shows the percentage of electricity produced from China's major power sources in 2014.

Thermal power in this chart includes both coal and natural gas, but natural gas use in power is minimal. Solar power production is as yet so small as to not register in these national statistics, but capacity has grown 13 fold since 2011. Nuclear and hydro fit in well into China's traditional grid management. Solar and wind's fluctuations and intermittency have proven to be technical challenges, while its distribution in the country (mainly in the north and west) has reportedly left State Grid with insufficient lines to transmit the power to demand centers. In March, State Grid Chairman Liu Zhenya announced a program to spend RMB 2.3 trillion ($355 billion) over the next five years to address the problem.[13] This development is essential to the Plan target to have non-fossil energy comprise 15% of the total energy mix by 2020 and 20% by 2030.

Cleaning the Air

While fuel switching helps improve air quality, the reality is that coal will be the largest energy source in China for decades to come, and oil as a transport fuel, is also an important part of the mix. As a result, end of pipe pollution abatement strategies are still a critical component of China's effort to improve air quality. As noted above, local governments are under considerable pressure to improve air quality performance. And so are major industries. In particular, the power sector has been out in front with new standards, proposing their own "ultra low emissions" standard for coal-fired power plants, which they argue would make coal plants' emissions comparable to natural gas plants. In interviews in Jiangsu and Shandong provinces over the past several years, I've found the provinces increasingly likely to require new power plants be either gas or non-fossil energy, while the power sector is concerned about gas cost and supply. To counter this trend the power sector has produced this new standard.

The challenges in meeting China's standards come in other sectors. About half of China's coal is used outside of the power sector. Thus, enforcement of other heavy industries is also critical. China still has numerous small-scale boilers and households using coal. Moving these small-scale users to electricity or gas is important, both to reduce ambient air pollution, and in the case of households to reduce even more lethal indoor air pollution. Chinese cities have been building combined heat and power plants and providing piped gas, and both of these trends are slated to continue under the current plan.

A major addition to the 13th Five Year Plan is a 10% reduction target for Volatile Organic Compounds (VOCs), which are a major contributor to both PM 2.5 and ozone pollution. VOCs

[13] Feifei Shen, "China's Grid Blames Bad Planning for Idled Renewable Energy," *Bloomberg*, March 30, 2016. http://www.bloomberg.com/news/articles/2016-03-30/china-s-grid-blames-bad-planning-for-idled-renewable-energy

are emitted not just from fossil fuels (though vehicles are a major source), but from paints, solvents and industrial processes. Thus, regulation will be more of a challenge than for some of the other pollutants.

Chinese vehicle standards have been improving over the years, but the quality of fuel in them has lagged behind. The 13th Five Year Plan also prescribes that vehicle fuel be produced suitable for cars and trucks at the China V (essentially Euro V) emissions standard, a standard adopted in the European Union in 2009. The challenge to date has been that the petroleum industry has failed to produce high-quality fuels. This issue was the target of the on-line documentary "Under the Dome" last year and has been a persistent concern of the Ministry of Environment (which endorsed the film before it was removed by censors).

The reality as noted above is that air quality is improving, but it is not yet become noticeable to the public. We can expect to see continued improvements over the course of this plan. The addition of NO_x in the 12th Five Year Plan and now VOCs in the 13th suggest that China should be able to make significant progress in air quality. The Ministry of Environmental Protection has suggested that truly cleaning the air is a 15-year task, and given the percentage reduction targets that are used in these plans, that sort of a time frame seems realistic.

Cleaning Up the Water and Soil

In addressing public health and safety, water and soil pollution continue to be critical issues. China faces both water quantity and quality issues. The Premier's work report cited "relatively poor" water quality and "severe" over-extraction of groundwater in some regions. Unlike the energy and air pollution goals, which were met or exceeded the last Five Year Plan, China failed to meet its target to cap total water consumption at 600 billion cubic meters. Consumption was 618 billion cubic meters in 2015, and the new cap is set at 670 billion cubic meters. To stay within this cap the Plan also sets a target of reducing water consumption per unit GDP by 23% over the next five years. While China faces real limitations on water supply – its per capita water availability is only 1/3 the world average – numerous researchers have suggested approaches to reducing excess water use, from changing pricing policies to shifting agricultural use from water short (i.e. North China) to more water rich (Southern China) areas.[14] Many reforms have been implemented, at least partially, including the use of local water users groups or canal managers and shifting the types of crops produced in the greater Beijing area. However, more complete implementation would yield greater savings. These reforms are not necessarily popular at the local level, and it isn't clear how high a priority these goals are.

Another approach to improving water supply would be to improve water quality, an issue that does appear to have some greater urgency among Chinese policymakers. If the water were cleaner, more of it would be available for use. Perhaps more importantly in terms of the political profile of the issue, both water and soil pollution are associated with the Chinese public's grave concerns about food safety. A recent scientific article with lead authors from the Chinese Academy of Sciences, for example, found an association between both water and soil pollution,

[14] See, for example, Dalin, Carole, et al. "Balancing water resource conservation and food security in China." *Proceedings of the National Academy of Sciences* 112.15 (2015): 4588-4593.

unsafe food, and an even scarier topic for the Chinese public, "cancer villages."[15] Food safety is regularly discussed in the Chinese-language press from all angles, including the concern of its association with pollution.

Both industry and agriculture are major sources of China's water pollution, while agricultural chemical use is the major contributor to soil pollution. The two water pollution targets in the 13th Five Year Plan address two different types of pollution. The first, chemical oxygen demand (COD), was listed as a hard target a decade ago. It addresses the type of chemical discharge typical of industry. In the 12th Five Year Plan, five years ago, the Chinese government added ammonia nitrogen, a measure of the pollution caused by organic waste and fertilizer mainly from households and farms. The current plan doesn't add a specific soil target, but it proposes a number of pilot programs to test how to ameliorate the chemical problem in soil. While industrial pollution is relatively straightforward to address, because it is concentrated and pollution abatement equipment can be installed, agricultural pollution is much more difficult. It is known as non-point source, because the sources are so diffuse. The challenges China is facing are not distinct, but in a densely populated country with so many households, farms and livestock, the challenges are significant. Moreover, pollutants can accumulate, especially in the soil. Thus, these issues are likely to continue to be a challenge well after we see cleaner air and lower carbon emissions.

Absorbing Carbon

An often overlooked component of China's environmental record is its success in increasing its forest cover from just 8.6% of its landmass in 1949 to over 21% today. Both the 13th Five Year Plan and the China's climate commitments contain plans to continue to increase forest cover – up to 23% in 2020. Chinese forest policy has been criticized in the past for emphasizing area over forest quality and forests over grasslands. We see attempts to remedy both issues, although the remedy will not answer all critics – especially those that emphasize species variety. China's climate commitment contains a commitment on forest stock volume rather than just area of coverage. The Five Year Plan also contains a target for grassland vegetation.

Improving Quality of Life

Overall, the 13th Five Year Plan looks likely to contribute to improving quality of life for most Chinese. China has already solved one of the great challenges for most developing nations – enabling access to commercial energy. Almost all Chinese have access to electricity. Over the next five years, we can expect that energy to become cleaner as the coal-fired power industry continues to clean up its act, and renewables and nuclear energy become a larger part of the total mix. It also seems likely that the Chinese will be able to address some of the major grid problems that have prevented full utilization of its rapidly growing solar and wind resources. What had been less clear was whether they would be able to prevent overbuilding in the thermal power sector, but most recent reports on shutdowns are promising.

Greater challenges exist in cleaning up other sources of air pollution – in particular small-scale

[15] Lu, Yonglong, et al. "Impacts of soil and water pollution on food safety and health risks in China." *Environment international* 77 (2015): 5-15.

industry and vehicle fuel. The level of focus on these issues in this plan is promising, as is the emphasis on local and professional accountability. Water and soil, too, are much more of a challenge than energy and air. The level of concern about food safety suggests that these issues are now a higher priority, but translating that priority into real improvements will be a challenge.

One critical issue in quality of life is safety, and the last year has had a number of incidents that have highlighted poor safety in China, including the Tianjin warehouse explosion. The plan includes both a national survey to look for dangerous pollutants and provisions to upgrade China's nuclear safety apparatus.

What is Driving this Change?

There is considerable disagreement among observers on what forces are driving this effort to clean up in China. There is fair consensus that there is commitment from the top. We've seen President Xi Jinping publicly support environmental efforts, particularly the two agreements he signed with President Obama, his attendance at the COP and support for the Paris Climate Agreement, and his signing of the Agreement on Earth Day along with other world leaders. We also have long had indications that the Chinese Ministry of Environmental Protection (MEP) wished to play a more forceful role and sought greater power to enforce environmental regulations. The previous Minister of Environmental Protection Zhou Shengxian initiated letters to the public on the MEP website outlining initiatives. MEP officials have also always been much more open to the press, including the local Chinese press, than other government ministries. The current Minister of Environmental Protection, Chen Jining, is a prominent academic expert on water quality and former President of Tsinghua University, one of China's top universities.

The airing last year of the web video "Under the Dome" demonstrated both the extent and the limits of the Ministry's efforts to engage the public. The film, by independent journalist Chai Jing, engages with China's air pollution crisis in a manner quite similar to that of Al Gore's "An Inconvenient Truth," combining a lecture from a stage with reported video and interviews. A number of office directors from MEP appeared on camera for frank interviews about the causes and solutions to the air pollution problem. As a former bureaucrat myself, I think it is safe to assume that office directors don't appear on film without the boss's permission. Given the timing, the film was likely made during the previous minister's tenure, but Chen endorsed it when it came out. Perhaps more well-known in the West, at least in China-watching circles, is that the Chinese censors removed it from the web after 4 days, which was also after some 250 million people had viewed it. While this was certainly a blow for free speech, it is less clear that it was a blow to the effort to control air pollution. Surely among the 250 million viewers were many if not most of the intended target audience. Moreover, we've seen no evidence that Minister Chen has suffered politically from his original endorsement.

While public engagement has been one of the Ministry's strategies, it has also focused heavily on improving top-down accountability. It has created regional offices covering multiple provinces and modeled after the US Environmental Protection Agency's regions to supervise and inspect the provinces. It has also required considerably more automated monitoring, both of ambient pollution levels and pollution from fixed sources. And it has revised and implemented tougher

laws with more precise regulatory requirements.

At the same time there is certainly significant demand for environmental improvements from the general public. Whether public concern has driven central government attention is less clear. The bulk of the discussion of air pollution on line is centered in major cities. In contrast, the improvements we've seen have not been not restricted to the cities where public interest is greatest, but have occurred throughout China. Moreover, public concern rose rapidly after the "air-pocolypse" of 2013, while improved air quality can actually be dated to 2011, while the first major improvements in individual air pollutants began in 2007. These changes reflect the timing of the previous two Five Year Plans. Moreover, air quality is the type of public good that if Chinese leaders want it for themselves, they need to supply it to the general public.

The public and the media do actively engage on environmental topics. While no topic avoids censorship, a relatively large amount of information is available in china.

Civil society also involves non-governmental organizations (NGOs). Overall the NGO movement in China is weak. Chinese NGOs are restricted in how they can raise money, register and recruit members. Most are quite small. In the capital most depend on project funding from international donors and to some extent are perceived by others in China as project contractors more than as civil society. The only groups with actual members don't take international money, which considerably restricts their ability to expand.

Despite these limitations, NGOs have had an influence. There are a number of environmental innovations that do seem to stem at least in part from the efforts of environmental NGOs. The three I list below all have a significant aspect in common – they propose a simple idea that can make a real difference to a specific problem. While international academic and regulatory experts have made enormous contributions in everything from assisting with monitoring apparatus to solving problems with wind power intermittency, NGOs seems to be particularly good at proposing straightforward solutions to certain types of problems. Three stand out.

- The coal cap. This was an effort pushed by a consortium of NGOs. While the Chinese government was long at work on air pollution mitigation measures, the idea of simply capping coal stems from the NGO community, and was led by Dr. Yang Fuqiang, now at the Natural Resources Defense Council. This idea has now been applied to both coal and total energy.
- Banning free plastic bags at grocery stores. This was an initiative developed by Sheri Liao of Global Village of Beijing. It began as a bottom up initiative and was then embraced by various local governments. The key insight here was that such a rule helps local governments save money by reducing trash.
- The 26 degree campaign. This again is a bottom up initiative then embraced by government as an energy and cost-saving measure. The idea, which was copied from Japan, was to pledge to lower thermostats in summer to no lower than 26 degrees Celsius (or 78.8 F).

There are others, as well, including initiatives to regulate China's international forest practices, and a large number of areas where NGOs work often in combination with others including

government to create policy. In the climate area, a large number of NGOs have been active and have provided considerable policy advice. NGOs have also been active in advocating for information transparency, including efforts to put more environmental information on the web.

At the same time there are also very local groups, some organized, many not. Many are involved in opposing specific projects. Some of this opposition is rooted in environmental principles. There are projects that are polluting or dangerous. Other opposition groups are involved in what is known as NIMBY (not in my backyard) protests, a phenomenon we also see in other countries, but which is a new challenge for China. Indeed a great deal of Chinese academic work on the environment is focused on the NIMBY issue. Still other local groups are more educational or public service oriented.

A Huge Domestic Industry

The Chinese have supplied the bulk of their energy infrastructure themselves for decades. Opportunities typically arise in areas where there are new technologies or approaches that international companies can market. Some of these do exist in the new energy area. China has purchased a number of Westinghouse power plants, for example. The solar industry is also one with quite a bit of synergy, as Chinese companies purchase the manufacturing equipment often from US venders, and then US companies provide a great deal of the value added at the installation end, as well.

Coal-fired power has been an almost entirely domestic endeavor, and China is now the leading low-cost producer of modern coal-fired power plants. The same has rapidly become true of pollution abatement technology. The reality is that most of the end-of-pipe technologies in use were developed decades ago and are essentially commodity products. Chinese producers rapidly came to produce flue gas desulfurization (FGD, for SO_2) and selective catalytic reduction (SCR, for NO_x) at considerably lower cost than imported models. As domestic demand becomes saturated, we can expect Chinese companies to increasingly market these technologies abroad. China has long been a major international dam builder, and is now exporting large numbers of coal-fired power plants, as well.[16] This supply of relatively low-priced technology has both risks and benefits, since many developing countries still need to supply more energy to their populations, and Chinese companies can offer pollution abatement at a relatively low cost. At the same time, low-cost coal power may lead some producers to choose it instead of less carbon-intensive options. China, of course, is also a major exporter of more carbon-friendly options, like wind and solar, and its current ambition is to export more nuclear power plants, as well.

Opportunities for international companies exist where they can provide solutions to challenges the Chinese are facing. The Chinese are trying to reduce both greenhouse gas emissions and air pollution. Current air pollution technologies use considerable energy, for example, so new less energy intensive technologies might be attractive. Another key opportunity is in monitoring technologies, and a number of companies are active in this area. All the targets in the 13th Five Year Plan require monitoring of industries and localities. The Chinese have already installed continuous emissions monitoring systems (CEMS) on all its power plants and on a number of

[16] Hannam, Phillip M., et al. "Developing country finance in a post-2020 global climate agreement." *Nature Climate Change* 5.11 (2015): 983-987.

other large facilities, as well. CEMS data is available in real-time to local enforcement officials on their smart phones and in provincial and central government offices. But small facilities are monitored through spot inspections, which are much easier to defeat. Lower cost monitoring that allowed officials to track small-scale boilers and factories in real-time would be highly valuable.

Programs that promote public-private partnerships are an effective way to fully engage with Chinese partners. The Clean Energy Research Centers have been one such effective approach. An area like carbon capture and storage offers real synergies, because the US has expertise in storage, while the Chinese have done a great deal of capture work. The real issue is that both sides need to bring something to the table, including funding, for these programs to be sustainable.

Safety is another area where there is a need for solutions. The US and China have longstanding nuclear cooperation on both the safety and security sides. This is definitely an area with opportunities, not just for government-to-government cooperation, but for companies with good solutions for energy sector monitoring and prevention.

Overall, a cleaner China is a real opportunity for the United States. China's focus on greenhouse gas emissions reductions is critical to a major global goal. Its pollution abatement is mainly good for the Chinese people, but it also does reduce the amount of pollution coming across the Pacific. China has already shown itself to be an effective partner in the lead-up to Paris. The type of leadership Presidents Obama and Xi applied to the climate talks could be applied to other areas.

The slowing growth of China's energy demand and its greater diversification are also good trends for energy security. China's government is no longer worried (as it was a decade ago) that it has to face ever-rising energy demands. This should enable the two countries to coordinate somewhat more easily in addressing problems in resource rich states.

The concern is how all of this development affects markets. The reality is that strong investment on energy development at home makes a country's industries more competitive overseas. We've seen that with China's coal sector. Having built coal-fired power plants for the domestic market, China is now exporting them. The Chinese wish to apply this model in additional energy areas. But this approach can work for the US, as well. Investing in clean power and new environmentally friendly technologies for the US market will assist those companies in then marketing their products to other nations. The US has a great deal of innovative technology. The best way to show it is valued is to use it at home.

Charts

Chart 1. Key Energy and Environment Outcomes and Targets

	12th Five-Year Plan (FYP)'s Targets (Compare to 2010 level)	**12th Five-Year Plan (FYP)'s Achievements (Compare to 2010 level)**	**13th Five-Year Plan (FYP)'s Targets (Compare to 2015 level)**
Energy Intensity (Energy Consumption per Unit of GDP)	-16%	-18.2%	-15%
Carbon Intensity (Carbon Emissions per Unit of GDP)	-17%	-20%	-18%
Non-Fossil Fuel Percentage	11.4%	12%	15%
SO_2	-8%	-18%	-15%
NO_x	-8%	-18.6%	-15%
Ammonia Nitrogen	-10%	-13%	-10%
Chemical Oxygen Demand (COD)	-10%	-12.9%	-10%
Forest Coverage	21.7%	21.63%	23.04%

Source: Seligsohn and Hsu, "How China's 13th Five-Year Plan Addresses Energy and the Environment," ChinaFile, March 10, 2016.

Figure 1. China's carbon intensity in context[17]

[17] Geoffrey Henderson, Ranping Song and Paul Joffe, "5 Questions: What does China's new Five-Year Plan mean for Climate Action?" March, 18, 2016. http://www.chinafaqs.org/blog-posts/5-questions-what-does-china%E2%80%99s-new-five-year-plan-mean-climate-action

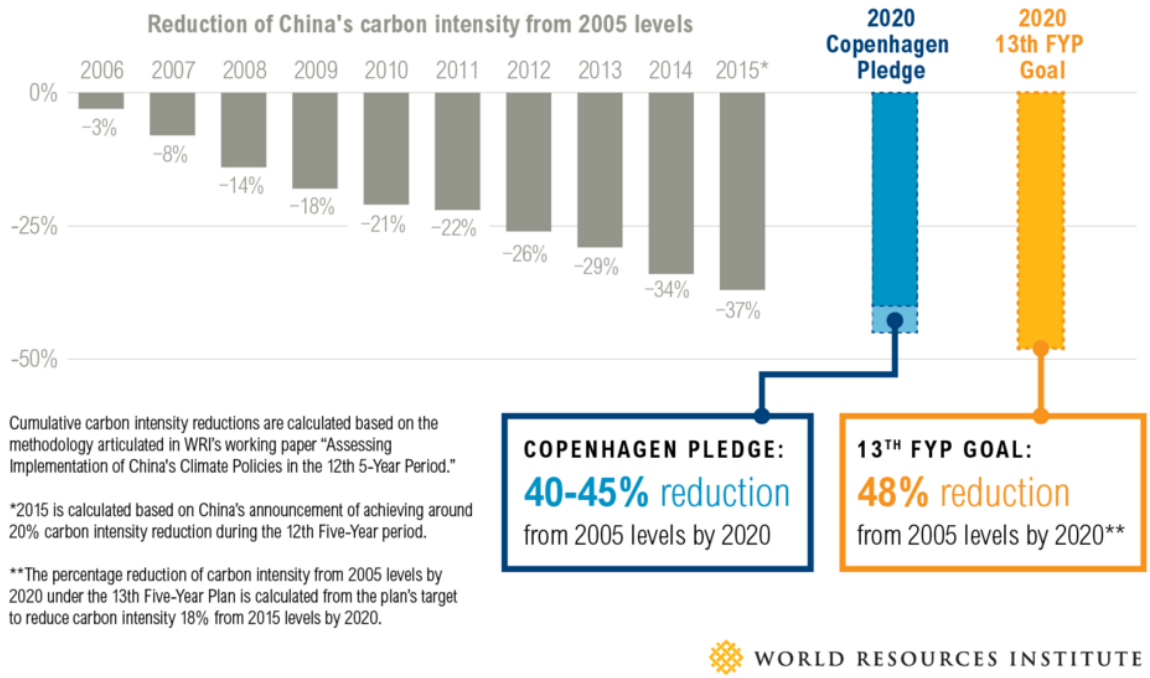
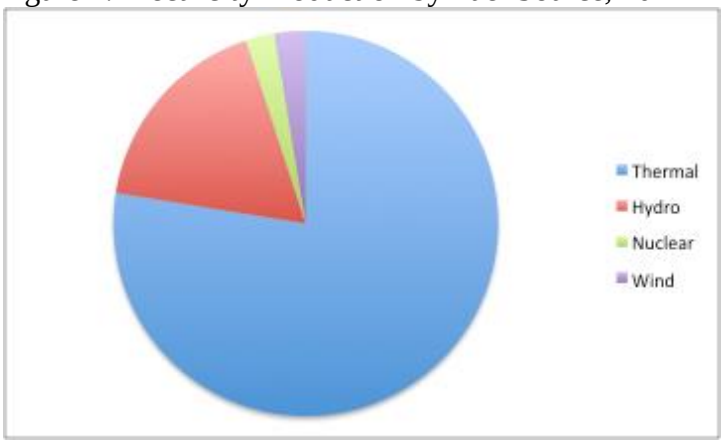


Figure 2. Electricity Production by Fuel Source, 2014



Source: All China Data Center

OPENING STATEMENT OF MR. DAMIEN MA
FELLOW AND ASSOCIATE DIRECTOR, THE PAULSON INSTITUTE

MR. MA: I'm going to copy Deborah and use my computer because I had forgotten to print out my oral testimony, but first of all, thank you to the Commission and Commissioners for having me testify today.

I was--and I will do my best to keep myself within the time limit--I was asked to discuss a few of the key macro themes in the 13th Five-Year Plan with a focus on the plan's emphasis on a people-centric approach, which is somewhat different than how they have described their 13th Five-Year Plan in previous years.

This includes a shift to an innovative and services economy, as well as China's ongoing urbanization efforts. All of these issues are, in fact, very closely linked and should be viewed in an integrated fashion. You can't look at them separately. China's success in these areas is crucial for its next stage of growth and development.

Now services have already been the biggest contribution to GDP growth in the last few years. Now whether it can be sustained I think innovation holds the key. And that's why this innovation agenda is a priority in the current five-year plan, and actually is the first section that leads the plan if you read it. It essentially set the overarching framework from which many of the other areas of the plan flow. The prominence of innovation makes sense given the kind of new economy that China hopes to build, what you might call a post-industrial economy.

In this sense, the plan avoids what has long been labeled--in this sense, China, the actual plan actually avoids what has long been--long China has labeled "indigenous innovation." Those terms are not as prominently invoked in this particular plan, though there is still clear emphasis on large industrial policies as you all heard earlier today on industrial policies.

Now, in addition, in the abstract, it's difficult to wrap your head around, and most governments obviously wish to see more innovation. Nobody disputes innovation is a bad thing. So it's probably not as useful to simply talk about innovation, which is just a broad intent or aspiration of the Chinese government.

Instead I'll do my best to focus on a few of the discrete elements under the innovation agenda, or what I would consider the fundamental building blocks of bolstering China's innovative capacity, and they're really centered on two themes: how to build more human capital and institutional capital.

But before getting into those two themes, I think it's important to provide just brief context of what China is hoping to achieve with its current Five Year Plan, at least my view.

The current plan really is critical for China to transition out of what's called the "middle-income trap," which most economists put around 10,000 to $15,000 per capita GDP. Depending on how you calculate it, China is about to hit that range or China is already in that range. So it is very, it's a very critical time for China to actually rise above that and to escape the trap. So essentially the 13th Five-Year Plan can be viewed as a way for China to get out of that trap.

The historical record is not that great. Many, few countries have actually succeeded. If you look at post-World War II economic history, mostly they've been in Western Europe and sort of the more developed OECD countries. Really only South Korea, Japan and Taiwan have successfully gone from a middle income to a high income economy.

So to do that, China obviously needs to shift its economic model to one that uses

economic resources more efficiently and productively than one that relied on uncoordinated deployment of massive resources that often led to boom and bust cycles and overcapacity, which I'm sure you've heard about in previous testimonies.

And simply put, the economy will also need to move into high-value-added and technology-intensive sectors.

For all that to happen, China has to think about how to create an environment for sustained innovation and build a knowledge-based economy and services economy. This is precisely why the 13th Five-Year Plan has a focus on that.

An innovative and knowledge-based economy requires harnessing human capital, not just labor but human capital. The new economy will need entrepreneurs and patent owners rather than widget makers and construction workers.

The challenge here is that the disruption in the Chinese labor market, both at the skilled level, college graduates, and also at the blue collar level, the construction workers and the steel plant workers, that's already putting a lot of upward pressure on wages, on the one hand, and a scarcity of supply of the right opportunities for the high-skilled workers.

So whether China wants to change or not, these secular trends are forcing it to change no matter what. So the key is how do you incentivize both the unskilled workers and the young skilled talent to become entrepreneurs and risk takers?

Another challenge is that although the aspiration seems to be fairly obvious, there is some seemingly large contradictions that's hard to reconcile. For example, if you see the substance of the plan, it does talk about how to create human capital by doing top-down fiat, which is a pretty typical Chinese government way of doing things, which is, you know, they want to create 10,000 high quality managers, they want to attract 10,000 overseas Chinese to go back and manage and start businesses, very mechanical quantitative targets. That's not how you create the Steve Jobs of China. Steve Jobs was not created by the state.

So there's an inherent contradiction here in terms of the state's ability, wanting to control, on the one hand, and how to set up an environment to actually incentivize innovation. One of the biggest incentives here is really the continual liberalization of the hukou system, which is the household registration system that has strictly controlled population flows for decades.

Now this policy has outlived its usefulness and reforming it will allow freer labor mobility, which is essential in allocating human capital efficiently. In some ways, this is fairly analogous to China's one-child policy, which recently was lifted--it also a legacy policy that was in place for too long and no longer makes any sense in the context of China's current development.

But there are some wrinkles to this policy liberalization. It will be very gradual, and it will not be equally applied across China. It will most likely only hit the second and third-tier cities, whereas the mega first-tier cities like Shanghai and Beijing are not really going to see huge loosening.

For example, the target is to really increase urban hukou holders from 40 percent to 45 percent by 2020. So it's a very modest, in my view, a very modest target.

Urbanization is at the heart of innovation. We all know--we've seen a lot of literature--cities tend to have much higher innovative capacity relative to rural areas for various network reasons. So for urbanization to process well and to actually succeed, they need to focus on liberalizing the hukou system. China is now a majority urban country. It's 56, 57 percent urbanized. So there's no way that they can have a large pool of second-class citizens, or migrant

workers, that is similar to sort of internal immigrants in China. Estimates on migrants vary, but they make up roughly about 20 percent of the Chinese population or about 260 million people. So nearly the entire population of the United States are considered migrant workers.

So this is really the population they got to deal with, plus the high-end college graduates. The problem is that China has had a ballooning of college graduates over the last decade. So they're graduating about six to seven million college graduates at the same time who can't find the right jobs.

So these two pressures, from the top-down, from the skill level, and from the bottom-up, is really pushing China to change, and part of the innovation agenda and creating entrepreneurs and allowing private sector to drive is because private sector is the biggest source of job creation, and it is the biggest source of innovation.

And my last point here, given the time, is that China also needs to create an institutional environment or build up institutional capital if China is serious about building entrepreneurial and innovative economy. They need to do better on improving legal regimes for intellectual property protection, and they need to have universities that promote entrepreneurship and tolerate failure and nonconformity among others.

The irony here is that if China is serious about creating an army of entrepreneurs, the government has actually created a new domestic constituency that will internally demand for better protection of IP going forward because competition within China is fierce. If you're an Alibaba or Baidu, you don't want, you don't want your domestic Chinese competitors to steal your idea either.

So, in fact, this is a potential silver lining that when you move there, you're going to have--when China becomes a producer of innovation, it will naturally lead to better protection of its own intellectual property. That's just the way it goes.

And the final thing, and I think is extraordinarily difficult, and I don't see much movement on it, is whether the state itself, the key institution that needs to change its role from being an active participant in the market to just being a mere referee, and it's not just about competing against foreign companies, but it's about allowing the Chinese private sector breathing room and a fair competitive playing field to actually generate the kind of entrepreneurship and innovation that the government aspires to achieve.

I'll end my comments right there. Thank you very much.

PREPARED STATEMENT OF MR. DAMIEN MA
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Growth Through Creative Destruction: Cultivating Human Capital and Institutional Capital in China's 13th Five-Year Plan

Testimony before the U.S.-China Economic and Security Review Commission

April 27, 2016

Damien Ma[1]
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Executive Summary

- China's economic transition is critical for avoiding the "middle-income trap," which typically occurs around $10,000-$15,000 per capita GDP. Depending on how it is calculated, China is either already in this range or fast approaching it. Therefore, the 13th Five-Year Plan can be viewed as a broad strategy for China to rise above the trap and into the ranks of high-income economies.

- To move from middle to high income, China will need to shift its economic model to one that uses economic resources more efficiently and productively rather than one that relied on uncoordinated deployment of massive resources that often led to boom and bust cycles and overcapacity. The economy will also need to move into high value-added and technology-intensive sectors.

- To make this transition, China will need to focus on how to create an environment for sustained innovation and build a knowledge-based and services economy, clearly key priorities in the 13th FYP.

- An innovative and knowledge-based economy requires harnessing human capital—the new economy will need entrepreneurs and patent owners rather than widget makers and construction workers.

- Disruptions in the Chinese labor market and demographic pressures are forcing the economy to make this transition whether China wants to or not. One key challenge is how to deal with labor that will be "losers" in this transition (i.e. in legacy industries such as steel and coal) and how to incentivize young, skilled talent to become entrepreneurs and risk takers.

[1] This testimony reflects solely the views of the author and not of the institutions and organizations with which he is affiliated.

- A major policy incentive is the continued liberalization of *hukou*—the household registration system that has strictly controlled population flows for decades. This policy has outlived its usefulness and reforming it will allow freer labor mobility, which is essential in allocating human capital efficiently. However, this policy loosening will not be equally applied across China. It will take place primarily in second- and third-tier cities, as the government aims to attract college graduates and young migrants away from the coastal hubs or keep them in the local economy.

- Cities tend to have much higher innovative capacity relative to rural areas for a variety of socioeconomic reasons and network effects. This is why urbanization is also central to the innovation and human capital agenda.

- Change in the approach to urbanization is directly related to attracting talent and population to central and western China. The emphasis has shifted to a "people-centric" approach, which means the government is focused on boosting services and the provision of social goods such as education, healthcare, and pensions to narrow the gap between coastal and inland China. Without such economic incentives in place and efforts to meaningfully narrow regional inequality, attracting human capital will be very challenging.

- China will also need to build up institutional capital—such as legal regimes for intellectual property protection and universities that promote entrepreneurship and tolerate failure and nonconformity, among others—to maintain an environment and culture conducive to sustained innovation. Perhaps most important and the most difficult: the key institution that needs to adapt is the Chinese state itself to deliberately limit the role it plays in business and the market.

Introduction

China is undergoing a vital but immensely challenging economic transition. The country's record of economic success, or rapid convergence with advanced economies, of the last three decades depended on several key factors: a massive demographic dividend, high household savings that allowed China to invest in manufacturing and infrastructure on an unprecedented scale, relatively low inflation, and robust demand from OECD markets to absorb Chinese exports. In short, China built a formidable "producer-oriented" economy that catapulted it from a poor nation to a $10 trillion middle-income economy in about a single generation.

But GDP growth has slowed significantly from its peak of nearly 14% in 2007 (see Appendix). That's because many of the factors that perpetuated this "catch-up" growth are turning into headwinds. The labor force, once China's greatest comparative advantage, is starting to shrink and is already facing upward wage pressures. Moreover, credit has flooded the economy, primarily toward fixed-asset investment, and is generating diminishing returns. Put another way, deployed credit is becoming less productive and efficient. Finally, demand in OECD markets is not expected to return to the heights of the 2000s anytime soon, leaving China's export sector sputtering amid global economic weakness.

It has become clear that China's current economic model risks leaving it in the "middle-income trap."[2] This is precisely why the Chinese leadership has imbued such significance in the comprehensive economic reforms announced at the Third Plenum in late 2013, which subsequently informed the goals and priorities in the 13th Five-Year Plan (FYP) released in March 2016. The 13th FYP can be essentially viewed as China's plan to elude the middle-income trap and propel it through the next stage of development to a high-income country (see Appendix).[3]

Top policymakers have rightly diagnosed that to achieve that goal, China must undertake fundamental structural economic adjustments—a process often described as "rebalancing" from an investment-driven to a consumption-based growth model. But that simple dichotomy perhaps obscures more than it elucidates, and implies that "investment" is somehow no longer necessary.

That assessment is derived from the fact that when looking at the components of China's GDP, investment's contribution is quite high, while consumption's is relatively low. However, according to official data, income growth has on average outpaced GDP growth over the 12th FYP period from 2011-2015, implying that consumption is generally healthy. Retail sales reinforce this trend of sustained consumption growth, albeit slower in recent years but still higher than GDP growth (see Appendix).

A central issue, then, is not simply that of investment vs. consumption, but rather how to rebalance investment so that capital is being invested in the right things that would facilitate continued income growth to support consumption. One of the main problems is that China has over-invested in fixed assets, such as ports, plants, and property, but under-invested in what might be deemed quality-of-life assets, such as healthcare, education, and social welfare. The former is abundant and rife with overcapacity, while the latter remains scarce and in demand.[4] (The Chinese themselves, also guilty of resorting to simple dichotomies, often refer to it as the hardware vs. software problem.)

It is no surprise, then, that promoting a services economy features prominently in the 13th FYP, which can be a driver for sustained consumption that underpins a broader structural adjustment. As China transitions into a post-industrial economy, a growing middle class tends to shift its consumption preferences from material goods (cars, houses, etc.) to consuming more services.[5] Over time, this will naturally recalibrate how much consumption contributes to growth. In fact, the 13th FYP specifically calls for consumption and *higher quality* investment to be mutually reinforcing.

Indeed, investment in another type of capital is crucial to this transition: the Chinese people.

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[2] See Eichengreen, Barry, "Escaping the Middle-Income Trap," https://www.kansascityfed.org/publicat/sympos/2011/Eichengreen_final.pdf.
[3] See Ma, Damien, "Can China Avoid the Middle-Income Trap?", http://foreignpolicy.com/2016/03/12/can-china-avoid-the-middle-income-trap-five-year-plan-economy-two-sessions/.
[4] See Ma and Adams, *In Line Behind a Billion People: How Scarcity Will Define China's Ascent in the Next Decade*, FT Press, 2013.
[5] See Zhang, Bin, "Easing China's Transition to a Services Economy," Paulson Institute Policy Memoranda, April 2016, http://www.paulsoninstitute.org/think-tank/2016/04/05/easing-chinas-transition-to-a-services-economy/.

Given the centrality placed on the innovation agenda in the 13th FYP, boosting investment in human capital is a necessity. This is why the Chinese government has devoted a significant portion of the 13th FYP to creating a "people-centric" growth model—a point President Xi reiterated in a recent high-level meeting on implementing reforms.[6] It also reflects Beijing's general shift away from relying heavily on GDP growth as an indicator of the health of the economy toward focusing on employment as an equally important indicator.

Top leaders, in particular Premier Li Keqiang, have repeatedly downplayed headline GDP growth over the last year. According to Premier Li, each percentage point of GDP growth now creates roughly 1.3 million jobs, higher than the 1 million previously,[7] implying that China can tolerate slower growth with jobs holding up.
This paper will discuss how the 13th FYP aims to move toward a new model of growth. It is organized around two broad themes/strategies that underpin the people-centric agenda: *human capital* and *institutional capital*. Within these areas, several interrelated elements need to be addressed in coordination for China to achieve its intended objectives and rise above the middle-income trap: *innovation*, *incentives*, and *inequality* (the three "I"s).

Examination of these elements, including how each is treated in the 13th FYP (herein after referred to as "FYP"), follows. The paper will then offer a few concluding observations and some potential recommendations.

I. Human Capital

The FYP's substance suggests that the Chinese government's concept of labor has evolved from viewing it as essentially massive indistinguishable inputs into economic growth toward labor as human capital. This distinction is important because like other types of capital, human capital also needs to be allocated efficiently, which requires relatively unfettered labor mobility. It also implies the creation of a higher caliber labor force necessary to move toward a knowledge economy and specialization in value-added sectors, in particular the digital economy, an area that policymakers have repeatedly emphasized.

Even as China's aging population is expected to lead to a shrinking work force over the next decades, it is still one of the world's largest labor forces—Premier Li put it at around 900 million in 2015, or three times the entire US population.[8] Nonetheless, changes in the labor force have already begun to exert upward pressure on wages, with double-digit rate of increases seen over the last few years.[9] The era of the "China price" appears to be coming to an end.

Meanwhile, the last decade saw college enrollment balloon, and China now graduates some 6-7

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[6] Zuo, Luxiao, "China Approves Document Regulating Business Operation by Relative Officials," *People's Daily*, April 18, 2016, accessed at http://en.people.cn/n3/2016/0418/c90000-9046246.html.
[7] Roberts, Dexter, "China Needs 7.2% Growth for Jobs, Says Premier," *Bloomberg News*, November 5, 2013, accessed at http://www.bloomberg.com/news/articles/2013-11-05/china-needs-7-dot-2-percent-gdp-growth-for-jobs-says-premier.
[8] See full text of Premier Li Keqiang's 2015 speech at the World Economic Forum, accessed at https://www.weforum.org/agenda/2015/09/chinese-premier-li-keqiangs-speech-at-amnc15/.
[9] "China Wages Seen Jumping in 2014 Amid Shift to Services," *Bloomberg News*, January 6, 2014, accessed at http://www.bloomberg.com/news/articles/2014-01-06/china-wages-seen-jumping-in-2014-amid-shift-to-services-.

million college students a year. Yet many of them either cannot find jobs that match their credentials and educational pedigree or their salary demands could price them out of certain employment opportunities. The expectations of an urban and urbane university-educated worker differ significantly from an aging migrant worker who has toiled on the factory floor.

In short, the Chinese government needs to grapple with both scarcer blue-collar workers who will likely become "losers" in the transition away from legacy industries and the export sector, as well as the current surplus of white-collar, skilled workers for whom opportunities are in short supply. Given these secular trends, China's economic model must change whether it wants to or not because its greatest endowment—labor—is being disrupted on both ends.

A. Innovation

From commitments to further liberalize the restrictive *hukou* policy to bolstering education standards and opportunities, these largely fall under the FYP's focus on building what it deems a "human capital superpower (人才强国)." This is the foundation on which the leadership's innovation agenda rests.

Innovation has risen to considerable prominence in this FYP, an agenda likely driven by Premier Li himself, who in recent months have been on a campaign advocating entrepreneurship and visiting startups in Beijing.[10] In some sense, this emphasis on entrepreneurs and innovation hearkens back to the early days of economic reforms in the 1980s, arguably one of the most entrepreneurial decades that paved the way for the economic boom that followed.[11]

Most governments that trumpet innovation in the abstract are well intentioned, but actually creating an environment conducive to innovation is entirely different. Judging by the FYP, the Chinese government intends to tackle this from virtually all fronts, including top-down "mass mobilization" tactics that seem antithetical to the kind of bottom-up organic innovation that's more sustainable.

To illustrate, on the human capital front, targets in the FYP stipulate cultivating 10,000 professional and high quality management personnel; attracting 10,000 high skilled overseas Chinese to pursue entrepreneurship in China; training about 1 million skilled technical personnel each year to supply backbone industries; and establishing 1,200 technical personnel training bases to produce 10 million high skilled talent.

Viewing from these efforts alone, Beijing's approach to human capital appears mechanical and based on seemingly arbitrary numerical targets. It is almost reminiscent of cultivating athletes in the state sports system to turn them into Olympic stars. This reflects something of a default tendency of the Chinese government to resort to supply-side policies, based on the thinking of "if you build it, they will come."

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[10] "Premier Li Cheers Startups in China's Silicon Valley," *Xinhuanet*, May 7, 2105, accessed at http://news.xinhuanet.com/english/2015-05/07/c_134219350.htm.
[11] See Huang, Yasheng, *Capitalism with Chinese Characteristics*, Cambridge University Press, 2008.

B. Incentives

Such policy thinking, however, has led to overcapacity in everything from steel to solar panels. So too could this dynamic afflict the labor market, if the supply of skilled human capital is not matched by the demand for those workers. While the government certainly hopes that the knowledge economy will be able to absorb college students and young urban migrant workers alike, both policy and economic incentives need to be in place to encourage companies/startups to form. There is, however, recognition in the FYP that leveraging innovation and human capital requires a more systematic approach rather than merely through top-down fiat.

One important policy incentive in the FYP is the continued liberalization of *hukou*—the household registration system that has controlled urban population flows since Mao Zedong's days. Although the *hukou* won't be completely abolished in the near term, the plan explicitly states that workers in different industries and geographical regions should be able to move freely. One specific target in this regard is to increase the portion of urban *hukou* holders from 39.9% in 2015 to 45% in 2020. In addition, the FYP aims to narrow the difference between migrants who are long-term urban residents and formal *hukou* holders. This essentially means that in practice, migrants who have a resident permit to live in city X but no formal urban *hukou* should, in principle, be treated the same as urban *hukou* holders in terms of access to healthcare and benefits such as free primary education for their children.

However, reform of the *hukou* system contains a few wrinkles. Most of the *hukou* liberalization will likely take place in second-tier cities and below, as the government aims to encourage labor to increasingly flow west. The mega cities along the coast, such as Beijing, Shanghai, and Guangzhou, are unlikely to substantially loosen their *hukou* system due to a variety of political and resource competition reasons. In some sense, this is an attempt to reverse the longstanding urban bias toward the coast, which has received by far the most state resources.

Yet many economic incentives will be needed to attract the college graduates and "millennial migrants"—a new generation of migrant workers who have mostly lived in cities but without formal *hukou*—to relocate to the hinterland and smaller cities. For one, because of the decades-long imbalance in resource allocation, enormous gaps exist in public services and social welfare benefits between the first-tier cities and every other tier below it.

It is precisely because of the recognition of this deficiency that the Chinese government is eagerly pushing for more investment in services and demanding local governments to pivot their investment priorities from public goods such as roads and bridges to services such as secondary education and medical care. The onus will primarily fall on local authorities to boost spending and investment in these services to attract young workers away from the dynamic coastal hubs. However, benefits such as pensions and healthcare are not readily portable across provinces, which further increases the cost of relocation, potentially stifling labor mobility.

Beijing's pressing need to boost services hints at the government's realization that it is caught in a chicken and egg problem: even with a freely mobile labor force, young Chinese will consider moving to smaller cities if the distribution of certain services are relatively equal and job opportunities available. But to boost those services, local governments need more fiscal revenue

from the new companies in the local economy that will create those opportunities for young people in the first place, who will in turn become taxpayers to support the provision of said services. In the meantime, the central government will need to increase its spending and subsidize local governments as part of this transition, which is why the central budget deficit was increased from 2% to 3% of GDP in 2016. Whether that will be sufficient remains to be seen.

Like most governments, Beijing appears to envision an optimal scenario of widely dispersed entrepreneurial hubs spread across the country—galvanizing provincial governments to compete with each other to attract talent and skilled labor that will set up innovative companies to support the local economy.

While provincial and municipal governments will certainly compete fiercely, as they've always done, for human capital and funding for innovative ventures, the large inter-regional differences in economic development remains a fundamental obstacle to the freer flow and efficient allocation of human capital—crucial to the agenda of innovation and entrepreneurship.

To use an imperfect analogy, in the United States, it is already a tall order to convince a San Franciscan to move to Denver, where access to public services is essentially equal, healthcare benefits portable, and quality of life metrics basically indistinguishable. But the Chinese government is attempting to persuade millions of young Chinese to move from the equivalent of San Francisco to Fargo or farther afield.

C. Inequality

Urbanization has been a centerpiece of bridging this regional gap. Far from a new trend, urbanization has been an engine of China's economic growth and for reducing poverty for at least two decades. Much of the narrowing of income inequality within China can be attributed to the process of moving rural labor off farms and into cities. In fact, urbanization is an important driver of growth for developing economies in general, since wages tend to be higher in cities and industries concentrate around urban hubs.

China is no exception, and as of 2011, was already a majority urban country. Today, more than 730 million people live in urban areas, and the government expects the overall urbanization rate to rise from 56% to 60% by 2020.[12] These facts, combined with the new economy that China is attempting to build, mean the need to pursue a different type of urbanization. Historically, Chinese-style urbanization meant investing in manufacturing hubs and the accompanying infrastructure to move massive amounts of labor into factories along the coast. It was responsible for the investment binges into infrastructure and housing that produced repeated boom and bust cycles.

Now, the urbanization policy is also being adapted to emphasize a people-centric approach, according to the FYP. That's because *how* China urbanizes is directly connected to the broader innovation strategy. Literature that link cities and innovative capacity is numerous, and it is no secret that the young and ambitious increasingly prefer cities—a trend that has been notable in

[12] "China's Urbanization Rate Reaches 53.73%," *Caixin*, January 21, 2014, accessed at http://www.caixin.com/2014-01-21/100631353.html.

recent years in the United States.

Therefore, for all the challenges and deficiencies noted above, the Chinese government's urbanization policy is devoting much more attention to further closing the regional gap. For instance, the FYP announced a target of having 100 million migrants and long-term urban residents become formal urban *hukou* holders (likely based on the 45% *hukou* target noted above). But the emphasis is also on developing small and medium cities in central and western China, with the FYP proposing that another 100 million should become urbanized in smaller cities.

It is easy to see how this approach to urbanization is part and parcel of the strategy of persuading talented young people to these laggard cities to seek opportunities and bolster local economies, particularly in regions that will likely be left behind by the economic transition (e.g. coal provinces like Shanxi and the industrial rustbelt in the northeast). It is also aimed at enticing migrant workers to either return from the coast or move to the nearest city rather than to the coast, by making it easier to obtain *hukou* in second- and third-tier cities. The government surely hopes that many of these millennial migrants will also turn to entrepreneurship and start their own businesses.

In addition to the myriad public services and social welfare benefits noted above, the government will also invest in social housing and the renovation of urban slums into more livable residences. Migrants and urban residents without *hukou* will also be encouraged to own property, and will be entitled to subsidies if they cannot afford a down payment. (Such a strategy is partly also aimed at clearing some housing inventory in second- and third-tier cities where inventory has built up significantly.)

Finally, the Chinese government hopes that urbanization will continue to play its part in reducing poverty. In fact, China has targeted reducing rural poverty by another 55 million during the FYP period, which, incidentally, is roughly in line with the FYP target of creating more than 50 million urban jobs. This is likely not a coincidence—the majority of the new urban jobs, Beijing hopes, would be concentrated in the central and western regions, where most of the poverty alleviation will take place.

II. Institutional Capital

Innovation doesn't happen in a vacuum, and usually requires a set of institutions, both formal and informal, and regulatory support to maintain an environment that allows entrepreneurs to thrive and fail. The FYP seems to make some progress in this regard, at least on some fronts.

The plan devotes several sections to establishing systems and institutionalizing rules to protect business assets and the fruits of innovation. It calls for purchase guarantees of new products that may not yet be commercially viable in order to help them commercialize. There also appears to be an emphasis on ensuring that innovators get a fair share of the fruits of their labor, which would in turn further incentivize more research and development (R&D) funding.

Consequently, the Chinese government, just as it did for human capital, also calls on China to become an "intellectual property (IP) superpower" (知识产权强国). Of course, this requires strictly enforcing regulations that protect IP and establishing institutions, such as IP courts, that will properly deal with IP infringements. Ironically, by aiming to create an army of Chinese innovators, the government will have basically created a domestic constituency that puts a premium on IP and will, over time, demand the government to enforce IP laws.

When China becomes a producer of IP, rather than a digester, the IP legal regime will naturally become more credible. For instance, Chinese Internet giants—Baidu, Alibaba, and Tencent—are all IP-intensive companies, and would presumably be as protective of their respective IP as any other firm in their sector.

Perhaps the most difficult institutional adjustment, but also one of the most crucial, is the state itself.[13] If the boundaries between state and society, as well as state-owned enterprises (SOEs) and private businesses, are not clearly delineated, the competitive landscape will be uneven and will deter entrepreneurs from taking on certain risks. The FYP continues to advance the need to change the function of the government so that it behaves more as a referee rather than a participant in the economy. But in reality, local governments seem to be investing heavily in incubators themselves and wanting to control the process.

When it comes to SOEs, their dominance of certain sectors is so formidable that private businesses simply have no incentive to compete in such sectors because the entry costs are too high. At the same time, SOEs, harnessing their ample resources and access to cheap financing, also want to enter emerging sectors to carve out market share from the private players. In such an environment, it is difficult to sustain small, private businesses where most of the innovation and employment is generated.
While the burgeoning venture capital community in China has mitigated some of the financing problems for new startups and entrepreneurs, the state's continued hands-on approach, and the competitive dynamics vis-a-vis SOEs, could hamper would-be entrepreneurs and prospects for private businesses.

Conclusion

The current FYP largely reflects a continuation of the comprehensive reform agenda that President Xi laid out in late 2013. While this FYP is quite expansive as usual, it also appears to have given more thought to a coordinated strategy than in years past. At least, this seems to be the case in the areas examined in this paper.

From the emphasis on harnessing human capital to urbanization and bolstering services, the Chinese government clearly recognizes that growth without tangible improvement in income or quality of life can no longer work effectively. This is because China is dealing with a different labor market than it once had, as well as a generation aging into the workforce that has different expectations from the generation that came of age when China was still very poor. All of which

[13] See Feigenbaum and Ma, "After the Plenum: Why China Must Reshape the State," December 16, 2013, *Foreign Affairs*, https://www.foreignaffairs.com/articles/china/2013-12-16/after-plenum.

has forced the government to rethink its growth model, even if it wasn't prepared to.

By recasting the economic transition as "people-centric," the government is likely anticipating that such a transition will be disruptive and potentially unpleasant for many of the workers that are not equipped for a new, knowledge-based economy. Indeed, the government has already announced that it intends to lay off up to six million workers, mostly in heavy industries, over the next few years.[14] The state will need to step in and deal with those "left behind" by the transition. This implies that fiscal spending will certainly need to be ramped up, and the government will likely have to tolerate higher budget deficits in the foreseeable future.[15]

Like all FYPs, however, whether and the extent to which its goals will be met is highly contingent on implementation by local governments. At this point, any assessment of whether specific targets will be achieved is futile. For the human capital and innovation agenda specifically, what happens at the local level will be especially determinative because managing these labor flows and creating the conditions for entrepreneurship depends almost entirely on the local economy.

These aren't challenges that can be overcome by blunt instruments like monetary policy or fiscal stimulus. To address them requires more refined policies, incentives, and institution-building appropriate for local conditions. In this sense, the central government will need to further devolve to, and trust, the local authorities to meet both the letter and spirit of the agenda that Beijing has laid out. If successfully executed, it would set China on a path toward advanced economy status.

Recommendations

As China makes progress on its economic transition, the US and Chinese economies will actually become more complementary in myriad ways. The United States has one of the world's most dynamic and robust services sectors—from finance and consulting to IT and healthcare. Moreover, the United States remains a world leader in innovation and R&D. In short, a Chinese economy in transition affords many opportunities that US firms can explore.

At this point, the recommendations cannot be very detailed because the FYP itself is a general document that leaves the details to be hashed out at the local levels. But the proposals below are all within the context of how the United States might capitalize on China's transition to a services economy and its innovation agenda.

- Support completion of the US-China Bilateral Investment Treaty and ensure that various services sectors in China are open to US investment.

[14] Lim, Miller, and Stanway, "China to Lay Off Five to Six Million Workers, Earmarks at Least $23 Billion," *Reuters*, March 3, 2016, http://www.reuters.com/article/us-china-economy-layoffs-exclusive-idUSKCN0W33DS.

[15] Seven central ministries jointly announced in April 2016 a plan for retraining workers who are expected to be laid-off in the coal and steel sectors. The State Council, at the same time, also announced 100 billion yuan fund for worker retraining as part of its slashing overcapacity efforts. See *Xinhua*, http://news.xinhuanet.com/english/2016-04/16/c_135284887.htm; for the retraining plan (in Chinese), see http://www.mohrss.gov.cn/gkml/xxgk/201604/t20160413_238000.html.

- Promote US services exports to China, which could reduce the bilateral trade deficit over time.

- Support direct Chinese investment in your congressional district in which local US companies, particularly mid-caps, can establish strategic partnerships with Chinese investors and expand into the China market.

- Establish joint personnel training hubs to cultivate managerial talent (e.g. potentially through increased linkages among US and Chinese business schools).

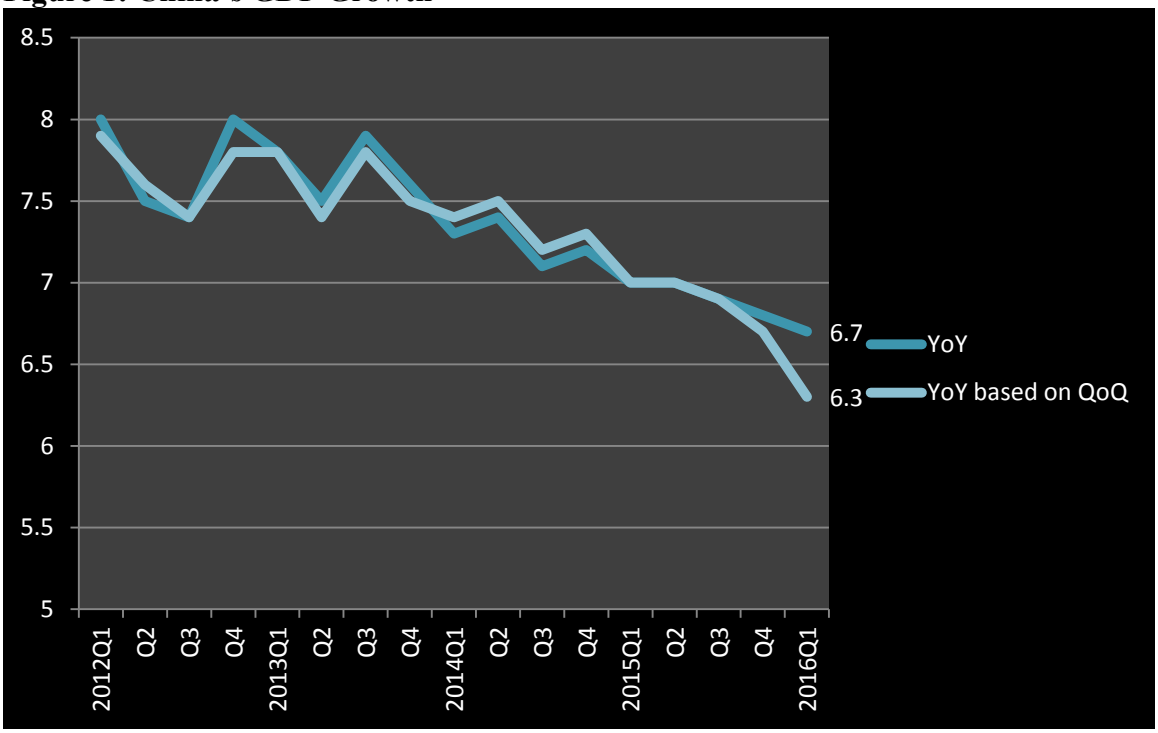
- Strengthen collaboration between key universities in designated Chinese provinces and US states to leverage the university R&D ecosystem and pool funding toward specific joint projects. Early-stage innovations can then be piloted in China, for example.

- Deepen linkages and interactions between technology hubs in both countries—for example, Silicon Valley and Shenzhen—so startups and incubators can collaborate on product development and in other areas (e.g. a US startup with prototype product that has little potential in home market might be able to commercialize in the China market with the help of Chinese startups and VCs).

- Expand "sister city" programs to include partnerships between "innovation hubs" that city governments in both countries have designated or intend to create.

Appendix

Figure 1: China's GDP Growth



Source: NBS; Author.

Figure 2: Retail Sales Growth

Source: Trading Economics; NBS.

Figure 3: Graduating from Upper Middle Income to High Income after 1950[16]

Country	Region	Year country turned UM (Y_{UM})	Year country turned H (Y_H)	No. of years as UM	Ave. GDP Per capita growth rate (%) (Y_{UM} to Y_H)
Hong Kong, China	Asia	1976	1983	7	5.9
Japan	Asia	1968	1977	9	4.7
Rep. of Korea	Asia	1988	1995	7	6.5
Singapore	Asia	1978	1988	10	5.1
Taipei, China	Asia	1986	1993	7	6.9
Austria	Europe	1964	1976	12	4.1
Belgium	Europe	1961	1973	12	4.4
Denmark	Europe	1953	1968	15	3.3
Finland	Europe	1964	1979	15	3.6
France	Europe	1960	1971	11	4.4
Germany	Europe	1960	1973	13	3.4
Greece	Europe	1972	2000	28	1.8
Ireland	Europe	1975	1990	15	3.2
Italy	Europe	1963	1978	15	3.4
Netherlands	Europe	1955	1970	15	3.3
Norway	Europe	1961	1975	14	3.5
Portugal	Europe	1978	1996	18	2.8
Spain	Europe	1973	1990	17	2.7
Sweden	Europe	1954	1968	14	3.6
Argentina	Latin America	1970	2010	40	1.2
Chile	Latin America	1992	2005	13	3.7
Israel	Middle East	1969	1986	17	2.6
Mauritius	Sub-Saharan Africa	1991	2003	12	4.0

Source: Felipe, Abdon, and Kumar.

Figure 4: Select 13th Five-Year Plan Targets

Target	2015	2020	Average growth [cumulative]	Type
Total GDP (in trillion yuan)	67.7	>92.7	>6.5%	Projected
Total labor productivity (10,000 yuan/worker)	8.7	>12	>6.6%	Projected
Overall urbanization rate	56.1%	60%	[3.9%]	Projected
Urbanization of *hukou* holders	39.9%	45%	[5.1%]	Projected
Services value-added as proportion of GDP	50.5%	56%	[5.5%]	Projected

[16] See Felipe, Abdon, Kumar, April 2012. "Tracking the Middle-Income Trap: What Is It, Who Is in It, and Why?", Levi Economics Institute, Bard College, http://www.levyinstitute.org/pubs/wp_715.pdf.

Total R&D intensity	2.1%	2.5%	[0.4%]	Projected
Inventions patents owned per 10,000 people	6.3	12	[5.7]	Projected
Contribution of scientific advancement	55.3%	60%	[4.7%]	Projected
Fixed line high speed Internet penetration	40%	70%	[30%]	Projected
Mobile high speed Internet penetration	57%	85%	[28%]	Projected
Average growth of disposable income	N/A	N/A	>6.5%	Projected
Compulsory education (years)	10.23	10.8	[0.57]	Binding
New urban jobs created	N/A	N/A	[>50 million]	Projected
Rural poverty alleviation	N/A	N/A	[55.8 million]	Binding
Basic pension coverage	82%	90%	[8%]	Projected
Urban slum housing renovation	N/A	N/A	20 million units	Binding
Average life expectancy (years)	N/A	N/A	[1]	Projected

Source: PRC State Council.

OPENING STATEMENT OF DR. YANZHONG HUANG
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DR. HUANG: Thank you, Chairman Shea, Senator Goodwin, Commissioner Bartholomew, Commissioner Tobin, and Commissioner Brookes, and Commission Wessel, and Commissioner Wortzel. Thank you for inviting me to testify at this Commission.

I'm asked to speak about China's healthcare sector, and if we look at this sector, we can, I think we can identify two parallel trends. On the one hand, there is the healthcare reform, which aims to provide so-called safe, efficient, affordable basic health care for all Chinese citizens, but on the other hand are the efforts of the government to promote healthcare and pharmaceutical industries, and to increase the share of healthcare spending in GDP.

So both trends can be identified in the 13th Five-Year Plan. Let's first look at the healthcare reform. The government certainly has shown a strong commitment to the healthcare reform. Between 2009 and 2014, they have spent more than 611 trillion--I'm sorry--not trillion--billion U.S. dollars on health care. That increased the government share in total health expenditure to 30 percent today compared to 15 percent in 1999. As a result, out-of-pocket spending dropped from 60 percent to 34 percent today.

And we have seen improved health insurance coverage to 96 percent. Progress has also been made in the equalization of access to public health services and in improving the financial situation of the grassroots healthcare institutions, including the township health centers.

But there is this lack of progress in reforming the public hospitals, which is widely considered the sine qua non of China's healthcare reform. And also it is now clear that the reform has not fundamentally solved the problem of access and affordability in China.

So in recognition of that problem, the 13th Five-Year Plan highlights the need to reform the public hospitals, to, and actually for the first time the government began to talk about reforming the personnel and salary system in public hospitals. The Five-Year Plan also vowed to mobilize more medical resources to the countrywide, to promote training of general practitioners and family physicians, and develop so-called telemedicine to address the access problems.

And in the meantime, to address the affordability issue, the government seeks to expand the catastrophic illness insurance nationwide, while in the meantime seeking to integrate basic insurance schemes in order to construct a nationwide basic insurance network.

But these efforts have their own limits and constraints. The first problem is the monopoly, continued monopoly of the public hospitals, which still provide 90 percent of the outpatient and inpatient healthcare services even though 43 percent of the hospitals nationwide are owned by non-public entities.

There is also the health financing problem. The government health spending comes from both central and local government coffers, but unlike the United States, China does not have a healthcare tax. So even though tax provides the most important revenue source for the government revenue, but they don't have a healthcare tax. Since 1995, 70 percent of the national tax revenue actually has flown to the central government, and during 2009-2014, the central government contributed around 30 percent of the total government health spending with the remaining 70 percent from the local government.

In other words, while the local governments receive only 30 percent of the tax revenues, they shoulder 70 percent of the burden of healthcare financing. That fiscal power and responsibility mismatch has actually contributed to a debt crisis at the local level. In fact, during 2007-2015, the sheer amount of money local governments owe doubled from less than 20

percent of GDP to nearly 40 percent, and since 2014, the property slump also dealt a serious blow to the local state revenue from the land transfers.

In fact, in 2015, their revenue from land transfers fell 21.6 percent, and we don't expect that situation to improve any time soon.

Now, let's look at the government efforts to promote healthcare and pharmaceutical industries. I noted in the written testimony the five trends in China's health sector that are going to sustain the robust growth of China's healthcare market that could create opportunities for U.S. pharmaceutical companies, hospital groups and insurance companies.

Among those trends, are the rising burden of noncommunicable diseases and also a demographic shift. We know the Chinese population is aging very rapidly. By the middle of this century, they are expected to reach 25 percent. That means 25 percent of the people will be aged over 65. That will be the same as the level of Japan today.

In order to address that population aging problem, the government recently abandoned its one-child policy, and that I believe is going to create a demand for consumer products, such as diapers and baby formula where the U.S. already, the products already are becoming popular in China.

Population aging has also led to the growth of a new market that is: senior care. The 13th Five-Year Plan promises to improve its senior care system, including comprehensively opening the senior care market.

And during the 13th Five-Year Plan, the government also promised to deepen healthcare reform and bring high quality healthcare and public service to all residents in China. So with the government targeting healthcare as a social and strategic priority, the healthcare market is rapidly expanding at an annual growth rate of 21 percent, and now it trails the United States to be the second-largest market of health industry in the world. It is estimated that five years from now, the size of Chinese health service industry would reach $1.3 trillion, and the assumption is that China still has a lot of room to improve in terms of increasing its share of healthcare spending in total gross domestic product.

Currently, the share of healthcare expenditure in total GDP is still considered very low. In 2013, China spent 5.6 percent of the GDP on healthcare. That is much lower than the world average of ten percent, even lower than the U.S., which is 17 percent.

So the objective--we have seen the two objectives; right. On the one hand, you want to promote the healthcare industries, and on the other hand, you want to bring affordable, accessible and quality care to 1.3 billion people. These two objectives, in my opinion, are not entirely mutually exclusive. For example, encouraging the injection of foreign and social capital to the healthcare sector might put these competitive pressures on the public hospitals and force the public hospitals to be more competitive, you know, to adopt by adopting more meaningful reform measures.

But the policy rhetoric reveals, also like Mr. Ma just identified, the inherent dilemmas and contradictions in Chinese health sector.

For example, in the absence of proper regulation, efforts to nurture robust healthcare and pharmaceutical industries in China could lead to rapid increase in healthcare costs, and that is going to compromise the government healthcare reform objectives. In fact, between 2008 and 2012, the share of out-of-pocket payments dropped from 40 percent to 34 percent, very impressive; right? But the actual healthcare costs shouldered by the patients also increased by 64 percent from around 6,000 yuan to nearly 10,000 yuan; right?. The latter is actually even higher than the rural per capita net income in the same year.

That presumes Pursuing these two objectives may also contribute to safety and efficacy problems of the healthcare products, pharmaceutical products. We have seen that in the recent vaccine scandal in China.

So what does all that mean for the U.S.-China relations or U.S.-China cooperation over health? I think if you look at the history of the U.S.-China cooperation of health, it's interesting that unlike the security-related issue areas, the dynamics of U.S.-China health cooperation is largely insulated from the fluctuation of domestic politics in China and the strategic foundations of the U.S.-China relations.

The shared health concerns basically challenge the two countries to promote jointly the welfare of their people. We have seen already this effective bilateral cooperation underway in HIV/AIDS prevention and control, in food and in drug safety, addressing international public health emergencies, in tobacco control, research, but the areas of cooperation can be, in my opinion, further expanded to include health management, environmental health, healthy lifestyle promotion, and encouraging the private sector and social forces in health education and risk reduction.

Indeed, additional areas of cooperation can also be identified in the 13th Five-Year Plan. For example, we could, I mean the United States, could initiate new programs helping China training the family physicians and the general practitioners.

Meanwhile, in seeking cooperation with China, we have to keep in mind these inherent dilemmas and contradictions in China's healthcare, health policy process. While the 13th Five-Year Plan suggests China is willing to allow the market to play a more decisive role, it continues to rely on this heavy-handed industrial policy in pursuit of the growth of its healthcare and pharmaceutical industries. It also, as Ma, Dr. Ma just identified, while the government welcomes the entry of foreign business and investment, but it has also increased information and ideological control while sustaining its devotion to bolstering domestic industrial competitiveness.

So against this background, I think the U.S. Congress is advised to work more diligently and closely with the executive branch to pressure Beijing to improve the operating environment of U.S. business in China.

Thank you.

PREPARED STATEMENT OF DR. YANZHONG HUANG
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China's Healthcare Sector and U.S.-China Health Cooperation

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Before the
U.S.-China Economic and Security Review Commission

Hearing on China's 13th Five-Year Plan

Background

Since the early 1980s, China's healthcare system has undergone profound transition. Prior to 2003, reform efforts were marked by state withdrawal from the healthcare sector and introduction of a laissez-faire approach to funding and delivering healthcare. This move yielded rapid growth in the urban health sector, especially high-tech hospital services, at the expense of rural health sector and preventive and primary care. It also converted public hospitals into a revenue generating machine, which, in conjunction with the regional maldistribution of healthcare resources, exacerbated the problems of access and affordability.

The 1990s saw the establishment of the Urban Employee Basic Medical Insurance (UEBMI) scheme, which covers formal sector employees, mostly those of state-owned enterprises. This was followed by the spread of New Cooperative Medical Scheme (NCMS) since 2002, which sought to cover the 900 million rural residents with a partial state subsidy, and the establishment of the Urban Resident Basic Medical Insurance (URBMI) scheme in 2007 to address the healthcare needs of urban residents not already covered by the UEBMI.

In April 2009, the government kicked off a new round of healthcare reform with the goal to provide safe, efficient and affordable basic health care for all Chinese citizens by 2020. The reform was anchored in five specific targets: expanding health insurance, making public health accessible to all, improving grassroots healthcare institutions, introducing the essential drug system, and reforming the public hospitals. By 2012, significant progress had been made in achieving the first three targets. The three health insurance programs altogether cover over 95% of the population, with 15% covered by UEBMI, 70% by NCMS and 10% by URBMI. Progress has also been made in the equalization of access to public health services, and in improving the financial status of grassroots healthcare institutions (e.g., township health centers).

Despite so, introduction of the essential drug system achieved at most mixed results. While it led to the drop of the prices of drugs on the essential drug list, it has not fundamentally solved the problem of overreliance on drug sale by public hospitals in revenue generation. This is at least in part caused by the lack of significant progress in reforming public hospitals, which is widely

considered the sine qua non of China's healthcare reform. Government health authorities remain the owners and general managers of public hospitals, which still provide 90% of outpatient and inpatient services, even though 43% of the hospitals nationwide are owned by non-public entities. It came as no surprise that the reform has not fundamentally solved the problem of access and affordability.

In November 2015, China issued its 13th Five-Year Plan (FYP), which highlights the need to simultaneously push for changes in areas of health care services, healthcare insurance and medications. Public hospital reform was highlighted in the plan. For the first time, the government began to talk about reforming the personnel and salary system in public hospitals. The Plan has also vowed to mobilize more medical resources to rural areas, promote training of general practitioners and family physicians and develop telemedicine to address the urban-rural gap in accessing healthcare. To address the affordability problem, the government seeks to expand catastrophic illness insurance nationwide, while in the meantime seeking to integrate basic health insurance schemes in order to construct a national basic insurance network.

Financing healthcare

Healthcare demands are hard to measure. For a country of nearly 1.4 billion people, the challenge of financing healthcare is overwhelmingly mounted. It is estimated that diabetes alone may consume more than half of China's annual health budget if routine, state-funded care is extended to all the diabetes sufferers. Compared to many countries, share of healthcare expenditure in total GDP remained relative low in China. In 2013, China spent 5.6% of its GDP on healthcare, which accounted for only 3% of the global healthcare spending. In other words, China addresses healthcare needs of 22% of the world's population with only 3% of the world's healthcare resources.

In the 1980s, driven by market-oriented economic reform, government spending as a percentage of total health expenditures dropped precipitously—from 40 percent in 1982 to 15 percent in 1999. China's economic take-off and the implementation of the tax-sharing reform in 1994 nevertheless carved out more fiscal space for central government to spend on healthcare. In the 2000s, two developments boosted government incentives to invest in the health sector. The first was the 2002-03 SARS crisis, which uncovered the vulnerabilities in China's healthcare system and the drawbacks in the government's single-minded pursuit of economic growth. The second was the 2008 global financial crisis, which made it imperative to construct a social safety net to encourage domestic consumption. Between 2009 and 2013, government spending on healthcare has grown 20 percent annually. Consequently, government spending in total health expenditure increased from 15% in 1999 to 30% in 2013, and out of pocket spending dropped from 60% to 34%. Still, compared with OECD countries the share of government health spending in total fiscal expenditure remains relatively small. Even using the government adjusted figure (12.5% in 2013), China's share is still lower than that of the US (21%), UK (16%), and Japan (17%), although it might be higher than other BRICS countries.

The government health spending comes from both central and local government coffers. Tax provides the most important revenue source for government revenue. Since 1995, 70% of national tax revenue has flown to the central government. The central government revenue is

mainly from three sources: 1) domestic value-added taxes (VATs) and consumption tax; 2) VATs, consumption taxes and tariffs for import goods; and 3) Enterprise Income Tax. The three taxes contribute to 80% of the central government revenue. Local governments control up to 17 taxes, including income taxes of local enterprises, local business taxes, personal income taxes, real estate and land use taxes, pollution and resource fees. A key revenue source for cash-strapped local governments is land sales, which accounted for a quarter of their revenues, on average, across China. In order to avoid conflict of interest with local revenue collection, the independent State Taxation Administration (*guo shui ju*) was established which operates parallel to the existing local taxation authority (*di shui ju*). Unlike the United States, China does not have a health care tax or an itemized health insurance fee in its general tax revenue. When adjusting the share of government health spending in total fiscal spending, the government sometimes counts the health insurance premium contributions from employers as health insurance tax. But the contributions are earmarked – workers in Shanghai cannot access the fund collected in Beijing.

One of the challenges in China's health financing is the mismatch between local fiscal power and responsibilities. During 2009-14, of the $611 trillion government spending on healthcare, the central government contributed around 183 billion or 30%, with the remaining 70% from local governments. In other words, while the local governments receive only 30% of the revenues, they shoulder 70% of the burden of healthcare financing. The power-responsibility mismatch has contributed to the debt crisis at the local level. Indeed, during 2007-2015, the sheer amount of money local governments owe doubled from less than 20% of GDP to nearly 40%. Since 2014, the property slump has dealt a serious blow to the local state revenue from land transfers. In 2015, their revenue from land transfers fell 21.6%. The situation is unlikely to improve against the recent economic downturn. In February 2015, year-on-year national public fiscal revenue only grew by 0.26 percent, while public fiscal spending was up by more than 55 percent over the same period.

Supporting the development of healthcare industries

During the 13th Five-Year Plan period (2016-2020), the government promises to deepen healthcare reform and bring higher-quality healthcare and public services to all residents in China. This would involve efforts to promote Universal Health Coverage (UHC), refine healthcare financing mechanism and coordinate governmental, corporate and individual responsibilities. The government encourages non-state actors to invest in healthcare industries, and promises to promote the not-for-profit civilian hospitals to be treated the same as public hospitals. In the meantime, the FYP emphasizes the need to create a policy environment that can foster homegrown entrepreneurship, including increased investment in research and development (R&D) for new drugs. Those originator drugs that are already marketed in China and those consistent with the originator drugs in safety and efficacy will receive priority status in being included in the National Reimbursement Drug List (NRDL). In March 2016, China FDA formally launched a new classification system for registration of chemical drugs. Under the new classification, "new drugs" now refers only to (i) new chemical entities that have never been marketed anywhere in the world, or (ii) improved new forms of known chemical entities that have never been marketed anywhere in the world. Domestic drugs that have been marketed outside of China, even if they have not been marketed in China, are now considered generic. The

new regulation is expected to provide more incentives to develop new drugs, which may receive an expedited review and a more favorable standing in post-approval tendering and reimbursement.

How effective these measure will be remains to be seen. The policy rhetoric reveals inherent dilemmas and contradictions in China's healthcare reform. In absence of proper regulation, efforts to nurture robust healthcare and pharmaceutical industries in China could lead to rapid increase in the healthcare cost, further compromising government healthcare reform objectives. Indeed, between 2008 and 2012, the share of out of pocket payment dropped from 40 percent to 34 percent, but the actual healthcare cost shouldered by the patients increased by 64 percent, from 5,876 yuan to 9,655 yuan (the latter is even higher than the rural per capita net income in 2012). Similarly, an industrial policy that supports the pharmaceutical industry is out of sync with other public policy objectives. In order to incentivize original drug development, the market and the state should reward firms that create genuinely innovative products with profit margins significant higher than their generic counterparts. But this conflicts with the government's objective of ensuring affordable access to health care. The same dilemma exists in the entry of non-public hospitals. Since 2010, the government has sought to inject social capital into the healthcare sector, but thus far the public hospitals continue to enjoy monopoly status in health services provision. Yet in the absence of a competitive non-public sector, it is difficult to incentivize the public hospitals to kick off meaningful reform measures that would create a policy environment favorable to the entry of the social capital.

Opportunities and challenges for U.S. service industries

Five trends in and beyond China's health sector are going to sustain robust growth of China's healthcare market, creating opportunities for U.S. pharmaceutical companies, hospital groups, and insurance companies. The first is the rising burden of non-communicable disease (NCDs), including cancer, cardiovascular diseases, diabetes and their risk factors such as smoking. Currently more than 85% of the mortality in China is attributed to NCDs. According to a recent World Bank report, if effective measures are not adopted, the burden of NCDs in China could increase by at least 40 percent by 2030. The NCDs are expected to drive up outpatient visits, hospitalizations and overall medical spending.

In association with this epidemiological change is the demographic shift. Chinese population is aging very rapidly. In 1982, only 5% of the population is aged over 65 years old. The number increased to 9% in 2010. By the middle of the century, it is expected to reach 25% (same as the level in Japan). In order to address the population aging problem, the government abandoned its one-child policy last year. It also proposed to raise the retirement age to 65 by 2045. The relaxation of the one-child policy and the expected baby boom will create demands for consumer products such as diaper and baby formula. Population ageing has also led to the growth of a new market: senior care, including home-based, community-based and institution-based care. 23% of the elderly people are disabled, but less than 2% of the senior population uses institution-based care, even though more than 10% are willing to receive care in institutions. The number of elderly people who are able to afford senior housing will reach 22 million by 2020. The 13th FYP promises to improve its senior care system, including comprehensively opening the senior care market. Current policy though treats institution-based care as a supplement to its multi-

level senior care system, which will be predominantly residence-based, with support from the communities.

The third trend is urbanization. 25 years ago 26% of the people lived in urban areas; the rate rose to 55% by the end of 2014. By 2020, 60% of Chinese people will be living in the cities. Rapid urbanization, in combination with policy changes that allow migrant workers to reimburse healthcare costs incurred in the cities, would continue to generate more effective demand for healthcare. In the meantime, rapid social stratification also calls for healthcare to meet the country's increasingly diversified healthcare demands. Private hospitals, high-tech medical devices, patented drugs and commercial health insurance have yet to be developed to cater to the needs of the country's well-to-do population.

Fourth, the widespread use of information technology has the potential to revolutionize healthcare, drug development and distribution. A growing consensus in China is that mobile health technologies (mHealth) provides a cost-effective solution to reaching out to the population in the rural and/or remote areas. We have already seen the "Big Three" Chinese Internet and E-Commerce Companies (Baidu, Alibaba, and Tencent) compete to invest in healthcare industries. Jack Ma even predicted that the only person who could surpass his success would be from the healthcare industry.

Finally, healthcare reform in China is being deepened in a way that encourages foreign and private investment in the healthcare sector. In August 2013, Premier Li Keqiang convened a State Council meeting, signaling that China would relax restrictions on market entry and encourage private and overseas capital to invest in China's healthcare industry. It is thus no surprise that a new round of mergers and acquisitions have been under way since 2013, attracting a growing number of U.S. investors. China's 13th Five-Year Plan suggests that the government will continue to focus on developing China's biomedical industry and welcome private and foreign investment in pharmaceutical R&D. The growing medical needs and the governmental support have increasingly drawn multinational pharma players to invest in China. Since 2006, 13 of the top 20 pharma companies have established R&D centers in China.

Although private and wholly-foreign-owned hospitals account for almost half of China's total number of facilities, they account for only about 10% of total in-patients and out-patients served, far below the projected goal (20%). For U.S. investors who want to establish and operate hospitals in China, there are several hurdles to cross. One of the major concerns is talent recruitment. Under current rules, foreign physicians who aspire to practice in China must pass the Chinese medical test to get a practicing certificate. This hurdle forces many foreign hospitals to hire Chinese physicians to fill the gap, but most of the Chinese doctors are moonlighting because they are also full-time employees in the public hospital sector. Multi-sited licensing reform, which allows doctors to practice in more than one primary healthcare institution, did not make much progress in many places in part because of resistance from the managers of the public hospitals. Foreign hospitals seeking to import high-end medical services need first to obtain government approval, which can be a tedious process. In addition, services provided by foreign hospitals are not covered by China's health insurance schemes, which limits the demand for their services.

Compared to hospitals owned by foreigners, foreign medical device firms fare better. Many U.S. companies have hired local Chinese talent to expand their medical device business. And as long as they have better products and provide good after-sale services, these firms can remain competitive in the Chinese market. However, they are advised to adopt "bullet-proof safeguards" (e.g., keeping critical IP components in the home office). Uncertainties also arise with the increasingly stringent product-registration processes, changes in the tendering process, the fragmentation of reimbursement, and increased scrutiny of pricing. Public tendering has recently been moved to the provincial level, leading to price for several categories of medical device products.

Overall, access to China's growing market is becoming more complex for foreign investors. Access conditions vary at the provincial, the city, and even the hospital level. For pharmaceutical companies, the increasing complexity and uncertainty stem from growth in the number of reimbursement categories and continued government pressure to reduce prices and ease the burden on patients. The 2014 GSK scandal suggests that in a country where rule of law is still good only in theory, multinationals too can be victims of the capricious and arbitrary Chinese politics. The anti-corruption campaign in China, which seemingly targets only foreign companies in the healthcare sector, further increased the cost of relying on giving bribes and other illicit tactics to increase product sales in China. Successful business operation in the country requires lower expectations and improved management, but it is equally important for top pharmaceutical executives to have the political acumen to swim with the political tide, not against it.

Public-private partnership in pharmaceutical R&D

Pharmaceutical Public-private partnership can be defined as any informal or formal arrangement between one or more public sector entities and one or more private sector entities created in order to develop new medicines for the public good. It offers an integrated and systematic approach to the development and purchase of needed vaccines, drugs and therapies to address public health challenges. To be specific, it enables companies to realize shared value while furthering public health goals by sharing risk, mobilizing significant resources for diseases where private entities have no incentive to invest in new drug development and bringing together data or expertise that resides with different parties. PPPs become particularly relevant in dealing with public health emergencies, when there is an urgent need for pooling of resources not only to accelerate the development of medical countermeasures but also to make large scale manufacturing feasible.

While PPP is increasingly becoming a buzz word in the Chinese economy, pharmaceutical PPPs remain largely alien in China's new drug development. On the one hand, there are excessive government restrictions on foreign entities intending to get involved in government-funded projects. On the other hand, local researchers remain predominantly government funded and, despite growing state funding, their ability to innovate has been seriously constrained by institutional, policy and capacity-related challenges. In contrast to the market failure in the development of drugs for rare or neglected diseases, what we have seen in China is a government failure behind the unsuccessful efforts to incentivize original drug development.

Despite these problems, some nascent, informal PPPs are emerging in China that enables Chinese firms and research entities to participate in global R&D. With growing state support, many overseas Chinese scholars have returned and established their own technology firms in China. Tapping into China's relatively low price for skilled labor, for example, contract research organizations (CROs) built by these scholars have become increasingly important, if not essential, for global drug discovery and innovation. Currently, there are more than 400 CROs in China providing preclinical and clinical research services, mostly to MNCs and research organizations overseas. Among these CROs the most well-known is WuXi PharmaTech (Charles River Laboratories wanted to buy for $1.6 billion). By 2010, it had already had more chemists than any other CROs in the world.

In January 2011, the U.S. Department of Health and Human Services (HHS) and other federal agencies announced a new public-private healthcare partnership between the U.S. and China. The initiative is aimed at fostering cooperation in research, training and regulation. The initial U.S. participants include Pfizer, Medtronic, Abbott Laboratories and Johnson & Johnson, as well as trade groups AdvaMed, which represents medical device makers, and the Pharmaceutical Research and Manufacturers of America, which represents drug makers. In the meantime, we have seen private foundations and international NGOs forge partnerships with Chinese state-owned enterprises in R&D. Through a generous grant from the Bill & Melinda Gates Foundation, for example, an international non-nonprofit organization called PATH in 2009 signed a collaboration agreement with the government-owned Chengdu Institute of Biological Products (CDIBP) to develop a vaccine for Japan Encephalitis (JE). PATH provided technical and financial support so that CDIBP could meet the strict standards required for prequalification by the World Health Organization. Three years later, the vaccine became the first single-dose JE vaccine that the WHO has approved for use on children. By 2017, the JE vaccine is anticipated to reach nearly 290 million people in Asia.

PPPs have also been used in China's development of anti-Ebola drugs. During the outbreak. When a limited supply of ZMapp was quickly exhausted in the fall of 2014, a small private Chinese company, Beijing Mabworks, produced about 100 doses of experimental drug (MIL77) within three months, making more potentially lifesaving treatments available for desperate patients. The drug was reported to have successfully treated a British military nurse who contracted Ebola while serving in Sierra Leone. Even though the Chinese drug was similar to ZMapp in the antibodies it used, Mabworks had a more efficient manufacturing process developed prior the outbreak: supported by Chinese government grants, it was able to use mammalian cells to quickly produce antibodies targeted against viral diseases in humans.

Relying on PPPs to deal with global health security threats has its own drawbacks. As Stefan Elbe noted, partnership in the private sector is often confined to smaller companies, which usually do not have the capabilities and expertise to cross the so-called "valley of death," or the transition from laboratory success to human clinical trials. There are also intellectual property roadblocks. Indeed, the use of information by Mabworks on the ZMapp patents raised concerns of potential IP infringements by the Chinese company. Still, PPPs offer an important means to engage China to contribute to global health security in an efficient and effective manner.

U.S-China cooperation in addressing other health challenges

U.S.-China cooperation, of course, is not confined in R&D for new drugs, vaccines and therapies. They have cooperated in other areas of global health security. The U.S. and China were two of the first countries to respond to the Ebola outbreak in Western Africa. Unlike the United States, China has not publically framed the Ebola outbreak as an international security threat or deployed a large number of military personnel to the affected countries. Its dispatch of elite PLA units to the affected countries nevertheless suggests that it did view the outbreak as an existential security threat that required a response out of the normal political boundaries. Beijing's willingness to implicitly securitize trans-border disease outbreaks has opened a new area for future collaboration between China and other countries (e.g., the U.S.) under the Global Health Security Agenda. Indeed, during the crisis Chinese military personnel trained a Liberian engineering company so that the latter could play an instrumental role in helping the U. S. Army to construct its treatment center in the country. Similarly, the U.S. Air Force provided large forklifts to help unload the supplies that China brought to Liberia. On June 24th, 2015, US Secretary of Health and Human Services Sylvia Mathews Burwell, Chinese Vice Premier Liu Yandong and Minister Li Bin of China's National Health and Family Planning Commission, met to recommit to that partnership in addressing public health emergencies by renewing a Memorandum of Understanding for the next five years on cooperation to address emerging and re-emerging infectious diseases.

In addition, both governments have established partnerships over basic medical research. In 2008, National Cancer Institute (NCI) launched a research partnership with China and established NCI Office of China Cancer Programs. This is followed by the launch of US-China Program for Biomedical Research Cooperation in 2011, by NIH and National Science Foundation of China.

Non-governmental organizations are also involved in establishing partnership with China. In August 2014, Massachusetts General Hospital was reported to be in early discussions with two partners to build a full-service hospital with 500 to 1,000 beds in China. Mass. General also signed a "framework agreement'' with a Chinese hospital specializing in traditional medicine and a Chinese investment firm, allowing the three parties to exchange financial information and work on developing a definitive agreement to open a facility in an island city close to Hong Kong.

In late November 2015, the U.S.-China Joint Commission on Commerce and Trade (JCCT) was held in Guangzhou, China. Secretary of Commerce Penny Pritzker and U.S. Trade Representative Michael Froman co-led a high-level U.S. government delegation to the high-level dialogue. The Chinese delegation was led by Vice Premier Wang Yang. For the first time in JCCT's 26 years of history, the dialogue featured a one-day healthcare event attended by senior government officials and business leaders from the healthcare industry in both countries.

Policy recommendations

Unlike security-related issue areas, the dynamic of U.S.-China health cooperation is largely insulated from the fluctuations of domestic politics and strategic foundations. Indeed, even in the post-Cold War era, U.S.-China health cooperation continues to grow in breadth and depth. In

part, this is because health is a politically less sensitive area where each side feels strongly about. Shared health concerns challenge the two countries to promote jointly the welfare of their people. Already, we have seen effective bilateral cooperation under way in HIV/AIDS prevention and control, in food and drugs safety, and in addressing international public health emergencies.

Transformation in both countries' healthcare sectors are generating extra business opportunities. In the JCCT healthcare event, Dr. Michael Lu of U.S. Department of Health and Human Services identified five changes in the U.S. healthcare system: improved access through the Affordable Care Act, payment reforms, delivery systems transformation, health information technologies, and quality improvement and innovation. Similar dynamics can be found in China. With the government targeting healthcare as a social and strategic priority, the healthcare market is rapidly expanding. China now trails the United States as the second largest market of health industry in the world. It is estimated that five years from now the size of China's health service industry—which covers medical care, pharmaceutical products, healthcare products, medical devices, and health management—would reach $1.3 trillion, up from less than 1.7 trillion RMB in 2012. This would mean an annual growth rate of 21 percent between 2012 and 2020.

But U.S.-China cooperation in healthcare is not just about market opportunities. It is also about how to improve health and well-being of the people in both countries. The two objectives are not necessarily mutually exclusive, but without proper regulation and balance of interests, single-minded pursuit of business opportunities may exacerbate the problem of affordability, thereby defeating the very purpose of the healthcare reform. Already, demographic and epidemiological transitions against the background of moving toward universal health coverage have raised concerns regarding financing and cost control in both countries. The growing cost of healthcare highlights the importance of cooperation in preventive care. Over the past years, both countries have been collaborating over tobacco control research and tobacco surveillance. But the areas of cooperation can be further expanded to include health management, environmental health, healthy life style promotion, and encouraging the private sector and social forces in health education and risk reduction.

Meanwhile, in seeking cooperation with China we have to keep in mind the inherent dilemmas and contraditions in China's health policy processes. While the 13th Five Year Plan suggests that China is willing to allow the market to play a more decive role, it continues to rely on heavy-handed industrial policy in pursuit of the growth of its healthcare and pharmaceutical industires. While the government welcomes the entry of foreign business and nvestment, it has increased information and ideological control while sustaining its devotion to bolstering domestic industrial competiveness. Against this background, the U.S. Congress is advised to work more deligently and closely with the executive branch to pressure Beijing to improve the operating environment of U.S. businesses in China.

Cooperation by definition is not a one-way street. As Chinese Vice Premier Wang Yang noted, in order to ensure effective Sino-U.S. cooperation over healthcare, China would ease the market access and strengthen the efforts in IP protection, but it also hoped the U.S. side to consider favorably China's concerns in patent protection duration and corporate social responsibilities. I would suggest that a working group be created to address these concerns and explore how the

two sides can cooperate with each other for a win-win. Policymakers and business leaders of both sides are challenged to seize the new opportunities and promote the bilateral cooperation to a new high, as this is good for not only the health of the bilateral relationship, but also the health and well-being of people in the two great nations.

PANEL III QUESTION AND ANSWER

CHAIRMAN SHEA: Thank you, Dr. Huang.

First question, Vice Chairman Bartholomew.

VICE CHAIRMAN BARTHOLOMEW: Yes. I have one for each of you. First, though, I'd start, Dr. Huang, I notice from your bio that you have been named one of the "20 brightest people in New Jersey," and many people might not know it, but New Jersey is indeed a state that has had very, very smart people, including Albert Einstein.

CHAIRMAN SHEA: Thomas Alva Edison.

[Laughter.]

VICE CHAIRMAN BARTHOLOMEW: Thomas Alva Edison. So we wouldn't be where we are today without that so my commendation on that.

COMMISSIONER TOBIN: And healthcare leaders.

DR. HUANG: Thank you, Commissioner. That is very generous.

VICE CHAIRMAN BARTHOLOMEW: So here are my questions. Ms. Seligsohn, you mentioned the reduction in pollution, and I think that it's laudable, but I wonder if you can break out how much of it is a result of the economic slowdown versus how much of it is implementation and intentionality?

Why don't I give you each a question, and then you can go back and answer, and similarly, some people are saying that this sort of closing of coal plants and a slow down in bringing on line new coal plants has more to do with slowing of economic growth than it does with actually dealing with pollution, and my colleague from West Virginia will be pleased to know that there are some people who believe that as the economy picks up, the use of coal will pick up once again. So a question about that.

Mr. Ma, I really commend you for focusing on human capital, but I was really surprised that while you talk about innovation and entrepreneurs, you don't mention the importance of basic freedoms in order for their to be entrepreneurial actions taking place.

Do you think that freedom of speech and access to the free flow of information is critical to innovation, or are the Chinese going to be able to get the innovation they want by keeping the restrictions on?

And Dr. Huang, maybe a simpler question for you. Is there any data on how many people leave China to get their health care?

All right. Ms. Seligsohn.

MS. SELIGSOHN: So the trends that I'm talking about actually start in 2007 and then speed up in 2011. So the slowdown in the economy is in the last year. So, no, I don't think that the fundamental improvement in especially criteria air pollution, sulfur dioxide, nitrogen oxides, particulates, is mainly about the economy although the current economic slowdown is going to help accelerate the trend in the future.

But to really get to the kind of clean air that we feel comfortable in, you have to do things like reduce emissions from a coal-fired power plant by 95 to 98 percent. You don't get that just by closing a few coal-fired power plants. Between 2007 and 2009, China installed scrubbers on 80 percent of the coal-fired power plants in China. Since then they've installed them on most of the rest, and most of the little ones that they didn't, they've shut down. There's an annual shutdown list that the NDRC puts out.

They started doing the same thing around 2009-2010 with SCRs for nitrogen oxides, and that policy became firm in 2014. So especially in the power sector, an enormous of

this is active pollution abatement that I'm talking about. Similarly with energy efficiency, right. We had something called the 1,000 Enterprise Program, which addressed the 1,000 largest enterprises in China, which account for 33 percent of total energy use in China and 50 percent of electricity use.

So just aiming on those thousand enterprises was enormously effective, and they were given specific mandates about the types of technology they had to use, the types of management plans and committees and people responsible within the plants, just checklists, making sure they did all these things to improve efficiency in these major sectors like power and steel. We have documented what the improvements have been in energy efficiency. So these are very active programs. There is no question that the current slowdown will accelerate all of these things, but the trends that we're talking about started way before the slowdown.

And simply relying on an economic slowdown, especially to remove the criteria pollution from the air, wouldn't be enough. We're talking on a bad air day in Beijing that the levels are 20 times what the U.S. EPA would consider adequate. To get rid of that would require not just a slowdown but, you know--because, remember, we're just slowing the growth rate. China is still growing. It's not actually in a recession. So all it's doing is reducing the net amount of new equipment that has to be installed. And, yeah, that makes it a little easier, but it's not fundamentally changing the situation.

VICE CHAIRMAN BARTHOLOMEW: Thank you.

Mr. Ma.

MR. MA: Well, thank you for a very tough question, probably the million dollar question, so let me put it this way.

I think the actual picture in terms of, there's obviously a spectrum of freedoms; right? There is absolutely completely free on everything and there is completely restrictive. And I don't think China is either/or obviously, and I think when it comes to innovation, there are certainly going to be sectors, I would say pretty much the entire creative industry, if you want to look at Hollywood versus what they're trying to do on their culture industry, that is going to be very hard to do under a pretty restrictive information and freedom of speech environment.

But if you look at some of the successful companies in the Internet sector, for example, none of them are state-owned. They're all private, and if you look at Jack Ma, Alibaba's business model doesn't necessarily require too much freedom of speech. You know, they sell products. Baidu is a different story because they're in the search business, and obviously that deals directly with access to information. So Baidu might be more affected than an Alibaba or Tencent, which is also very innovative, which is actually investing a lot in healthcare technologies. So their business is also less affected by certain restrictions on freedom.

So I think it is possible to innovate under a not entirely free environment. I think it will hit certain sectors much more severely than others.

VICE CHAIRMAN BARTHOLOMEW: Was Alibaba an innovation, or was it taking a model that was already working here and making it Chinese?

MR. MA: Well, the initial sort of the e-commerce is very much similar to what Amazon had pioneered, but what it has been doing domestically in China is really disrupting the financial sector. It's gotten into financial technology in a way that we haven't really done here. Amazon is not in that so things like Alipay, for example, two Chinese New Years ago, you know, during the Chinese New Year people send these red envelopes to everybody. So Alipay and Tencent, they sold billions of dollars of transactions over mobile phones--all right--and bypassing banks. And the Chinese banks got freaked out because, again, it's sort of like PayPal

undermining the banks.

And so in that sense, does it require freedom of speech? Probably not, but I think Alibaba now, like Amazon, is trying to get into the content business. They're getting into the media business and the movie business, and that is inherently much more difficult I think in the current environment.

VICE CHAIRMAN BARTHOLOMEW: Thanks.

Dr. Huang.

DR. HUANG: Thank you, Commissioner, for that question. I think it is very interesting and reflects a growing trend in China's healthcare sector, but the simple answer to your question is, no, we don't have data for that, but it is very clear that we have seen, on the one hand, these wealthy people who get sick seek care in countries like the United States. In fact, one of my friends who works in the healthcare sector just recently opened a company in California bringing the wealthy people from China to seek high-end care in the United States.

In the meantime, I think there are also not that wealthy people who get sick, but if they can afford to travel abroad to places like India where they could buy the generic drugs, for example, to treat cancer because those generic drugs are still considered counterfeit drugs, you know, in China. They're not allowed to be imported. This will be another group of poor people that we don't have any information on how many of them they are seeking care abroad.

You know, basically, so you Basically, we could identify what is two factors, one of the drivers, this of people seeking care abroad trend. One. It is the problem of seeking care in China because it's still the, it's the Chinese health sector, but it's is largely unable to provide this high-end care to meet the demands of the country’s well-to-do population.

We have seen the rapid social stratification in China that calls for healthcare to meet the country's increasingly diversified healthcare demands. Private hospitals, health tech medical devices, you know, patent drugs, commercial health insurance have yet to be developed or to cater to the needs of the country's well-to-do population.

VICE CHAIRMAN BARTHOLOMEW: Thank you.

CHAIRMAN SHEA: Dr. Tobin.

COMMISSIONER TOBIN: Great. Thank you. Thank you, all, for thought-provoking testimony, and right now I have a question for Ms. Seligsohn.

Several years ago we did what I'll call a deep dive into the agriculture and food safety arena. And you commented that there is a very clear association, as we saw then, and it still exists, between the water and the soil safety and food safety. So I'm wondering if you can share with us some of the problem-solving approaches? You said it was difficult, but what are some of the problem-solving approaches that they're doing that start to get at that at the food safety level?

And then, secondly, what recommendations would you make if you were speaking with Congress or somebody of influence on the Hill to push for our getting greater access to, when we were there, we weren't able--we heard about there not being visas given to enough people to do inspections of the food. So I'm just eager to hear--you've had 20 years of State Department expertise, and I thank you for that service. I'd like you to expand on those thoughts on the food safety issue, which hits us all in the U.S. and globally. Please.

MS. SELIGSOHN: So there's good academic articles on how the soil and water contamination affects food safety. I don't know that anyone has divided out how much of the food safety problem is related to those two issues, and the food safety problem is so much larger than just pollution; right? It's poor management of factories,--

COMMISSIONER TOBIN: Sure.

MS. SELIGSOHN: --it's deliberate contamination, it's all kinds of other things, which I think are a higher percentage of the total problem actually, and especially if we think about the sort of acute problems that people react to, they tend to be either some poor management of a facility that actually leads to some bacteria or something like that that gets people sick right away or one of these deliberate contamination things like the melamine, where again the reaction is very, very quick.

So when we're talking about water and soil contamination, we're talking about this pervasive concern about heavy metals. Certainly that concern is linked to Chinese people's concern about cancer, which is very much growing as the population ages and more people get cancer and there's better diagnosis so people also know what they have, which they didn't used to know.

So in terms of remediating water and soil--so remediating the water situation is relatively simple; right? It's about controlling industrial waste in particular, and so that's what the target in the Five-Year Plan called chemical oxygen demand is about. It's a target that measures the water that tells you how much chemical stuff is in your water. So they've been working on that for a long time, and it's making sure there are wastewater treatment plants in every industrial facility or, you know, and that's why you tend to try to get these industrial parks so you can have centralized industrial--

That's actually pretty straightforward. I suspect if there are people here who have good ideas on soil remediation, that's actually an area where the Chinese could really use some cooperation. My understanding from having previously lived in New Jersey is that--

[Laughter.]

MS. SELIGSOHN: --states in the United States that had heavy farming from the 1920s to the 1960s actually have a lot of chemicals in the soil. VICE CHAIRMAN BARTHOLOMEW: Yeah. Not to mention the industry, the chemical industry.

MS. SELIGSOHN: Yeah. I was told that it was a very good idea not to have your soil tested if you ever wanted to sell your house.

[Laughter.]

CHAIRMAN SHEA: Ignorance is bliss; right?

COMMISSIONER TOBIN: Yes.

MS. SELIGSOHN: So I'm thinking there's probably some knowledge here in terms--because a lot of that farmland in New Jersey, it's still growing--we have wineries now. We have fruit orchards and things. So people have to have figured out how to address it to some point. So I would suspect it's actually an area where there would be some fruitful--

COMMISSIONER TOBIN: Some collaboration.

MS. SELIGSOHN: Collaboration actually. I think more broadly two things. I was actually at the embassy when we did the preliminary work to bring in the FDA during the height of that melamine crisis, and I think getting the FDA into Beijing was a critical part of the story. I do think the best example of what it takes to get good inspection in China is the system of kosher inspectors in China.

COMMISSIONER TOBIN: Interesting.

MS. SELIGSOHN: Every five years or so, the Wall Street Journal runs the same article on the kosher inspectors in China, and there's actually a good academic article about it as well. So you know in the U.S. demand for kosher food is growing very rapidly because it's not just Jews that buy it anymore. It's Muslims and Hindus and vegetarians and all kinds of people

who want to know what's in their food.

And it's very valuable to the sellers because they get a 15 percent markup if they sell it, and China I think you may know cans mushrooms, and tomatoes and all this kind of stuff. And so there are all these rabbis who travel around China and inspect.

[Laughter.]

MS. SELIGSOHN: And they just don't take "maybe" for an answer, and, you know, if it doesn't meet their standards, they're out of there, and you're going to lose your certification, and these Chinese businesses court them because it's a very valuable stamp. So I think in terms of creating consumer labeling systems that the consumers want, this is after all a completely private enterprise; right?

I mean the kosher stamps are simply trademarked, and the consumers know what they are so I think there are a lot of things like that. There's been a lot of work done on like humanely raised fish and all these kinds of things, and I think one of the things we could do in the United States is help consumers know which of these labels are real, which aren't real. You know, there are so many choices if you want to get sort of healthy chicken or a healthy fish, and kind of cleaning out the confusion might actually enable consumer demand to affect choices.

MR. MA: May I add a quick point to that?

COMMISSIONER TOBIN: Yes, please.

MR. MA: On food safety, at the Institute, we have a program in agribusiness investment, and since we're in the Midwest, the bread basket of America, we've been talking to a lot of farmers and people in the agri-sector, and a low-hanging fruit idea, I think, in terms of helping China improve its food safety is really helping them collaborate on developing a better cold-chain logistics system. The Chinese are pretty good at moving people around, but they're not as good at moving goods around the county.

For example, for one reason coal is so expensive is it's often really hard to get it from the Northeast down to the South so a lot of the imported was in the South because it was frankly cheaper and easier coming from Australia than it is from the Northeast. Same with food. One statistic I heard was I think lettuce from the time it gets into a truck, it's about 80 percent spoilage rate when it gets to the end consumer because they don't have the proper cold chain trucks that we do here in the United States.

So there's actually a lot of Chinese investment, investors looking to invest in cold-chain logistics because they need that technology to actually get food from Point A to Point B. So just a simple thing like that, to maybe make sure the spoilage rate is only 20 percent rather than 80 percent, that in itself could improve a lot of food safety issues in China.

COMMISSIONER TOBIN: Thank you.

CHAIRMAN SHEA: Thank you, all.

I just want to note that I'm from New York and I've been to New Jersey a number of times.

[Laughter.]

VICE CHAIRMAN BARTHOLOMEW: Hey, hey, you've got a lot, at least two of us up here, from New Jersey.

CHAIRMAN SHEA: So I claim--right.

DR. HUANG: Yeah, we're both from New Jersey too.

CHAIRMAN SHEA: A question maybe for Mr. Ma and Dr. Huang. I've read in a few places that the argument has been made that China can never escape the middle income trap because of demographics. The genie is already out of the bottle. It will age before it gets--

get older before it gets rich, and I'm wondering if you could comment on that?

And secondly, for you, Dr. Huang, how is China going to manage this, this aging issue? I know I've looked at these issues in the United States from a health and housing perspective, and here in the U.S., 70 percent of those of who reach 65 will need some form of long-term service and support, help with bathing, medication management, food preparation. So I assume that is also a similar statistic could apply to China.

People here in the United States want to age in place in their homes and in the same community. But often the home and the community is not structured in ways to enable aging in place. People here in the United States don't have any private long-term care insurance, and a lot of it is provided by family members, which can affect worker productivity.

95 percent of people who are 65 have a chronic disease, and many have more than one. So and that's very costly to manage. So when you look at China--we're 300 million, they're four times, four-and-a-half times our size. How--and how are they going to manage this, particularly when they're going to have fewer workers supporting more retirees?

MR. MA: Do you want to go first?

DR. HUANG: Yeah, sure, I wouldn't mind.

CHAIRMAN SHEA: I mean are the same trends in the U.S.--sort of can you point to the same things that are happening in the U.S. as applicable to China, for example?

DR. HUANG: Yeah, there's a lot of these dynamics there that are similar to the United States. First of all, the population is rapidly aging, and it was like eight percent in the 1990s people aged over 65. Now, it's 12 percent, I believe. It will be 25 percent. We're, making it probably one of the most aging societies in the world. There's predictions that the dementia cases in China could be more than all the developed countries cases combined. That's just an indication how there is correlation, connection between the aging and the noncommunicable diseases.

So there are a lot of challenges, and that is why they recently abandoned that one-child policy. The expectation is that maybe 20 years from now they are going to alleviate that problem. But that means it is going to take more than 20 years for that policy to really take effect. They have also put out measures postponing the retirement age. We have seen that similar dynamics here, right, that you're? That we're talking about extending the retirement age up to 67.

In China, they were talking about having the retirement age postponed to 65 by 2045. In the meantime, they have been advocating the so-called home-based senior care because unlike--this. This is different from the United States. Here we focus more on the institution-based senior care, but in China, it seems that these efforts didn't work out very well. So now they have changed the strategy to focus more on the home-based care with support from the local communities and the institution-based care will be only like a supplement.

CHAIRMAN SHEA: So Sunrise doesn't have a big future in China; is that what you're saying?

[Laughter.]

DR. HUANG: If you say so. I think, yeah.

CHAIRMAN SHEA: But so they are focused on bringing services and healthcare to the actual home of people?

DR. HUANG: Yeah. I think the problem is that we haven't seen this effective cooperation collaboration between the Civil Affairs Department and Health Care Department in how, for example, to provide effective healthcare, right, to this segment of the population. I

haven't seen that interdepartmental collaboration.

CHAIRMAN SHEA: You haven't seen it yet.

DR. HUANG: No.

CHAIRMAN SHEA: Yeah. Interesting.

DR. HUANG: Yeah.

CHAIRMAN SHEA: And what about the general question about the middle income trap, Mr. Ma?

MR. MA: Well, I think to answer your question, a lot of people make parallels to Japan, right? China-Japan. Is China just going to be a bigger version of Japan where it stagnates and then it faces a demographic time bomb, those sorts of things? But I think people often forget that Japan was extremely wealthy.

CHAIRMAN SHEA: Exactly.

MR. MA: Before it actually stagnated. It was already a very advanced country. So China is not anywhere near there. Japan, I think, was already $40,000 per capita GDP, and China is right now eight or $9,000. So a huge difference. So the potential I think still is there for China to continue to grow. I think a lot of it is determined by what happens in the labor market, which is really the key thing.

And, you know, there are some secular trends in terms of the demographic changes that is putting pressure on the labor market in terms of fewer workers, but it's also what I'm talking about in terms of the allocation of labor. This hukou system has really, some of that scarcity of labor supply is because the migrants aren't--they don't really want to go to these--they don't want to go to the coast anymore because it's not worth it, and it's really hard to--it's really hard to actually work there. So there is some artificially policy driven labor problems there.

So if they can get some of the policy incentives in place, China could continue, I think, to perform decently. I don't, I just, when I think about the fact that something like two to 300 million people still live on $2 a day, if you just raise that to $4 a day or $5 a day, that gets you growth in a way. So I think people really need to think about how just big this country still is and how many people are still really living in a very developing, poor developing country versus sort of some of the images we see these days of Shanghai and Beijing and so on.

So the potential is there. A lot of it is up to whether they can get the policy incentives right.

CHAIRMAN SHEA: Okay. Thank you.

Commissioner Wessel.

COMMISSIONER WESSEL: Thank you, all, for being here. I'm thinking that Hebrew National might do rather well over in China, remembering growing up that "we answer to a higher authority" commercial. So I may have to talk to ConAgra about that.

[Laughter.]

COMMISSIONER WESSEL: Ms. Seligsohn, about the question of industry, and in steel, I think it's three times the amount of carbon-emitted per ton of steel there as here, and I think you used a figure of four times for some sectors?

MS. SELIGSOHN: Total energy in--

COMMISSIONER WESSEL: Total energy. And it's coming down. But China has now agreed to certain climate commitments understanding they will take awhile. And the U.S. has agreed, and as you probably know, several years ago, Congress was considering climate change legislation and put a border adjustment clause in there.

How do you think the Chinese would respond to that in the sense of ensuring that

we don't create a larger market for energy-intensive, trade- exposed products that are produced with much lower environmental standards than our own?

MS. SELIGSOHN: Well, I think they responded pretty negatively when it was a hot topic, and I think they would again. I mean so they look at another issue, which is that they see the end consumers partly responsible for the emissions; right. So they think the U.S. and also Europe, to an even greater extent that the U.S. should be considering the carbon, the imbedded carbon in imports when considering what our own carbon responsibility is; right?

So you can think about it both ways. I mean it would, they would say is they're working very hard to reduce their carbon intensity. Now, carbon intensity in steel is all about whether you're using iron to produce your steel or whether you're using recyclables.

COMMISSIONER WESSEL: It's also centering materials.

MS. SELIGSOHN: But the big magnitude of difference is whether you're reusing steel that you already have, and that has to do with whether you're tearing down a bunch of buildings that you can use the steel from or not. So that's one of those things that just evolves over time, and we can assume that it will in China as well.

They have this huge overcapacity issue that they finally seem to be actively trying to manage. I mean they hadn't in the past, but they at this point are seriously trying to shut down these extra plants and this kind of thing. So I think a border adjustment would set everybody off in the wrong direction.

I mean at this point the Chinese have implemented everything that they've agreed to in the last several U.S.-China joint statements and all this plus what they put in their commitment in Paris. The United States' commitment is, of course, is stuck in court. So what I was impressed by when Xi and Obama announced their joint statement in September of 2015 was that the Chinese were actually willing to make major, major commitments despite enormous uncertainty as to whether the United States could deliver, that they knew full well there was a presidential election the next year, they knew that another party controlled both houses of Congress. These were not secrets.

And so I think the reason the Chinese are committing to these things is because they really think they're good for China, and when we talk about these issues of the middle income trap and how to get growth, then improving energy efficiency, diversifying their energy supply, these are all very good things for China. So I think they're moving in the same direction, and getting in a spat about tariffs would probably divert everybody's attention from what both countries need to do.

DR. HUANG: May I add something here?

COMMISSIONER WESSEL: Please.

DR. HUANG: I think one of the silver linings in the economic slowdown in China is that they actually have facilitated the efforts to clean the environment. I was in Shanxi this past December, and we all know Shanxi is like China's coal capital, right?. Over the past years, they have seen the coal prices drop significantly. Now they're even having problems paying their civil servant salaries, you know, but I didn't feel that it was so polluted when I was there.

Actually they pointed to me how the government over the past years had cleaned the water, the Fen He [ph]River in Shanxi Province, you know, and since 2014, we also have seen this for the first time the reduction of the coal consumption in China. So I think this might be good news for the environment protection, but, of course, how, whether that is going to be sustainable, that is a big question mark because they have to, after all, you know, this economic

growth remains the pillar of the regime's legitimacy.

MS. SELIGSOHN: Well, but the point is what they're doing is shutting a lot of small plants that are incredibly inefficient and replacing them with much bigger, much more efficient plants, and so that's built in.

And the other thing is I think we have to keep remembering China is still growing; it's not in a recession. All we're talking about is that the rate of growth has slowed so in terms of energy consumption, you would still expect that absent efficiency gains, it would increase, not decrease.

And so the decline in coal use is because there's both an improvement in efficiency of coal plants, massive improvements in efficiency, combined with some switch to hydro power and nuclear power, wind and solar. And there's more solar and wind being produced than is being used effectively.

So if they finally seem to be pushing the grid to solve those problems, and when they do, that should be the next step change in improving the reductions in coal use.

CHAIRMAN SHEA: Okay. Dr. Wortzel.

COMMISSIONER WORTZEL: Dr. Huang, I think most of my questions relate to pages six and seven of your written testimony. And I want to, first of all, just ask a simple question related to the contracted research organizations. In one paragraph you say that when private companies go or individuals go back into China or begin to work with CROs, they get limited because ultimately it's municipalities and the state that has to fund and license those things. It seems to me that sort of limits innovation.

But before you answer that, let me go on to a more fundamental question. And this relates to what I would call structural and value related dilemmas that can be created by our international systems. And what brought me to this was your discussion of U.S.-China cooperation in health challenges and your discussion of both genetic engineering and human clinical trials. So if the United States has both drug companies and agencies of the federal government going into China, either to do experimentation or do clinical trials, what do we know about the standards for human clinical trials in China?

You know, in other words, if a drug company tried to do it here, there would be all kinds of informed consent required, and I just want to make sure we're not going in there because it's easier to experiment on people and save time and money.

DR. HUANG: Yeah, absolutely. I think that is a very legitimate concern indeed. Speaking of the CROs, the contract research organizations, they are essentially built by the overseas returnees. The technologists themselves are not that new. Everybody knows that if you are in this field. They provide this pre-clinical and clinical services mostly to multinationals, and interestingly the connection between the CROs and the domestic industries are not there indeed. And so I agree with you, they do not really contribute to domestic innovation in China.

In the meantime, I also share a concern about the standard of the human of the clinical trials. That is indeed a problem. Actually the government agents actually admits that. Recently they have actually tightened the standards in terms of submitting the information for approving the new drugs. They basically said, well, we're going to tighten the criteria, the control, so if you don't believe your data that are submitted are not up to the standard, please withdraw. And actually they are seeing a large number of withdrawals in China.

In the meantime, they also raised the bar, the so-called consistency standards, so that even the generic drugs produced in China also are consistent to those drugs produced, the patented drugs, you know, in terms of safety and in terms of efficacy. So I think that is

indication that this is certainly a legitimate concern and.

COMMISSIONER WORTZEL: And can you address standards on experimenting with drugs on individuals? How do they differ between us and--

MS. SELIGSOHN: Can I add one thing? I mean NIH has actually given the Chinese a great deal of Institutional Review Board training, and there are a number of Institutional Review Boards in China. It's also the case that all of the NIH funded research that goes on in China requires both Institutional Review Board approval in the United States and in China, which has been part of what's fostered the development of IRBs.

And it also requires the State Department to review it for foreign policy implications, which is why I read every single one of those projects.

COMMISSIONER WORTZEL: Were you in the Science Office?

MS. SELIGSOHN: I was the Science Counselor.

COMMISSIONER WORTZEL: Oh, you were the Science Counselor?

MS. SELIGSOHN: Yes. So there's lots of other stuff going on, but, and I'm not claiming that everyone, everything in China is being checked appropriately, but there definitely has been a strong effort by NIH to try to get that information out.

DR. HUANG: Yeah, let me just put this way. I think in the absence of effective government regulation and control, we are going to see that problem continues, rampant and serious in China.

COMMISSIONER WORTZEL: Thank you.

CHAIRMAN SHEA: Senator Goodwin.

HEARING CO-CHAIR GOODWIN: Thank you.

Mr. Ma, you indicated in your testimony that to make this transition that the Chinese want to make, one of the things they need to do is build up their institutional capital, including quite notably the expansion of intellectual property protection, which you then posit as being somewhat of an inevitability in the sense that once innovation takes hold and a domestic constituency is built up, they will demand and insist that their own intellectual property be protected.

My question is what do we do in the meantime to protect American intellectual property, especially in light of the recommendations you make at the end of your testimony includes enhancing collaborative efforts between, in R&D between American universities and their Chinese counterparts and tech firms?

MR. MA: That is an excellent question. I think one model to potentially look at is actually in a vehicle that is already part of the U.S.-China collaborative effort. It's in the Clean Energy Research Center that we set up. We have set up three. I think one is actually in West Virginia.

HEARING CO-CHAIR GOODWIN: Yes, we had a hearing on it last year, I think.

CHAIRMAN SHEA: Yeah.

HEARING CO-CHAIR GOODWIN: Yeah.

MR. MA: That's right. And in that particular, in that particular area so in terms of the IP component, there's actually a lot of joint development of intellectual property so there is a effort within that to think about how you deal with IP, not just in terms of licensing, but in terms of who gets the fruits of what coming out of that particular innovation?

And I think--I didn't talk about this in my oral testimony, but I think one of the biggest benefits for China right now is that product cycles is much faster in China. They can

commercialize much faster than we can because they have market power. 1.4 billion people versus 300 million. So there are a bunch of hardware accelerators in China now that if the software stuff comes in, they partner up with somebody in Shenzhen, they can turn this thing around in about 12 hours, and then they can market test it right away.

And so that to me is a huge comparative advantage for China right now because they've developed that, they've developed this ecosystem over the last 20 or 30 years. So this stuff is already happening.

So I think the more we can encourage that and think about in that process how we kind of co-own, you know, IP and who gets the core IP, that is, that really needs to be thought about in a way that I think we just haven't thought about it. It's sort of like you own it, and that's it, and that may not work going forward, especially if the early stage companies start to continue to actually just by virtue of natural inertia start to partner with these Chinese incubators, and what comes out of it is going to have to be divvied up pretty fairly and equally I think among the two parties involved.

And so I would look at the CERC as a potential model to kind of continue to develop that process.

HEARING CO-CHAIR GOODWIN: Thank you.

CHAIRMAN SHEA: Okay. Dr. Brookes.

COMMISSIONER BROOKES: Thank you for a very interesting conversation today.

In our Annual Report in each section we do, we have the implications for U.S. interests. I was wondering if you could, in a short period here, summarize what you think the implications of these quality of life issues are for U.S. interests, just focusing in on the United States as opposed to what is going particularly on in China?

MS. SELIGSOHN: Each of us?

COMMISSIONER BROOKES: Yes, please.

MS. SELIGSOHN: Okay. So I think in the energy and environment sphere, the real impact is on sort of U.S. sort of policy and sort of global environment and energy interests rather than, I mean there's some business opportunities here and there, but the big impact is that we have an opportunity to reduce dangerous climate gases, and China is much more interested than it used to be in being a cooperative partner.

Chinese air pollution actually does circulate around the globe, and so reducing that, as well as the Chinese get more and more interested in all these other parts of their pollution problem. Again, there are issues with the food chain, there are issues with ocean fish. There are all kinds of things, and I think China's interests in environmental matters helps us enormously from a policy point of view.

MR. MA: Well, I think in general, if China, as China continues its economic transition to a more services-based economy, one, it's going to naturally lead to a less energy intensive economy in general. Services tend to be less energy intensive than steel and cement.

But I think as China progresses along that path, assuming it's moderately successful, if you think about it, in fact, this means the U.S. economy is actually more complementary to the new Chinese economy because we're the leader in services, everything from IT to healthcare to consulting to management.

So, in fact, if China actually does that, our exports that we're good at in the high value-added sophisticated area, like services, we already have a surplus with China in terms of surplus export, but that number could get much bigger as the Chinese economy trans--and that

may actually have an impact on reducing the overall trade deficit that we have with China if we continue to export there.

So we need to think about it, that the U.S. economy actually in many ways could be more complementary, and there are a lot of interesting partnerships. I work on Chinese direct investment a lot, and at the subnational level in various states, I think in congressional districts where there are potential job-creating Chinese investment in an area that could lead to a strategic partnership in expanding market for U.S. companies. I'm talking about private mid-caps. That's where a lot of the services firms are.

That's a huge potential opportunity to capitalize on for a lot of U.S. companies, I think.

DR. HUANG: Well, I think the Chinese rapidly growing healthcare sector presents tremendous opportunities for U.S. firms, hospital care, and pharmaceutical industries, medical devices, industries, and it also that if. If you look at the rapid population aging and the rising noncommunicable diseases in China, also this presents opportunities for us to expand into areas of cooperation between the two countries, that focus on preventive care, tackle population aging and other issues.

So I think it's important for the Congress to continue to work with, as I say, the executive branch to help improve the policy environment of the U.S.-China cooperation. This is not just about like having the U.S. firms treated the same as domestic firms, but in the meantime also improve the policy environment for NGOs working in China. We know that China is now reviewing I think the--

VICE CHAIRMAN BARTHOLOMEW: Foreign NGO law.

DR. HUANG: --foreign NGO laws in China, you know, so that's I think something that we should pay close attention to as well.

COMMISSIONER BROOKES: Thank you very much.

CHAIRMAN SHEA: Thank you. We're going I guess to have two questions here in a second round. We have about ten minutes so Vice Chairman Bartholomew.

VICE CHAIRMAN BARTHOLOMEW: Yeah, Dr. Huang, I'm actually glad that you mentioned the foreign NGO law because it's one of the things that I was going to ask about, but I could ask everybody about it, which is what are the implications for this crackdown on foreign NGOs in terms of the environmental community, for example, where there has been some leadership on those issues?

And, Dr. Huang, you mentioned specifically this partnership with Massachusetts General Hospital. Do you think the Chinese government is just going to define a whole category of NGOs that it's okay to work with, but then there are all of these other ones, including some that work on HIV/AIDS, a very big health issue, that they're just going to not allow?

DR. HUANG: Any of you want to be the first to respond?

[Laughter.]

MR. MA: Well, so I work at a nonprofit, and we have a Beijing office so it directly hits us; right? So I think, I think our understanding, and it's based on talking to a lot of people in Beijing about this particular issue, is that I think this particular law was pushed very quickly up the system without a lot of very tactical thinking about what's what. And it is my view that at the end of the day, they're going to have to have carveouts for specific things, for example, business associations or whatever.

They can't treat every category of NGOs the same. Obviously, I think what they're really worried about is where the money for certain NGOs are going to funding specific

projects.

VICE CHAIRMAN BARTHOLOMEW: Well, civil society development.

MR. MA: Yes, that's where they're--that's ultimately what they're really concerned about. So if you're the U.S.-China Business Council or AmCham, that doesn't necessarily fall into the same agreement as what I think they truly have in mind. So my guess is that this was a sort of all-in thing that got pushed up really quickly, and I think many people at the very high levels were not necessarily aware of the comprehensive nature of this particular law.

VICE CHAIRMAN BARTHOLOMEW: Do you think that those carveouts will come with leverage by the Chinese government to shape, for example, the findings that your organization's Beijing office? Maybe it might not feel as free to make some analytical findings that it might otherwise have felt free to do?

MR. MA: Well, I think fortunately for us, and I can only speak about us, we're working on sort of the environmental energy side, which has been a priority there for I don't--I wouldn't be too worried about that. But if you're working on some of the more sensitive social issues, I could see there's a problem.

For example, it's not just, it's not just, it's not even just foreign NGOs, for example, even some of the major state think tanks. We've had some relationships working with scholars there, but you know they've definitely had--they've definitely in the last few years been more reluctant and reticent about having that connection with a foreign nonprofit. But I think just our area specifically, I don't see as a huge problem, but social issues could be a problem.

MS. SELIGSOHN: I think that the space for NGOs in China may have been overstated to begin with. I mean it's never been very good; right?

MR. MA: That's okay.

MS. SELIGSOHN: So for Chinese NGOs, either you could have members or you could take outside money, and you couldn't do both. So there were very few membership organizations that were really limited because they had very little budget. So you didn't have any of these groups like Sierra Club and National Wildlife Federation, you know, with a million members who all paid dues and vote for the positions or whatever, but also might have some rich people that give them a bunch of money; right?

So most NGOs in China took money from some donors, usually foreign donors, because there really isn't much of a domestic donating community, and what domestic donating community there is sees its role very much in terms of disaster relief and poverty alleviation; right? Especially since the 2004—Asian tsunami, Chinese people have been donating a lot of money whenever there is disaster around the world.

But it's viewed as helping people in massive need, and so this idea of sort of supporting groups that are trying to do good works all along kind of thing, that doesn't exist, and it doesn't exist much in the business community either. The business people who get involved in this stuff tend to talk more than they give.

So there really, you know, I've worked in South Asia as well, you know, and India has many, many NGOs with four million members; right? I mean you know, most Chinese NGOs have less than 25 people in them. So I think one can overstate how good it was in the past, and then the role of foreign NGOs was never viewed as civil society.

They were viewed as representatives of some foreign society, and they were welcomed because they had specific expertise to offer to China, so many foreign NGOs have had very, very successful relationships in China, whether it's on environment or on health. There

have been a number working in HIV/AIDs. There have been some working actually on things like diabetes, on cancer, all kinds of things, vaccine development, but the reason they're welcomed is not because they're sort of building civil society, and their usual MO is to work closely with the government and provide useful policy advice.

So I think some NGOs right now are very worried about the NGO law. Some NGOs are kind of feeling like wait and see, who knows if it's going to be better or worse. And some I've even heard are finding it's fine, and they're going along just fine. But I think all of that has to do with the fact that NGOs are not really viewed as part of civil society in China.

VICE CHAIRMAN BARTHOLOMEW: And one more very quick question for you, Ms. Seligsohn. Have the rabbis been able to protect that kosher stamp from counterfeiting, that trademark?

MS. SELIGSOHN: Yeah, I think they sue people like crazy in U.S. courts.

VICE CHAIRMAN BARTHOLOMEW: In U.S. courts.

MS. SELIGSOHN: Right. There's no market for this stuff in China, right, so we're talking about something that goes into the U.S.

VICE CHAIRMAN BARTHOLOMEW: Oh, so you're, you were not talking about, I got the impression when you were talking, that there were rabbis in China.

MS. SELIGSOHN: Oh, yeah, there are.

VICE CHAIRMAN BARTHOLOMEW: So how are they protecting--

MS. SELIGSOHN: It's for export.

CHAIRMAN SHEA: It's selling to Chinese consumers.

VICE CHAIRMAN BARTHOLOMEW: Selling to Chinese consumers?

MS. SELIGSOHN: No, no, no.

VICE CHAIRMAN BARTHOLOMEW: Oh.

MS. SELIGSOHN: They're inspecting Chinese facilities that export to the U.S.

CHAIRMAN SHEA: Oh, I see.

VICE CHAIRMAN BARTHOLOMEW: Okay. I thought they were selling inside China.

MS. SELIGSOHN: Yeah. Because you were talking about like difficulties with inspectors entering. And what I'm saying is if they don't get to inspect on the day they want in the way they want, the Chinese lose the ability--that factory loses its ability to put the stamp on. And it loses a lot of money.

VICE CHAIRMAN BARTHOLOMEW: And they fight back against counterfeiting.

MS. SELIGSOHN: Very stringently. And they have a community of--but that's the thing is, and this is where the academic piece that studied it comes in--there's a community of consumers in the United States that are very concerned about whether it's counterfeit or not, and there are publications and now I'm sure it's websites that alert kosher consumers ignore such and such, it's not real.

So that's why I'm saying the fact that we now have multiple labels for sustainably harvested wood, for sustainably caught fish, for, you know, animal-friendly chickens means that the average American consumer has no way to differentiate, and especially in terms of protecting American consumers, I think helping make that space clearer for consumers would be an enormous service.

VICE CHAIRMAN BARTHOLOMEW: Thank you.

CHAIRMAN SHEA: Dr. Tobin, the last question.

COMMISSIONER TOBIN: Yes. I wanted to do a reality check. Several of you have--Dr. Huang and Mr. Ma, you've talked about abandoning the one-child policy. And the reality check I want to get at, this was several years ago, and when I heard it stated, it was for a couple who might have, be an only child and an only child. So I want to know is it just verbiage that it's been abandoned, and will a family be able to have three kids, four kids? Are their controls all lifted?

And the second thing to remember, because it's always stated like this is going to help the aging situation, right, to replenish, but the second factor is the more educated women are, the less likely they are to have children. And you see that in Japan, and you--so I wonder--is it real? That's the reality check. And is it going to serve in any demographically positive way for China?

DR. HUANG: Okay. I think it's--the policy is real in a sense that the, the one-child policy has been abandoned. That applies to all the regions in China.

COMMISSIONER TOBIN: Totally abandoned?

DR. HUANG: Totally abandoned.

MS. SELIGSOHN: It's changed to a two-child policy.

DR. HUANG: Right.

COMMISSIONER TOBIN: Yeah, yeah, that's why I said three or four.

MS. SELIGSOHN: It's not been totally--so it was always called the birth limitation policy in Chinese. It was never called the one-child policy, and as you knew, it was sometimes one and sometimes two, and there were all these different rules. It's not--there's no more one. It's two.

COMMISSIONER TOBIN: There's no more one. So it's partially lifted.

DR. HUANG: Right. So what is abandoned is the one-child policy. So if you choose to have the third or the fourth child, well, that is still restricted. But the problem here is that that policy's impact will be limited because we know a de facto two-child policy has been the norm in many places in China, especially in the countryside. So that policy change only in a sense affects the urban area, especially the large urban cities.

But as you correctly pointed out, where the cost of raising a child, an additional child, is so high that for education, you know, women, the couples, the incentives to have additional children are still significantly low even with that new policy in place. So in that sense the effectiveness of that policy will be quite limited.

COMMISSIONER TOBIN: Thank you. Thank you very much.

MS. SELIGSOHN: Can I add a little bit on the demography?

COMMISSIONER TOBIN: Sure. Yes.

MS. SELIGSOHN: So I think the consensus of demographers is that China has long since hit demographic transition where the birth rate is just naturally dropping. In the early '90s when I covered population policy at the Embassy in Beijing, the State Family Planning Administration was overstating the birth rate, and it has been for quite a long time, and one of the other problems is when you restrict people to either two or one child, you're way below replacement, right, because some people are not going to have any.

So there, I don't think anyone, anyone who looks at demography, I don't think thinks this is going to have a big impact on the structure of Chinese families. One of the things that may start to happen over time is if you look at places like Japan and Taiwan, there are a lot of families that have two or three kids, and there are a lot of people who have no kids.

It doesn't turn out that the majority of people want one child. There are people

who really would rather not have kids. And there are people who want a couple kids. Right now in China that's almost socially unacceptable. And one of the things that has started to happen is there are more and more, especially in the cities, young people choosing not to have kids.

So you may see more diversity in family size, but I don't think we're going to see bigger families. The institutional thing they have done, and they did this a year before eliminating the single child for urban families requirement, is merge the Ministry of Health and the State Family Planning Administration, and that's 1.5 million workers added into the health apparatus.

So when we talk about where the family planning changes might help with China's aging society, it's they have to come up with something for all these people who have been spending their time chasing women down and making them get sonograms, and they do need a new job for these people. I'm kind of hoping it's something healthcare related, maybe elder care related.

COMMISSIONER TOBIN: Fascinating. Thank you. That was great.

CHAIRMAN SHEA: Well, great. This is a fascinating conversation and appreciate the three of you for being here and contributing to our deliberations and to our knowledge. So thank you very much and safe travels.

HEARING CO-CHAIR GOODWIN: Thank you.

CHAIRMAN SHEA: And I want to also just thank on behalf, with Senator Goodwin, thank Katherine Koleski, who was the staff person on this hearing, along with Nargiza Salidjanova and the entire economics team of the Commission. They did a great job. Thank you.

COMMISSIONER TOBIN: Thank you.

[Whereupon, at 3:03 p.m., the hearing was adjourned.]