



# THE PEOPLE'S REPUBLIC OF CHINA

## SELECTED ISSUES

August 2016

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# PEOPLE'S REPUBLIC OF CHINA

July 7, 2016

## SELECTED ISSUES<sup>1</sup>

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<sup>1</sup> These summary notes provide background documentation for the 2016 Article IV consultation with China. Many are based on longer research papers that are expected to be published over the next few months.

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# REBALANCING IN CHINA: ANALYTICS AND PROSPECTS<sup>1</sup>

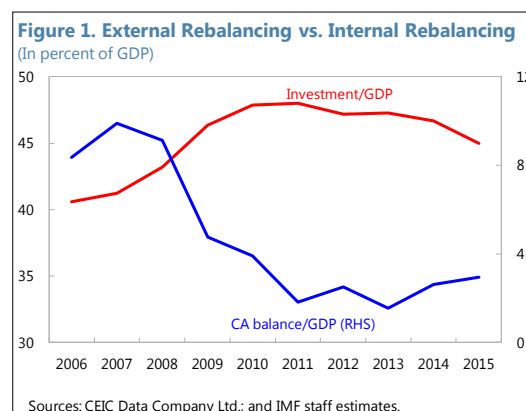
- *China is transitioning to a more consumer and service-based economy. This paper reviews progress along various dimensions of rebalancing and presents staff projections for the medium-term rebalancing path.*
- *External rebalancing has advanced well, while progress on internal rebalancing has been mixed—substantial on the supply side, moderate on the demand side, and limited on credit dependence. Rebalancing on the environment and inclusiveness has lagged.*
- *Going forward, the high national saving is expected to fall owing to demographic change and a stronger social safety net. The consumption ratio is expected to increase with rising labor income share and falling household savings. The investment ratio is forecast to fall in line with national saving, with external balance becoming more entrenched.*
- *Supply side rebalancing from industry to services is expected to advance further, helping reduce carbon intensity of output and promote income equality. Credit rebalancing is likely to progress slowly unless decisive corporate restructuring and SOE reforms are implemented.*

## A. Definition of Rebalancing

**1. Rebalancing in China contains four important elements: external, internal, environmental, and distributional.** While external rebalancing focuses on the role of external demand versus domestic demand, internal rebalancing has a much richer content: shifting from investment to consumption on the demand side, transitioning from industry to services on the supply side, reducing credit intensity of output, and improving the efficiency of resource allocation. They are closely interlinked and often reinforce each other. Environmental rebalancing aims to reduce the carbon intensity of output and make growth more environment-friendly. Income distribution rebalancing aims to create a more equal society by increasing the share of labor income in GDP and reducing income inequality.

## B. Progress on Rebalancing

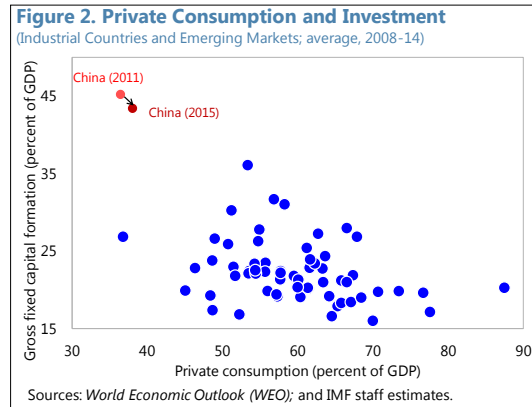
**2. External rebalancing has advanced well, but at the cost of growing internal demand imbalances until 2011.** After the Global Financial Crisis, substantial progress has been made on external rebalancing. China's current account surplus has come down from the peak of 10 percent of GDP in 2007 to around 2–3 percent in recent years, and the contribution of net exports to growth has been fluctuating around zero (from 2 percentage points of GDP annually in the pre-GFC peak).



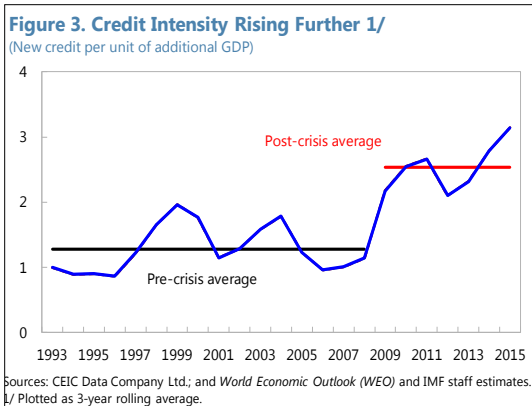
<sup>1</sup> Prepared by Longmei Zhang (APD).

Nonetheless, the narrower external imbalance has come at the cost of growing internal imbalances, with the investment ratio surging to 45 percent of GDP by 2011 (from about 38 percent in the pre-GFC years).

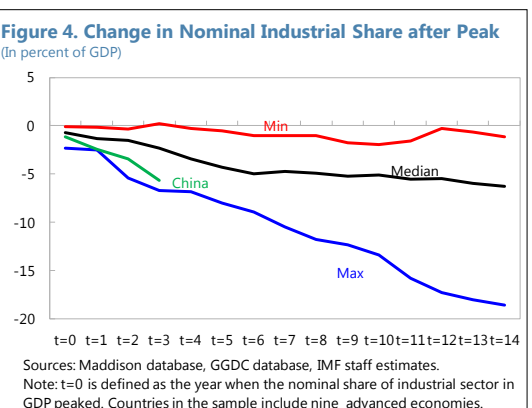
**3. Progress on internal rebalancing has been moderate on the demand side...** Since 2012, demand side rebalancing from investment to consumption has advanced, with a notable acceleration in 2015 and 2016:Q1 (consumption contributing two thirds of overall growth). Nonetheless, China remains a global outlier in its demand structure, with its investment ratio elevated at 43 percent of GDP, while private consumption accounts for only 38 percent of GDP.



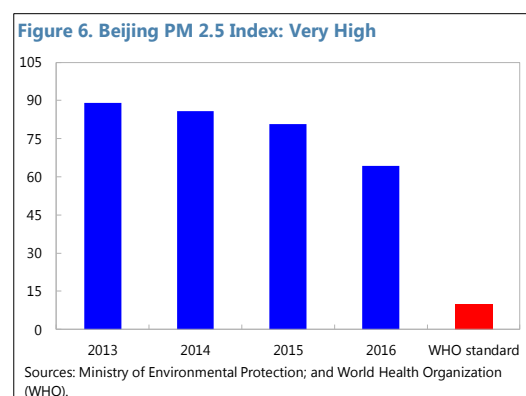
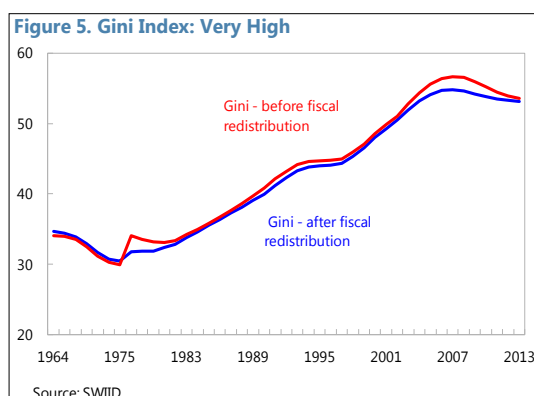
**4. ...while lagging on the credit side.** High investment, together with credit misallocation, has led to falling efficiency: the credit intensity of output doubled compared to the pre-GFC period and has continued to rise. Credit misallocation has, to a large extent, been driven by financing of nonviable firms, especially state-owned firms in overcapacity sectors, such as construction and steel. Since 2016, there have been early signs of improving credit structure, with a shift of lending from overcapacity sectors to the “new economy,” but overall credit misallocation remains significant.



**5. Supply side rebalancing has, however, made more substantial progress.** Similar to the experience of other advanced economies, China started to de-industrialize at an income level of about US\$9,000 (in 1990 international prices), with the output share of the industrial sector peaking in 2011. Since 2012, the nominal share of industry has been on a steady decline, and the pace of decline has been similar to the historical experience of advanced economies. The falling nominal share reflects to a large extent the price effect so far, as the decline in the real share has been much more muted. This is also in line with international experience, as relative price change is an essential part of deindustrialization, especially at the beginning. Resource reallocation will typically accelerate after these price movements. Another indicator for real adjustment is the industrial employment share, which peaked in 2012 and has been on a steady decline since then.



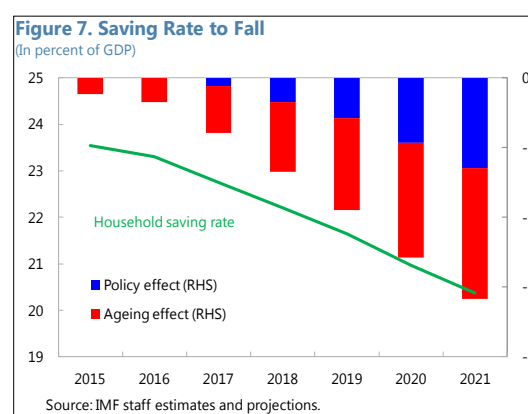
**6. Rebalancing on environment and inequality are lagging.** Some progress has been made in reducing the energy and carbon emission intensity of GDP, however, PM 2.5 indexes (fine particle air pollution) in cities remains very high. Rapid growth has been accompanied by growing income inequality, with the Gini index<sup>2</sup> rising from 0.3 in the 1980s to 0.53 in 2013. Progress has been made in recent years, with labor income gaining a larger share in GDP, but the redistributive role of fiscal policy remains limited as shown in the small difference between gross and net Gini index.



## C. Prospects for Rebalancing

*Staff's baseline envisages substantial progress in pro-consumption and services reform, but a lack of decisive SOE reforms and slow progress on hardening budget constraints. This will give rise to continued internal rebalancing on the demand and supply side, but less on credit side. The improvement in external balancing is likely to continue.*

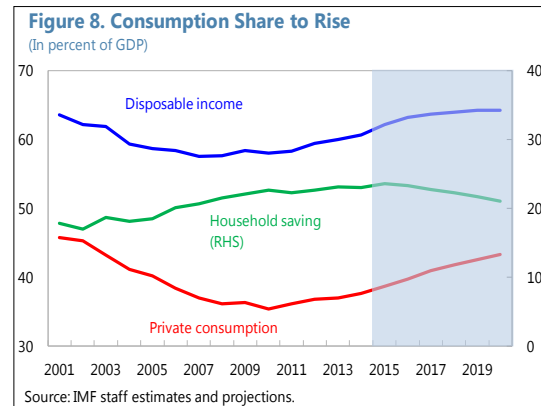
**7. The household saving rate is projected to fall, reflecting demographic changes and pro-consumption reforms.** China will experience rapid ageing in the next 15 years, with the old-age dependence ratio forecast to double from its current level by 2030. Cross-country evidence suggests such demographic change would significantly reduce the saving rate. In addition, precautionary saving is expected to fall with the strengthening of the social safety net, achieved through higher government spending on health care (rising from current 1.5 percent of GDP to 2.1 percent by 2021). As a result, household saving is expected to fall from 24 to about 20½ percent of GDP by 2021. Recently, the government has lifted the one-child policy, which may induce the saving rate to fall faster than staff projections, depending on the effect on the fertility rate.



<sup>2</sup> Data from Standardized World Income Inequality Database (SWIID).

**8. The investment ratio is expected to fall broadly in line with national saving, with external rebalancing becoming more entrenched.** Gross fixed asset formation in GDP is projected to fall gradually to 40 percent of GDP by 2021. The fall in investment will reflect both moderating private investment, as returns diminish in a slowing economy, and less excess in public investment. With the commensurate fall in investment and national saving, the current account surplus is projected to remain low, and decline further to less than 1 percent of GDP in the medium term.

**9. Consumption's share of GDP is expected to increase with rising labor income share and falling household savings.** Private consumption's share of GDP is projected to rise from around 38 percent in 2015 to 43 percent in 2021. The increase will come from rising labor income share in GDP (linked to the transition from industry to relatively more labor-intensive services) as well as declining household saving out of disposable income.



**10. Credit intensity, although expected to fall, will remain high in the medium term; as a result, the private debt-to-GDP ratio continues to rise.** Credit intensity is forecast to fall modestly, owing to lower investment ratio and some improvement in efficiency, but remains high in the medium term, reflecting moderate SOE reforms and slow progress in hardening budget constraints and loan write-offs. By 2021, the private credit to GDP ratio (excluding LGFVs) is expected to approach 200 percent, up from about 160 percent in 2015.

**11. Services will become a more important pillar of the economy.** The nominal share of services in GDP is projected to rise from current 50 percent to 55 percent by 2021. This will be achieved through both a price effect (higher service deflator than industrial deflator, reflecting the productivity growth differential) and in real terms and employment. By 2021, the share of service employment is forecast to rise to 51 percent, continuing the trend of net job creation in services seen in recent years.

**12. The changing economic structure will facilitate environmental and income distribution rebalancing, but proactive, supporting policies are also needed.** While the changing economic structure will naturally bring down the carbon intensity of GDP, China still needs more proactive policy measures, such as a carbon or coal tax, to reach the target set at the 2015 Paris climate summit. Similarly, a more service-oriented economy will give rise to a higher share of labor income in GDP, but requires further service sector deregulation to facilitate entry of new firms and job creation. A more redistributive fiscal policy will also be necessary to bring down income inequality, and provide more equal opportunities to both urban and rural households.



**13. Successful rebalancing requires coordinated progress on various fronts.** Going too fast in one area and slow in others may derail the process, in particular: (1) *asynchronous adjustment in savings and investment* (rapid decline in investment with still high savings will simply shift China's imbalance abroad, while continued excessive investment despite falling saving would eventually lead to dependence on foreign financing and greater exposure to global financial volatility); (2) *premature deindustrialization* (de-industrializing too fast may lead to a significant growth slowdown and stall income convergence); (3) *continued debt overhang* (lack of progress on credit rebalancing would significantly raise the probability of a disruptive adjustment, especially when buffers to absorb financial shocks erode with lower national savings over time).

Table 1. Rebalancing Score Card

	Unit	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
								Projection					
<b>1. External rebalancing</b>													
Contribution of net exports to GDP growth	%	-0.2	-0.8	0.2	-0.1	0.3	-0.1	-0.5	-0.2	-0.1	0.0	0.0	0.0
Current account balance	% of GDP	3.9	1.8	2.5	1.5	2.6	3.0	2.4	1.6	1.3	1.0	0.8	0.6
FX reserve coverage	months of imports	34.0	28.3	22.3	24.0	22.1	18.1	18.7	18.4	16.8	15.3	14.1	13.0
National saving rate	% of GDP	51.8	49.8	49.7	48.8	49.3	47.9	46.3	44.9	44.1	43.2	42.4	41.6
<b>2. Internal rebalancing</b>													
<b>Demand side</b>													
Growth contribution of consumption vs investment	%	0.7	1.3	1.3	0.8	1.1	1.4	1.3	1.6	1.5	1.4	1.4	1.4
Share of private consumption (Nominal)	% of GDP	35.6	36.3	36.7	36.8	37.4	38.0	39.1	40.2	41.1	41.9	42.6	43.2
Share of investment (Nominal)	% of GDP	47.9	48.0	47.2	47.3	46.7	45.0	43.9	43.3	42.8	42.2	41.6	41.0
<b>Supply side</b>													
Real growth rate of Tertiary vs Secondary sector	%	0.8	0.9	0.9	1.0	1.1	1.4	1.3	1.2	1.1	1.1	1.0	1.0
Share of Tertiary sector in GDP (Nominal)	% of GDP	44.1	44.2	45.3	46.7	47.8	50.2	51.9	52.9	53.7	54.5	55.0	55.4
Share of Tertiary sector in total employment	%	34.6	35.7	36.1	38.5	40.6	42.4	44.1	45.7	47.2	48.5	49.6	50.6
<b>Credit Side</b>													
Private credit	% of GDP	127	125	134	142	148	158	169	179	187	192	195	199
Credit intensity	%	2.2	1.5	2.6	2.8	2.9	3.7	4.1	4.0	3.7	3.4	3.1	2.9
SOE share in credit stock	%	61.6	58.8	56.8	54.8	55.6	...	...	...	...	...	...	...
Difference in return on asset	%	-7.0	-8.4	-8.4	-7.8	-7.1	...	...	...	...	...	...	...
<b>3. Environmental rebalancing</b>													
Energy intensity of output	per unit of output	102	105	103	104	100	92	89	87	86	84	83	82
Carbon emission intensity	kg CO2 per output	0.17	0.19	0.18	0.17	...	...	...	...	...	...	...	...
PM 2.5	mcg per cubic metre	...	...	...	67.4	64.1	55.0	...	...	...	...	...	...
<b>4. Income distribution</b>													
Gini	index number	0.54	0.53	0.53	0.53	0.47	0.46	...	...	...	...	...	...
Labor income	% of GDP	58.5	58.3	60.1	60.7	61.7	62.5	63.2	63.6	63.9	64.2	64.2	64.2
Urban/rural income gap	income ratio	...	...	...	2.8	2.7	2.9	...	...	...	...	...	...

Sources: CEIC Data Company Ltd.; and IMF staff estimates.

Table 2. Rebalancing Scorecard: Heat Map Descriptors

Categories		Indicators	Benchmark			
<b>1. External Rebalancing</b>		Contribution of net exports to GDP growth	Level	>0.5	0.2-0.5	<0.2
		Current account balance	Level	>3.2	2.5-3.2	<2.5
		FX reserve coverage	Level	>30	20-30	<20
		National saving rate	Level	>50	[45,50]	<45
<b>2. Internal Rebalancing</b>	<b>Demand side</b>	Growth contribution of consumption vs investment	Level	<1	[1-1.2]	>1.2
		Share of private consumption (nominal)	Annual change	<0	0-1	>1
		Share of investment (nominal)	Level	>45	[40,45]	<40
	<b>Supply side</b>	Real growth rate of tertiary vs secondary sector	Level	<0.9	[0.9, 1]	>1
		Share of tertiary sector in GDP (nominal)	Annual change	<0	[0,0.5]	>0.5
		Share of tertiary sector in total employment	Annual change	<0	[0,1]	>1
	<b>Credit side</b>	Private credit	Annual change	>5	[0,5]	<0
		Credit intensity	Annual change	>0.05	[0,0.05]	<0
		SOE share in credit stock	Annual change	>0	[-1,0]	<-1
		Difference in return on asset	Level	>0	[-1,0]	<-1
<b>3. Environmental Rebalancing</b>		Energy intensity of output	Annual change	>0	[-1,0]	<-1
		Carbon emission intensity	Annual change	>0	[-0.1,0]	<-0.1
		PM 2.5	Level	>10	[5,10]	<5
<b>4. Income Distribution</b>		Gini	Annual change	>0	[-0.1,0]	<-0.1
		Labor income	Annual change	<0	[0,0.2]	>0.2
		Rural/urban income gap	Annual change	>0	[-0.1,0]	<-0.1

Sources: CEIC Data Company Ltd.; and IMF staff estimates.

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## CHINA: SHIFTING TO A MODERN, MARKET-BASED MONETARY POLICY FRAMEWORK<sup>1</sup>

- *Financial liberalization and greater exchange rate flexibility require a modern, market-based monetary policy framework focused on maintaining price stability.*
- *The full liberalization of bank lending and deposit rates was an important milestone in the process of shifting to a market-based system.*
- *Interest rate policies now play a substantive role in the determination of both real activity and inflation and increasingly contain information about the monetary policy stance.*
- *The next major reform should be the introduction of an inflation target or a range together with operational (instrument) independence for the People's Bank of China (PBC).*
- *Effective communication of the PBC's policy stance and economic outlook, as well as further analytical capacity, is essential for the effectiveness of inflation targeting.*

**1. China's rapid transformation into a service-oriented, market-based economy with greater exchange rate flexibility requires a modern monetary policy framework.** The government has implemented a host of financial market liberalization measures including in the banking sector (liberalization of bank lending and deposit rates, for example), and stock and bond markets, and remains committed to further reform. This is welcome. But heightened financial market volatility (with global spillovers) in the wake of several changes in exchange rate policy and rapid credit growth point to the need of taking into account the growing linkages between monetary policy, financial stability and the exchange rate regime as financial markets are liberalized and capital flow restrictions gradually eased.

**2. With greater exchange rate flexibility, monetary policy will need to focus increasingly on domestic price stability.** The exchange rate has long been a nominal anchor for China's monetary policy and the renminbi was pegged against the U.S. dollar until 2005. Subsequently, the renminbi appreciated steadily. But since early 2014 capital outflows accelerated and the currency depreciated against the U.S. dollar as the PBC made several adjustments to the exchange rate regime with a view to allowing more flexibility in both directions. In recent communications, the authorities highlighted greater reference to a currency basket rather than the U.S. dollar. Naturally, these changes have led to rising uncertainty and volatility of exchange rate expectations, implying the need for a new nominal anchor for China's monetary policy which, as in most other countries, could be domestic price stability and, preferably, an explicit inflation objective. An effective float remains the goal, ideally by 2018, and should be adopted once the shift to a market-based, flexible inflation targeting approach is achieved.

**3. China's monetary policy framework is in the midst of transitioning to a market-based approach.** Historically, the PBC has employed a number of tools (price- and quantity-based) to conduct monetary policy. However, its operational conduct is increasingly relying on a standard interest-based system and short-term market interest rates increasingly contain information about the monetary policy

<sup>1</sup> Prepared by Thomas Harjes (MCM)

stance. Although money growth (M2) remains the official intermediate target (now at 13 percent y/y for 2016), the PBC has recently de-emphasized its importance, which paves the way to a money market rate as the intermediate target. Short-term repo rates have become much less volatile after the PBC introduced reserve averaging for banks and appears to calibrate the liquidity impact of its various policy measures to ensure that money market rates move closely with its own benchmark rates.

**4. The seven-day interbank repo rate appears to have become the targeted short-term money market rate.** Over the past few quarters, this rate has consistently traded just above the PBC's reverse repo rate, which banks have to pay for PBC funds with maturity of one week. On October 26, the PBC cut its seven-day reverse repo rate by 10 bps to 2.25 percent and since then the seven-day interbank repo rate fixing—a daily trade-volume weighted average—has traded closely above this rate, averaging 2.38 percent. This implies that the PBC largely accommodates banks' liquidity demand at the "policy" reverse repo rate. At the beginning of this year, the PBC increased the frequency of its open market operations from bi-weekly to daily.

**5. The corridor around the seven-day repo rate is likely to be defined by the interest rate on excess reserves (lower bound) and the standing lending facility (upper bound).** Together with its open market operations (OMOs), the PBC also operates several standing lending facilities with various maturities. The standing lending facility (SLF) offers overnight (currently at 2.75 percent), seven-day (currently at 3.25 percent), and one-month (currently at 3.6 percent) liquidity to domestic banks and other local financial institutions. The PBC is exploring the use of the seven-day SLF to set the upper limit of an interest rate corridor. The interest rate that banks receive on their excess reserves deposited at the PBC (currently at 0.72 percent) sets the lower bound of the interest rate corridor.

**6. The PBC's other longer-term lending facilities complement the daily open market operations and provide longer-term funding mainly for national priority projects.** The PBC also operates a number of medium-term lending facilities (3-month, 6-month, 1-year maturities) but access to these facilities is mostly granted to a number of large banks and the amount available is preset. With these facilities, the PBC aims to guide market interest rates at longer tenors but often these tools are also employed to support other policy objectives, such as lending to small- and medium-term enterprises. The pledged supplemental lending facility (PSL) provides funds with one-year maturity to policy banks to finance urban upgrades.

**7. The PBC requires banks to post central government bonds, central bank bills or policy bank bonds as collateral for its open market operations.** Local government bonds do not currently qualify as collateral but the PBC is reportedly exploring the possibility of adding these to the eligible pool of assets for OMOs. Other liquidity operations may each have their own collateral requirements but there is limited transparency on the specifics.

**8. Reserve requirements continue to play a role in the PBC's liquidity management but do not seem to be an independent signal of the policy stance.** The PBC has traditionally adjusted reserve requirements to help with the sterilization of large liquidity injections and withdrawals related to its intervention in the foreign exchange markets. The rate on reserve requirements peaked in 2011 (at 21 percent for large banks) and has since been lowered to 16.5 percent to partly compensate for the

liquidity withdrawn by the PBC through its FX sales. The latest cut in March, however, had virtually no impact on money market conditions with other PBC liquidity operations calibrated to keep the seven-day repo rate closely above the PBC's 2.25 percent reverse repo rate.

**9. The full liberalization of bank lending and deposit rates was an important milestone in the process of shifting to a market-based system.** Variation of lending rates across banks has increased and about 40 percent of bank loans are now priced more than 10 percent above the benchmark rate, which signals that a larger pool of customers may now have access to bank credit. This should facilitate a better allocation of credit and transmission of monetary policy. Although banks appear reluctant to engage in greater competition for retail deposits, many banks offer their retail clients principal guaranteed wealth management products mainly invested in short-term money market instruments or government paper and competition for these, as well as deposit certificates (CDs) and other wholesale funding tools, is more pronounced. To enhance commercial banks' response to the policy rate and money market conditions, the PBC should reduce or eliminate the administrative tools used to influence banks' activities such as setting credit targets through "window guidance" for individual banks, unless these are for the purposes of macroprudential policy.

**10. The recent growth and importance of bond, repo financing and other market-based financing tools also imply a stronger transmission of the interest-based policy stance than in the past.** Over the past few years, corporate bond issuance and repo financing have surged and the use of other financing tools (trust and wealth management products etc.) has grown rapidly. The cuts in PBC interest rates have been reflected in money market rates and have also reduced corporate financing costs in the bond market. Since early 2014, the reductions in the PBC's refinancing rate have been more or less fully passed on to short-term (2-year) government paper and the yield for highly-rated corporate bonds. While the prevalence of implicit state guarantees prevents the appropriate (usually countercyclical) pricing of credit risk in the bond market and distorts credit allocation, it makes the transmission of the policy stance to market rates even stronger due to the lack of countercyclical risk premiums.

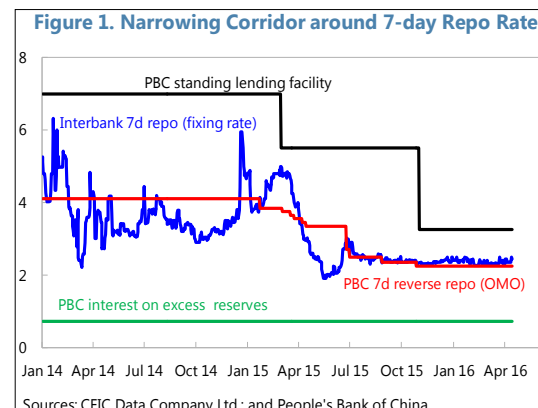
**11. Inflation and growth are clearly correlated, although the impact of the output gap on inflation appears limited.** This might reflect uncertainty and potentially large measurement error for China's output gap (and inflation). Moreover, many prices especially in the service sector remain regulated or administered. Global factors, such as international commodity prices and global activity appear to be important drivers of nonfood inflation in addition to the part that is imported U.S. inflation adjusted for exchange rate changes. Porter (2010) finds that cost pressures—reflected in domestic and foreign input prices—and expected inflation play an important role in explaining producer and nonfood consumer inflation. While direct domestic demand pressures have little impact on overall nonfood inflation, foreign demand pressures (as measured by the foreign output gap) play a substantial role.

**12. Nevertheless, the monetary transmission mechanism in China is becoming more similar to that in the United States and other major market economies.** Fernald, Spiegel, and Swanson (2014) find that changes in Chinese interest rates have a substantial impact on economic activity and inflation, while other measures of changes in credit conditions, such as shocks to M2 or lending levels do not once other policy variables are taken into account. They use a broad set of

Chinese economic indicators and a dynamic factor model framework to estimate Chinese economic activity and inflation as latent variables in a factor-augmented vector autoregression (FAVAR) to estimate the effects of Chinese monetary policy on the Chinese economy. Their approach is particularly well-suited to such analysis due to concerns about Chinese data quality, a lack of a long history for many series, and the rapid institutional and structural changes that China has undergone. As more data under the new regime of liberalized financial markets and interest rates become available, it should become easier to identify and estimate the effect of changes in the policy interest rate on activity and inflation.

**13. To complete the transition towards a more market-based framework, the key next steps for the authorities to consider include:**

- Objectives:** Although the PBC does not operate under an explicit inflation targeting regime its official mandate is “maintain the stability of the currency value and thereby promote economic growth”. This is similar to that of other central banks with a focus on price stability and the next step should be the introduction of an explicit medium-term inflation target or a range (set by the government/state council) together with operational (instrument) independence for the PBC.
- Instrument:** The PBC should declare the seven-day repo rate its new intermediate policy target for monetary policy purposes, permit more flexible use of reserves averaging and publish a new market rate (7-day repo) representative of lending conditions for Tier 1 banks only. Longer-term rates should be market-determined, reflecting expectations of the central bank’s future policy rates, future inflation, among other factors. The clearer the policy framework, the easier it will be for the market to establish a yield curve. Standing facilities should act as a backstop with unlimited access for banks on demand against appropriate high-quality collateral. Eligibility and collateral requirements for the PBC’s liquidity facilities should be clear and transparent.
- Communication** of the PBC’s policy stance and economic outlook would increase the effectiveness of a flexible inflation targeting framework. Historically, many central banks kept markets guessing, to some extent, about their policy intentions; but most central banks have found that policy operates more efficiently and effectively if (i) the policy is clearly and simply communicated; and (ii) implementation fully supports the stated policy. Simultaneous publication of monetary policy reports (at least the conjunctural chapter) in English would support these goals.





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# CHINA: FINANCIAL SYSTEM VULNERABILITIES— SHADOW EXPOSURES, FUNDING, AND RISK TRANSMISSION<sup>1</sup>

- *The proliferation of “shadow” credit products and growing reliance on short-term, wholesale funding could pose substantial risk. Oversight should be enhanced commensurately.*
- *Recent supervisory action seems to close the major regulatory gaps but will need to be implemented strongly and should ensure that losses on existing shadow credit holdings are promptly recognized.*
- *On funding, liquidity frameworks should be reviewed, tightening of leverage mechanisms in the interbank market considered, and the overall shift toward wholesale and interbank sources closely monitored with a view to imposing more measures if recent trends continue.*

**1. The proliferation of “shadow” credit products and growing reliance on short-term, wholesale funding, could pose substantial risks.** Recent work by the Fund and others suggest that borrower solvency is deteriorating and that potential defaults on corporate loans by ‘at-risk’ borrowers could potentially imply significant costs (e.g., the April 2016 *Global Financial Stability Report*). But the process of loss realization on loans is likely to be gradual and the system has mechanisms, such as state backstops, to prevent loan deterioration from rapidly metastasizing. A possibly greater risk to stability may reside in the potential for defaults on widely-held “shadow products” to trigger risk-aversion that results in the withdrawal of liquidity from short-tenor investments in high-risk borrowers. This risk is intensified by financial institutions’ own increasing reliance on short-term wholesale (including interbank) funding, a structure potentially susceptible to rapid risk transmission and destabilizing liquidity events.

**2. “Shadow credit products” are large and growing rapidly.** Shadow credit products are investment instruments, mainly with loans or other credit as underlying assets, structured by trust or securities companies, or their asset management subsidiaries. The volume of these products grew by 48 percent in 2015, to RMB 40 trillion, equivalent to 40 percent of banks’ corporate loans and 58 percent of GDP.

**3. About half of shadow credit products appear to pose elevated risk of default and loss.** Some shadow products appear benign; but others appear to contain significantly higher default risk and loss potential than banks’ corporate loan portfolios. These high-risk products offer yields of 11–14 percent, compared with 6 percent on loans and 3–4 percent on bonds. Those whose underlying assets are ‘nonstandard credit assets’ (NSCA)—untradeable debt, typically loans—are probably of lowest quality; and shadow products based on equities are also risky. RMB 19 trillion,

<sup>1</sup> Prepared by John Caparusso and Kai Yan (both MCM).

nearly half of total shadow products, have either NSCA or equities as underlying and appear high-risk relative to corporate loans.

**4. Banks' on-balance sheet exposures to shadow products are large and growing fast.** At end-2015, banks held RMB 15.2tn<sup>2</sup> of shadow products—equivalent to 8 percent of banks' assets and 92 percent of capital buffers, and up 58 percent year-on-year for listed banks. Because these positions appear to be motivated in part by some banks' practice of repackaging deteriorating loans into investment securities to avoid recognizing and providing for nonperforming loans (NPLs), banks' exposures are likely skewed toward the riskier products (those with NSCA as underlying asset). The "big four" banks have small exposures, but several other listed banks and the unlisted in aggregate have exposures that are several times their capital.

**5. Shadow products also can generate transmission risks that are potentially less manageable than loan losses.** Where shadow products differ qualitatively from high-risk loans is in their greater power to transmit risk across the financial system. Of greatest concern are holdings by investors who have little ability or incentive to continue supporting market liquidity in the face of shocks or deterioration in credit conditions. Vulnerable segments include 'collective' instruments (RMB 10.9 trillion at end-2015); and holdings by nonbank financial institutions (particularly investment funds), corporates and individuals. Sizing the 'high-transmission' segment of the shadow system is difficult; but it appears sufficient to potentially catalyze significant liquidity challenges.

**6. Rapid asset growth has increased banks' and other financial institutions' reliance on wholesale funding.** From 2010 to 2015, total financial system assets grew by 5½ times more than GDP, twice as much as total social financing and three times as much as loans. Thus while the banking system loan-deposit ratio remained stable, total assets have grown much faster than deposits. Financial system assets relative to the stable bank deposit funding in the system rose from 163 percent in 2010 to 193 percent in 2015; and for banks, from 130 to 143 percent. The gap has been funded from wholesale sources; staff estimate that wholesale sources as a percent of total bank funding essentially doubled, from 15 to 34 percent, over the period 2013 to 2015. (Counting banks' principal-protected wealth management products as quasi-deposits would lower wholesale funding dependence to 30 percent at end-2015.) This wholesale funding is potentially less stable than deposits.

**7. The interbank market, which accounts for about half of bank wholesale funding, may become a stress transmitter in the event of a shock.** Banks source about 16 percent of their total funding from the interbank market, up from 8 percent at the end of 2010. Financial institutions, including banks, are in aggregate net borrowers in the interbank market. The funding providers are investment vehicles, mostly structured as 'wealth management products', by which trust and fund management companies source funds (mostly less than three months in tenor) from yield-seeking investors. The interbank market is also shifting toward riskier practices—for example, increasing use of 'pledged' repurchase agreement contracts to increase leverage and investment returns.

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<sup>2</sup> Excluding Agricultural Bank of China due to data availability.

**8. The rapid expansion in the size, interconnectedness, and complexity of the financial system calls for a commensurate increase and coordination in oversight.** The broad direction should be to a more holistic, system-wide approach, with harmonized treatment of similar institutions and products, and enhanced supervisory coordination and information sharing. The authorities are progressing in this regard, though unaddressed issues and implementation challenges remain.

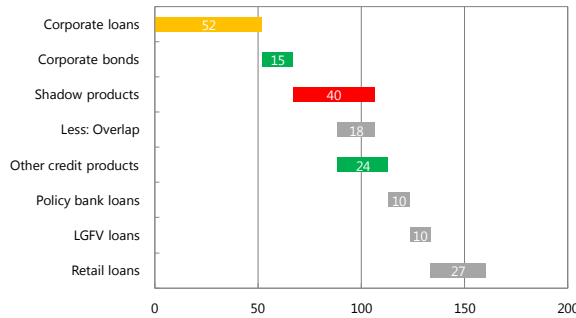
**9. Recent steps to close regulatory arbitrage incentives for banks to hold shadow products are welcome, though implementation challenges remain.** The rapid growth of banks' on-balance sheet exposures to shadow products seems intended in part to exploit regulatory loopholes. Transferring deteriorating loans into securitized packages, much of which ends up on banks' balance sheets, allowed banks to avoid recognizing these exposures as NPLs, taking loan-loss provision charges to earnings, and including the loans in their loan-to-deposit ratios. The recently published Document 82 constructively criticizes the opaque and nonstandard transactions structures and weak prudential supervision of capital adequacy and loss provisioning that enable these practices. More importantly, it appears to close the major regulatory arbitrage opportunities and should limit banks' ability to engage in these transactions in future—a significant positive development if implemented strongly. However, it is not clear that the new regulation compels recognition of impaired assets in existing positions. For some banks, immediate recognition of asset impairment in the investment receivables book would seem to imply substantial provision charges.

**10. The authorities should consider measures to strengthen financial institutions' liquidity and the robustness of wholesale funding structures.** A few specific suggestions:

- There are international frameworks for managing liquidity risk, and China has introduced Liquidity Coverage Ratio (LCR) regulation for banks. Nonetheless, evidence presented earlier of increasing funding risk suggests that the implementation of the LCR framework may require review, with focus perhaps on the designation of High-Quality Liquid Assets (HQLA) and the 'outflow' assumptions applied to wholesale and interbank elements of the banks' funding.
- The authorities may wish to revisit and tighten the mechanisms available for participants to generate leverage within the interbank system. This might include stricter limitations on the use of pledged repo to achieve leverage. In addition, the authorities should reconsider allowing the use of relatively low-quality assets like Trust Beneficiary Rights as collateral for repurchase agreements.
- Finally, the overall shift of funding toward wholesale and interbank sources should be monitored; and continued increases in this direction may merit consideration of more comprehensive frameworks to limit liquidity risk.

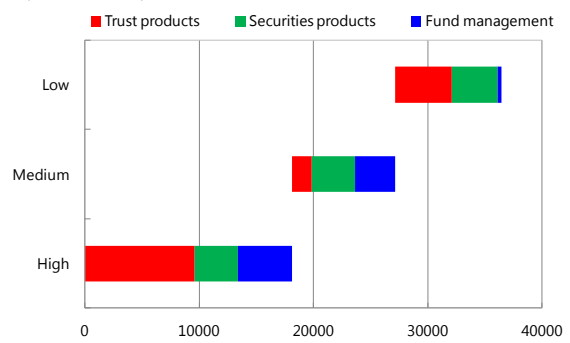
### Figure 1. China Financial System Vulnerability

**Shadow Products in a Credit System Context, 2015**  
(In trillion of RMB)

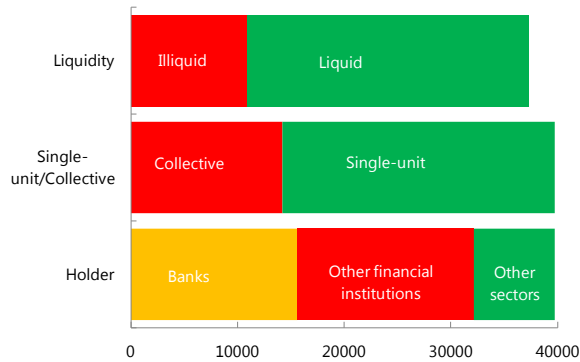


Note: Segments highlighted in red are high-risk, yellow indicates medium-risk, and green is low-risk. Segments in gray are outside the scope of analysis or assumed to be zero-risk.

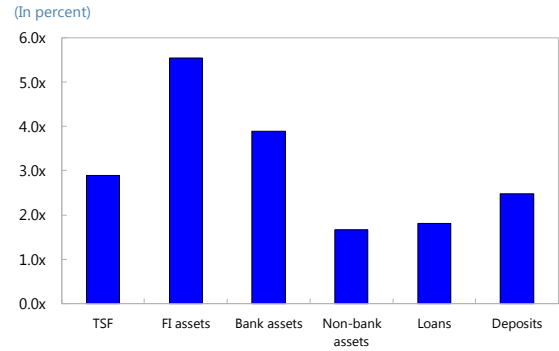
**Shadow Products: by Risk Level and Product Type, 2015**  
(In billion of RMB)



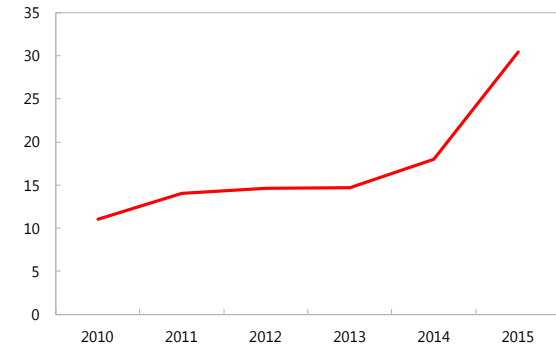
**Transmission Risk: Shadow Product Volume by Liquidity and Transmission Risk Indicators, 2015**



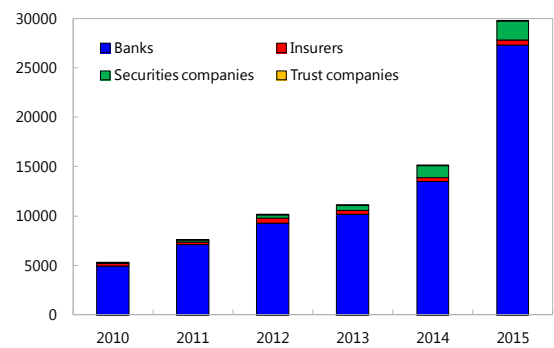
**Financial System Aggregates: Growth Relative to GDP, 2010-2015**  
(In percent)



**Wholesale as a Percent of Total Funding**  
(In percent)



**Financial Institutions: Interbank Liabilities**  
(In billion of RMB)



Source: IMF staff estimates.

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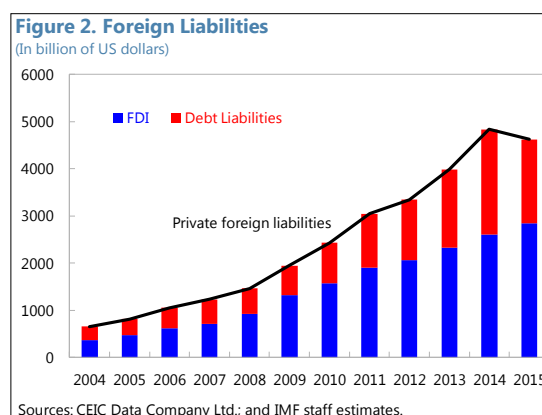
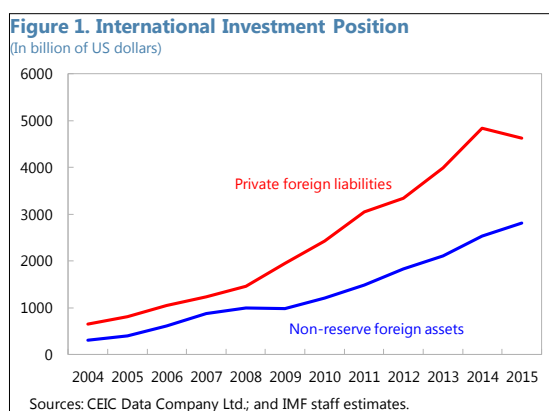
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## CHINA: OUTLOOK FOR NET CAPITAL FLOWS<sup>1</sup>

- In recent years, China's capital account saw a rapid acceleration in external borrowing.
- In 2014, that borrowing peaked before becoming large relative to standard metrics.
- Unwinding these liabilities has been a key driver of outflows and is almost complete.
- Nonetheless, risks persist with respect to FDI and Chinese savers' home bias.

**1. In 2015, China experienced unprecedented net capital outflows of 6.2 percent of GDP (US\$ 673 billion).** This is only the second time since 2000 that China has experienced net capital outflows. Such large outflows are important in their own right: when large, sudden or sustained, they can cause financial stress and output losses. They are also important for what they represent: such material changes in investor sentiment occur as a result of a change in some underlying fundamental such as an emerging policy inconsistency or change in expectations. This note looks at the nature of recent capital flows to better understand their durability going forward.<sup>2</sup>

**2. Over the last two decades, gross capital flows have grown materially.** The pattern of those flows is a function of both the relative pace of growth between China and the rest of the world and the pattern of capital account liberalization. That is, China's acquisition of foreign liabilities (inflows) has grown far faster than foreign assets (outflows) because investors sought to take advantage of China's rapid economic growth and residents were limited in their ability to diversify abroad. The large inflows were initially dominated by equity in the form of FDI. But on the eve of the global financial crisis, China began to liberalize the acquisition of external debt, leading to a sharp increase in external borrowing. In the four years since 2008, foreign loans and nonresident deposits alone rose from 200 billion to a peak of 1.1 trillion, roughly 10 percent of GDP.

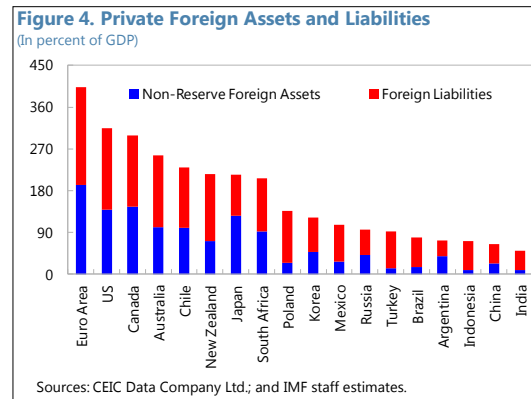
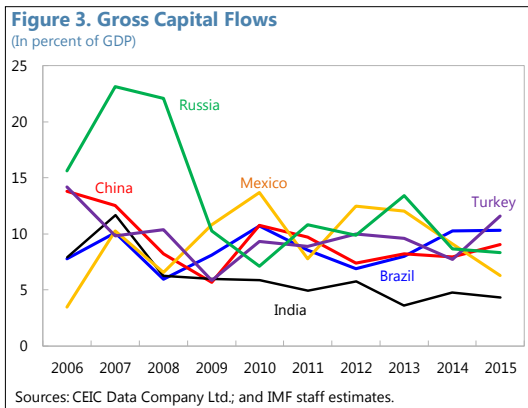


<sup>1</sup> Prepared by Geoff Gottlieb (SPR).

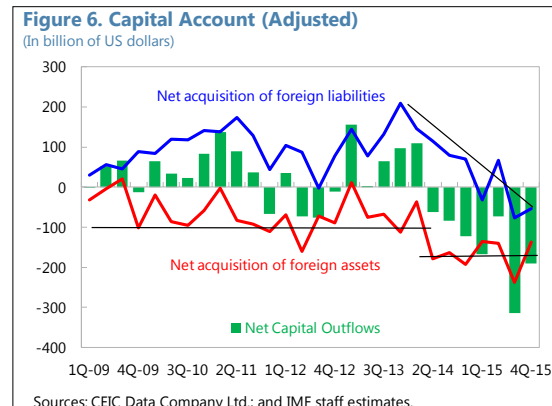
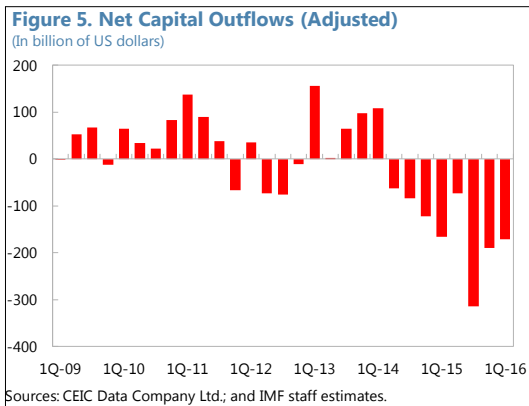
<sup>2</sup> In this note, the focus is on capital outflows recorded in the capital account and errors and omissions. There has been some discussion of whether there is also capital flight in the current account, notably with reference to tourism. However, this is difficult to verify due to important changes in SAFE's statistical methodology in 2014–15.

**3. Indeed, in a de facto sense, China’s capital account has not looked particularly closed.**

There is no question that controls still exist in China. Relatively constant onshore-offshore gaps exist for key prices, approval requirements remain for direct investment, and the portfolio account is still subject to strict quotas. But when looking at gross capital flows scaled by GDP, China is consistent with other large emerging markets and, in terms of *stocks*, China materially trails advanced markets but is broadly in line with most emerging markets. In short, controls matter but have still allowed material flows.



**4. The most recent bout of outflows started in early 2014 and reflected both the repayment of foreign liabilities and the acquisition of foreign assets.** But while the pace of repayment of foreign liabilities by residents (or nonrollover by nonresidents) has accelerated almost every quarter, there was a step increase in foreign asset acquisition that has remained relatively constant since.



**5. One can see this in greater detail by looking at a table decomposing the change in flows.**

On an annual basis, the increased pace of foreign asset acquisition, mainly “Other Investment” abroad, explains about 70 percent of the deterioration in the capital account in 2014 but only roughly 15 percent in 2015. That is, in the past year, a more rapid reduction of nonresident claims on China has been by far the dominant driver of outflows.



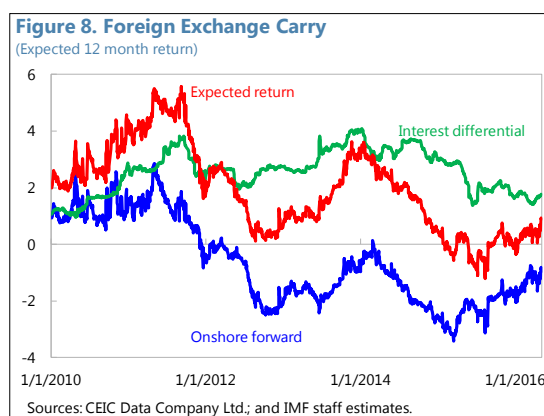
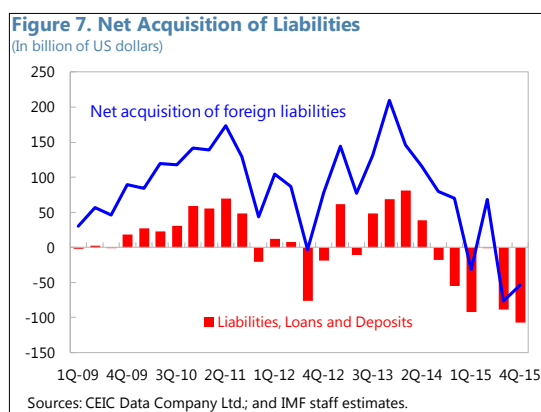
**Table 1. Decomposition of Capital Account Deterioration**  
(In billions of U.S. dollars)

	2013-14	2014-2015
Total change in capital account 1/	-481	-584
Change in foreign asset acquisition 1/	-329	-79
Direct investment	-50	-65
Portfolio investment	-5.5	-62
Other Investment 1/	-228	131
Errors	-45	-80
Change in foreign liabilities acquisition	-152	-505
Direct investment	-22.8	-18.2
Portfolio investment	35.0	-86.5
Other investment	-164.0	-401.7
Memo:		
Share of annual adjustment (percent)		
Assets	68.5	13.5
Liabilities	31.5	86.5

Source: CEIC Data Company Ltd.; and IMF staff estimates.

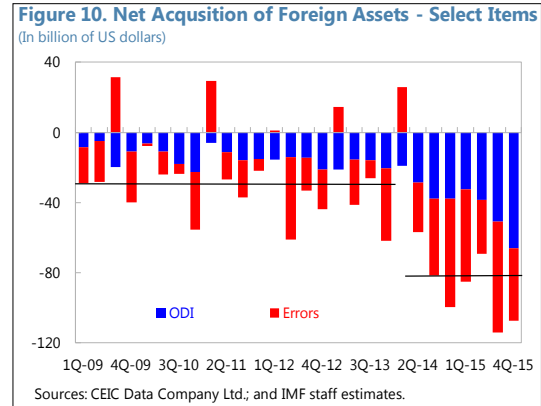
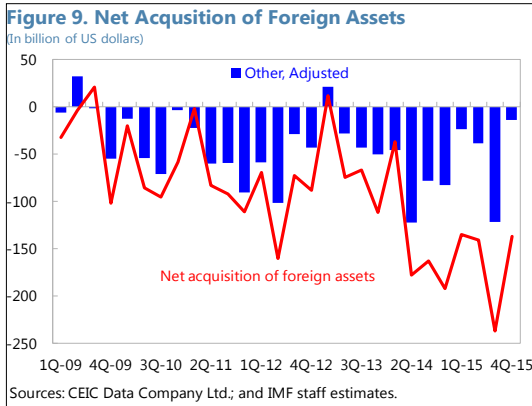
1/ Changes exclude "Other Investment: Asset: Other Receivables," which is largely driven by policy changes that resemble intervention.

**6. The rapid reversal in foreign liabilities is driven by the change in appeal of the carry trade.** Indeed, the dynamics of foreign liabilities are driven by the loans and deposits part of Other Investment, two relatively open parts of the capital account in which the carry trade was played. In turn, the reversal tracks the expected return as measured by the interest differential and the forward points.

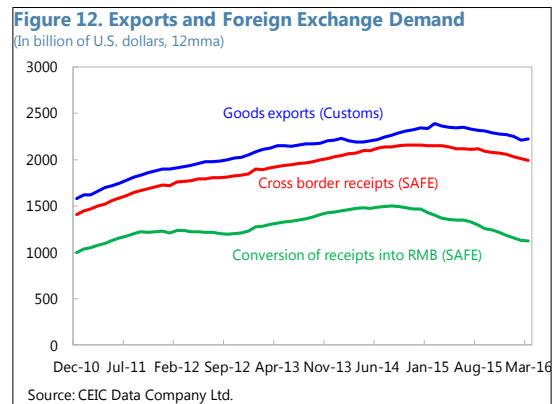
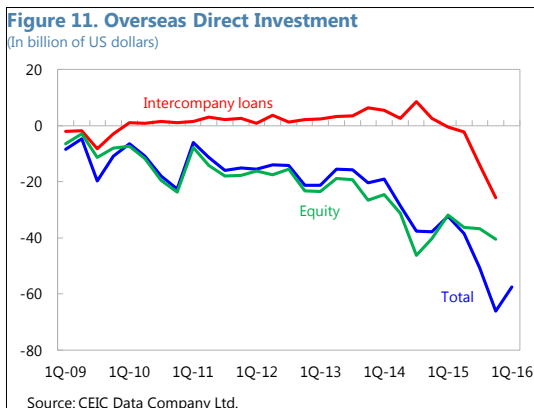


**7. The drivers of the step up in the pace of foreign asset acquisition are more complicated.** Historically, the dynamics of Chinese foreign asset purchases were driven by loans and deposits in Other Investment, much like with liabilities. However, since early 2014, this relationship broke down due to a surge in overseas direct investment (ODI) and errors.<sup>3</sup>

<sup>3</sup> When analyzing private capital flows, the line item "Other Investment: Other Receivables" is excluded as it relates to changes in Other Foreign Assets on the balance sheet of the PBC and tends to be policy driven. This line item included an US\$ 87bn inflow in Q3:2015.



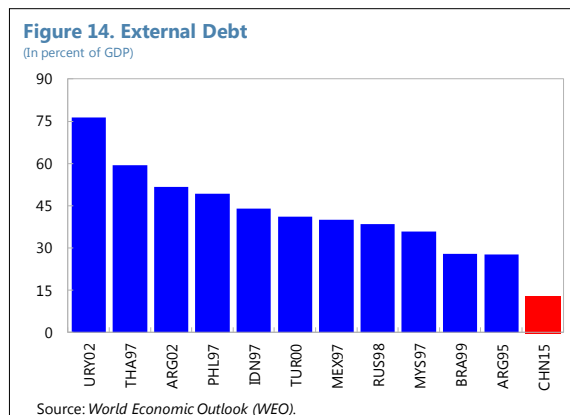
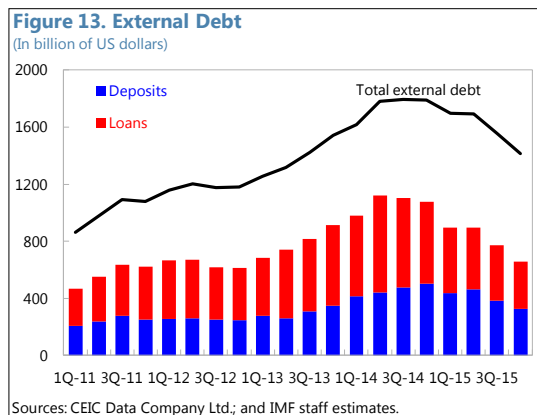
**8. Both the rise in ODI and errors and omissions appear to reflect, in part, changes in short-term sentiment.** On ODI, the increase in outflows likely reflects, in part, the traditional desire for new markets and technology as GDP growth in China moderates. However, the sharp rise in intra-company loans at precisely the same time as the increase in capital flight elsewhere in the BOP is suggestive of firms using the relatively low capital account restrictions in direct investment to reduce net exposure to Chinese assets. Meanwhile, the pattern of increase in errors and omissions is suggestive of similar factors. In China, discrepancies between customs data on trade and SAFE data on foreign exchange demand related to export transactions tend to show up in errors and omissions. During the recent period, one can see a sharp rise in these discrepancies. The fact that the decline of export receipts conversion into renminbi has outpaced the decline of exports measured by customs data likely reflects the increasing desire of domestic enterprises to hold foreign exchange deposits due to depreciation expectations.<sup>4</sup>



**9. Going forward, one can expect a deceleration in outflows related to external debt repayment.** The key categories that drove the rise in external debt have returned to levels last seen before the carry trade really accelerated in 2011–12. Overall external debt is now quite low at 12 percent of GDP, particularly compared to past crisis cases. One would not expect external debt to fall to zero as some of the financing reflects underlying economic transactions not sensitive to

<sup>4</sup> Note that such discrepancies between customs trade data and SAFE's foreign exchange data do not imply per se that the current account surplus is overstated. Rather, they point to outflows conducted by exporters and importers that are already captured in the capital account and errors and omissions.

changes in short-term expectations. The expected slowing of external debt repayment could reduce outflow pressure by \$100–125 billion per quarter.



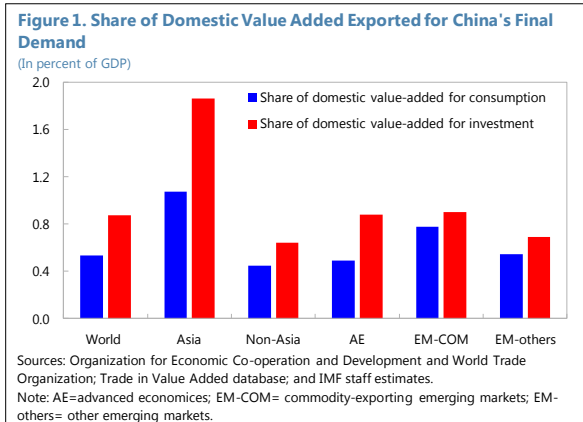
**10. Nonetheless, there are still two primary risks to the capital account.** First, there is a question as to what happens to the flow and stock of China's foreign direct investment. In terms of the flow, China's slowing growth prospects may weigh on inward FDI in a way that helps offset the improvement from lower debt payment; lower inflows, in an accounting sense, are the same as a rise in outflows. In terms of the stock, firms' accumulated reinvested earnings, to the degree they are in liquid assets, could leave as dividends which are current account transactions that do not face capital controls. Second, there is a question as to the speed at which Chinese investors will choose to acquire foreign assets and normalize what has long been seen as an excessive home bias. Nonreserve foreign assets remain low in China relative to investable private savings. For now, staff's judgment is that the combination of a rising current account surplus, low external debt, large reserves, and a still relatively controlled capital account should support a stabilization of outflows.

## REBALANCING IN CHINA: GLOBAL SPILLOVERS<sup>1</sup>

- *China's transition to sustainable consumption-based growth is desirable, benefiting the global economy and reducing longer-term tail risks, even if it entails a near-term slowdown.*
- *However, given its size, openness, high investment rate, and high import content of its investment and exports, a slowdown in China is likely to have strong global spillovers.*
- *Negative trade spillovers will weigh on global growth, but the effects will vary with each country's level and type of exposure to China.*
- *China's rebalancing away from investment has already contributed to a slowing in demand for, and prices of, many commodities.*
- *Financial spillovers from China are on the rise through strong trade linkages and rapidly rising financial linkages.*

**1. The Chinese economy—now the world's second largest at market exchange rates—is undergoing substantial structural change** to a model driven increasingly by consumption and services (rather than public investment and exports), with growth gradually slowing to a more sustainable pace. This transition is good for China and good for the world, benefiting global growth and reducing tail risks in the longer term.

**2. China's transition to a new growth model and a more market-based economy is inherently challenging and has been bumpy at times** as exemplified by recent market turbulence. Given China's size, openness, and high investment rate and the high import content of its investment and exports, a slowdown in China is likely to entail strong global spillovers through trade, commodity prices, and confidence, with attendant effects on global financial markets and currency valuations. Spillovers from China have increased over time as China's economy has grown in size and integrated more closely with the region and the world, both in trade and finance.



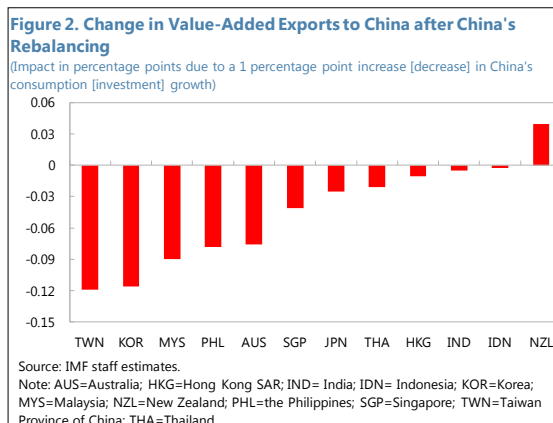
**3. Trade spillovers from China's growth slowdown weigh on global growth**, especially in Asian countries, reflecting their higher exposure to China. The exposure to final demand in China has been increasing for nearly all Asian economies. Value added in exports related to final demand in China was relatively high (more than 4 percent of GDP) for Australia, Korea, Malaysia, Singapore, Taiwan Province of China, Thailand, and Vietnam. Staff analysis (IMF, 2016d) suggests that a 1 percentage point investment-driven drop in China's output growth would reduce G20 growth by  $\frac{1}{4}$  percentage point. Duval and others (2014) estimate a growth spillover effect of about 0.3 percentage points for the median Asian

<sup>1</sup> Prepared by Joong Shik Kang.

economy, with each country's sensitivity increasing with its exposure to China in terms of value-added trade. Cashin, Mohaddes, and Raissi (2016) obtain similar spillover estimates for ASEAN-5 countries and also find that the effects here increased substantially over time (for example, twofold between 1992 and 2012 for the median country), reflecting the rising weight of China in the trade of each country. Rafiq (forthcoming) also finds similar growth spillover effects on four ASEAN emerging markets.

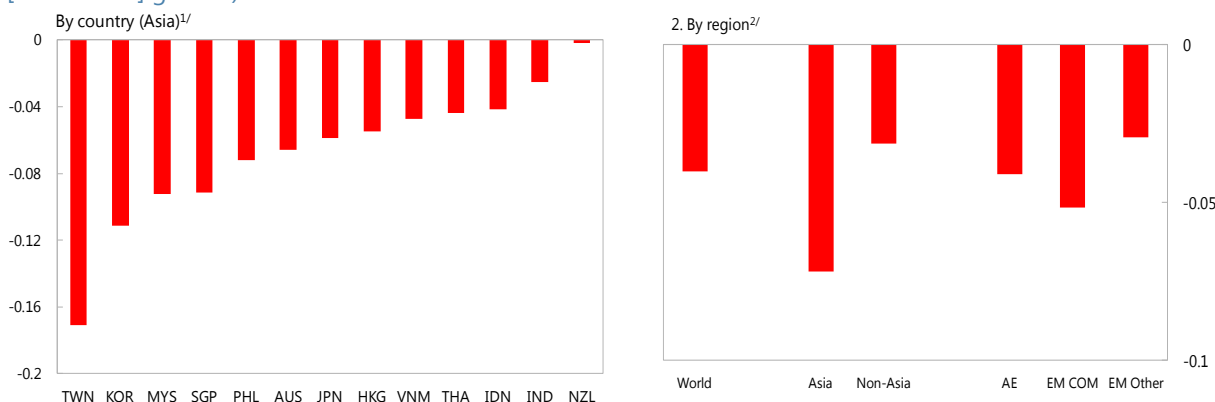
**4. Spillover effects in the short term vary with each country's level and type of exposure to China.**

"Unitary" rebalancing—defined as a 1 percentage point reduction in investment growth combined with a 1 percentage point increase in consumption growth—will have little effect on China's GDP growth itself because the shares of consumption and investment are about the same. However, this broadly growth-neutral rebalancing in China will weigh more on countries with higher exposure to China's domestic investment, while exposure to China's consumption will provide a buffer and may boost exports of some countries. Staff analysis (IMF, 2016a) indicates that the most adversely affected economies in Asia are those closely integrated with China through the global value chain and heavily exposed to its investment activity (Korea and Taiwan Province of China). In contrast, economies with a larger share of consumption exports, such as New Zealand, experience smaller negative spillovers as they benefit from the increase in China's consumption demand.



**Figure 3. Estimated Impact of China Rebalancing on Partner Country Growth Transmitted Through the Trade Channel**

(Impact in percentage points, due to a 1 percentage point increase [decrease] in China's consumption [investment] growth)



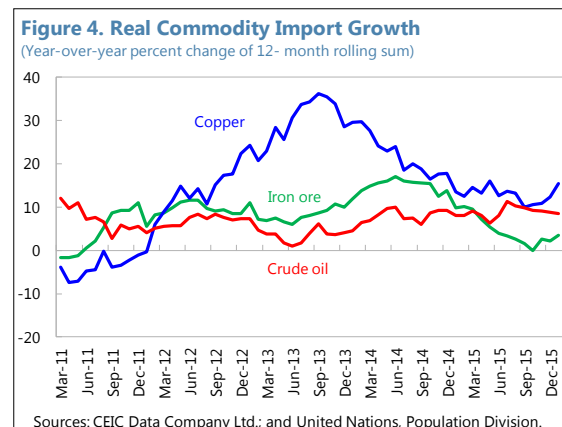
Source: IMF staff estimates.

1/ AUS= Australia; HKG=Hong Kong SAR; IND=India; IDN= Indonesia; JPN=Japan; KOR=Korea; MYS=Malaysia; NZL= New Zealand; PHL= the Philippines; SGP= Singapore; THA=Thailand; TWN=Taiwan Province of China; VNM=Vietnam.

2/ AE= advanced economies; EM-COM=commodity-exporting markets; EM-Other=other emerging markets.

**5. The evolution of China's product mix provides challenges and opportunities for other countries.** Staff analysis (IMF, 2016a) shows that China's changing trade patterns have important effects on advanced upstream economies. China is increasingly competing with upstream suppliers, affecting economies such as Japan, Korea, and Taiwan Province of China, as well as Germany and the United States. These effects have become more pronounced since the Global Financial Crisis, and increasingly in higher-technology products. Staff analysis (IMF, 2016b) also shows that China is exiting some labor intensive sectors. This trend is creating opportunities for frontier and developing economies, particularly in Asia (e.g., Cambodia, Lao P.D.R., Myanmar, Vietnam) to enter those sectors and to satisfy China's rising consumption demand.

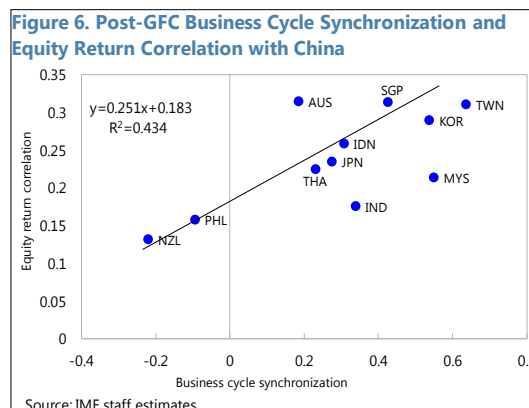
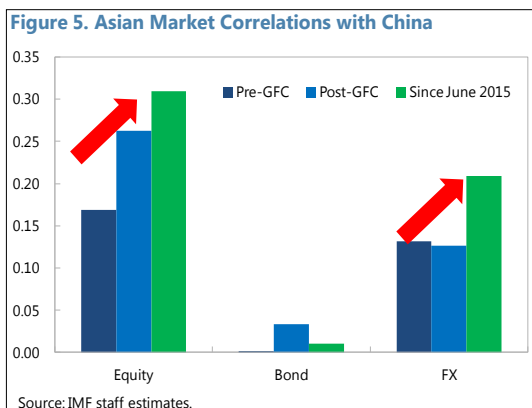
**6. China's growth transition has important implications for commodity markets and exporters.** China is a major importer across a range of commodities, especially metals, for which it accounted for about 40 percent of total global demand. China's investment slowdown has therefore had a significant impact on the demand for, and prices of, those commodities closely related to investment activities—indeed, metal prices have fallen steadily since early 2011 by almost 60 percent on average. This has generated substantial excess capacity in mining sectors and forced exporters to adjust to lower revenues. To the extent that China's slowdown and rebalancing contribute to lower commodity prices, net commodity exporters can also be affected.



**7. China's rebalancing has contributed to a slowdown in demand for, and decline in prices of, many commodities.** For investment-related commodities, the global consumption slowdown has been larger than can be attributed to China's slowing GDP growth alone, suggesting the important effect of the rebalancing of the economy. By contrast, the consumption of food commodities has surprised on the upside, reflecting the relatively higher demand for protein and vegetable oil as per capita income rises. China's demand for crude oil remained strong in 2015, partly reflecting the accumulation of inventories. Staff analysis (IMF, 2016a) suggests that much of the impact on commodity exporters has come through lower commodity prices, rather than export volumes. This analysis also suggests that China's rebalancing accounts for between one-fifth and one-half of the declines in broad commodity price indices, with marked differences across commodities (although the wide range highlights that the contributions are quite sensitive to the specifics of the analysis).

**8. Global and regional financial sensitivities to China have increased, in particular since the global financial crisis** (IMF, 2016a; IMF, 2016c). Even before the recent bout of volatility, the co-movement of Asian and Chinese markets had been rising. The region's asset return correlations with China have increased further in both equity and foreign exchange markets after the crisis. In fact, countries with a higher degree of business cycle synchronization with China have, on average, seen

their equity markets move more closely with China. Several economies in the region, such as Korea, Singapore, and Taiwan Province of China, have substantial financial links with China, both directly and through Hong Kong SAR. Moreover, several other countries, such as Japan, Indonesia, and Malaysia, are affected by episodes of global risk aversion. To the extent that uncertainty about China's growth and policy outlook contribute to such "risk-off" episodes, these countries may also be affected. Financial spillovers are likely to rise further with rapidly growing financial linkages with China, including through the ongoing internationalization of the renminbi and China's gradual capital account liberalization.



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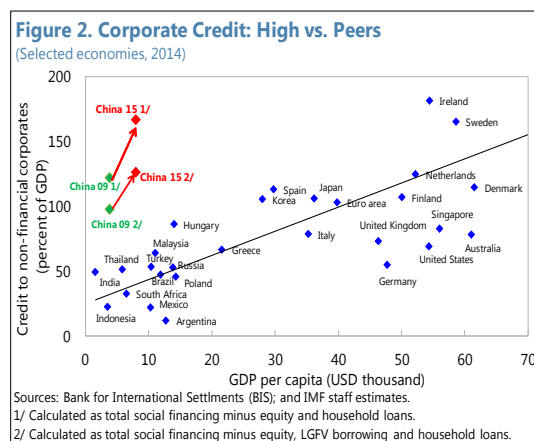
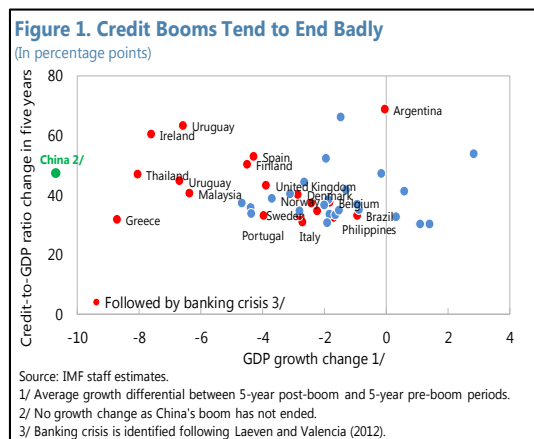
# RESOLVING CHINA'S CORPORATE DEBT PROBLEM<sup>1</sup>

- Corporate credit growth in China has been excessive in recent years. This paper looks at the causes and consequences of this credit boom and outlines a strategy to address the problem of excessive corporate debt.
- The credit boom is largely related to the large rise in investment after the global financial crisis. Investment efficiency has fallen and the financial performance of corporates has deteriorated steadily, affecting asset quality in financial institutions.
- The corporate debt problem should be addressed urgently with a comprehensive strategy. Key elements: identifying companies in financial difficulties; proactively recognizing losses in the financial system; burden sharing; corporate restructuring and governance reform; removing debt overhang through workouts; and hardening budget constraints.
- A proactive strategy would trade off short-term economic pain for larger longer-term gain.

## 1. China's high credit growth points to elevated economic and financial risks.

In response to the Global Financial Crisis (GFC) and collapse in external trade, China deployed policies to boost domestic demand supported by high credit growth, which averaged around 20 percent per year between 2009 and 2015—much higher than nominal GDP growth and the previous trend. The (broadly defined) nonfinancial private credit-to-GDP ratio rose from around 150 percent to over 200 percent over the same period as a result, and 15–25 percentage points above the level consistent with the historical trend at end-2015—a potentially dangerous, high 'credit gap.' The gap is comparable to countries that experienced painful deleveraging (Borio and Drehmann, 2009).

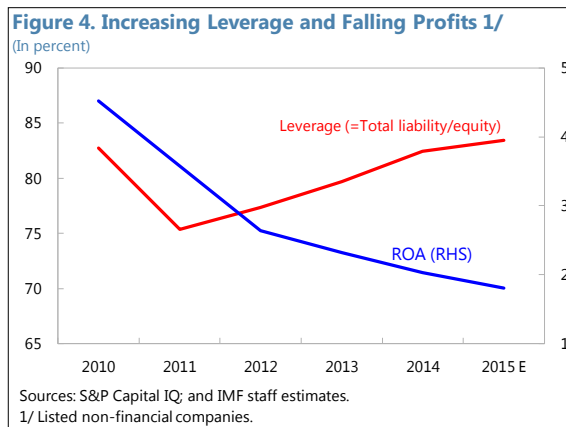
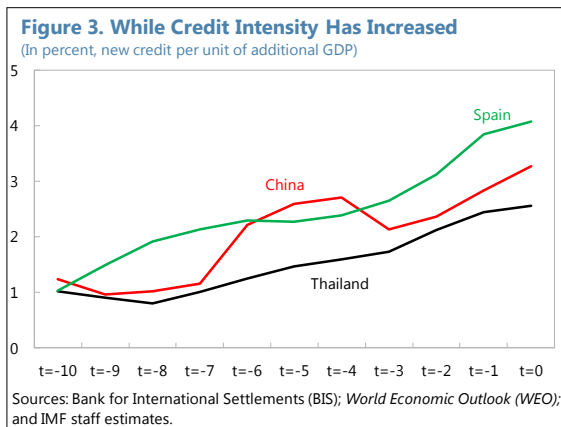
**2. Credit growth in China is concentrated in the corporate sector.** The rapid increase in credit could reflect financial deepening in a fast-growing economy. But the credit-to-GDP ratio for the corporate sector is significantly higher in China than in countries at a similar level of development and exceeded the level typical for developed economies. This indicates that credit growth has been faster than a normal path of financial deepening.



<sup>1</sup> Prepared by Joong Shik Kang (APD), drawing on a forthcoming paper by W. Maliszewski, S. Arslanalp, J. Caparusso, J. Garrido, S. Guo, J. S. Kang, W. Lam, D. Law, W. Liao, N. Rendak, P. Wingender, J. Yu, and L. Zhang.

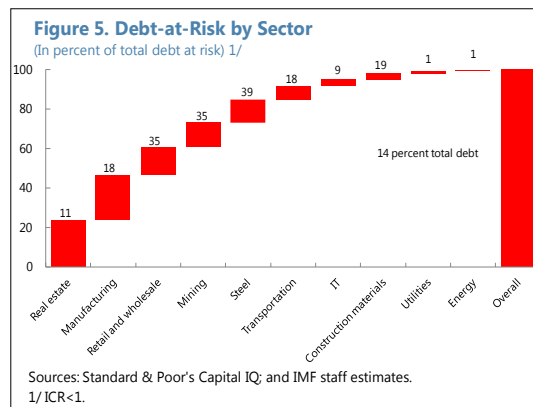
**3. High corporate investment after the GFC has been the main factor behind rapid credit growth.** Credit has financed broad-based scaling-up of infrastructure spending and real estate investment, which has then supported rapid development in upstream industries such as steel, cement and coal. In addition, corporate sector borrowing has increased in response to growing payments arrears.

**4. The use of capital has become less efficient, affecting corporate financial performance.** The 'efficiency of credit' (incremental GDP growth relative to incremental increase in credit) has been declining. Growth payoffs from additional capital spending have been falling despite the additional borrowing to finance balance sheet expansion. As a result, the corporate leverage ratio has been rising while return on assets has been steadily falling, suggesting deteriorating debt servicing capacity. This is most pronounced in real estate, construction and related upstream activities.



**5. SOEs have been more leveraged and less profitable than the private sector.** They have acted partly as a conduit for policy-driven investment. Soft budget constraints (access to cheap financing by state-owned banks underpinned by implicit government guarantees) have also contributed to the large buildup of leverage in SOEs. Staff estimates suggest that implicit guarantees translate to a 4–5 notches upgrade in credit ratings, and appear to lower borrowing costs by about 1–2 percentage points.

As borrowing costs are not commensurate with returns and risks, they distort the allocation of resources and promote inefficiency.



**6. Credit quality of bank loans has been deteriorating accordingly.** Reported NPLs and special mention loans have been on the rise, although they still remain relatively low (at about 5½ percent of total loans). However, staff estimates based on corporate data suggest that potential "debt-at-risk" amounts to 15½ percent of the total corporate loan portfolio, which could yield

estimated potential losses of about 7 percent of GDP when applying a 60 percent loss ratio on these loans (IMF, 2016a).

**7. The authorities recognize the problem and are developing plans to tackle it.** They have announced reductions of 10–15 percent of existing capacity in coal and steel over the next 3–5 years, together with a RMB 100 billion restructuring fund to absorb the re-employment and resettlement costs for an expected 1.8 million laid-off workers, signaling firm intent to reduce excess capacity and restructure the economy. But the current plan on operational restructuring is still narrowly focused on coal and steel industries and the full extent of associated losses in the financial system yet to be addressed. In addition, overall progress in state-owned enterprise (SOE) reforms has been slow and the current approach does not address decisively the issue of tightening budget constraints as implicit guarantees are still in place and promoting mergers and acquisitions among stronger and weaker SOEs does not help impose financial discipline (see Selected Issues chapter on SOEs). Cases of “mini” or “near” defaults among Chinese corporates have been rising, but corporate debt workouts are currently handled on a case-by-case basis and do not seem to promote corporate restructuring as ad-hoc state intervention in SOEs without clear guidance on the state’s role does not provide an effective mechanism to harden budget constraints.

**8. China needs a comprehensive proactive, strategy to address the debt problem.** Key elements should include:

- *Identifying companies in financial difficulties (triage).* This could be done through a market-based approach (driven by creditors) or by setting up a separate entity vested with sufficient legal and political powers (driven by government). A transparent and standardized process, including external experts in valuation, would provide an independent basis for decision making.
- *Loss recognition.* Proactively recognizing losses in the financial system through an enhanced supervisory and regulatory framework. Positive and negative incentives (“carrots and sticks”) need to be introduced to support the debt restructuring process.
- *Burden sharing.* Once the losses have been recognized, they should be allocated among the indebted firm, its creditors and local/central government. This should consider moral hazard (imposing costs on those whose decisions led to them), capacity to repay, and social consequences. Mechanisms should be developed to facilitate debt workouts (e.g., debt-equity conversions, IMF, 2016b).
- *Corporate restructuring.* Corporate restructuring and governance reform—particularly in SOEs—should also be a part of the process. Otherwise losses will resume.
- *Hardening budget constraints.* Additional measures (e.g., regulatory reforms, particularly in the bond market) are needed to harden budget constraints of corporates, including to remove implicit guarantees.

**9. Supporting policies are also needed** for successful corporate restructuring, including:

- *Enhancing the legal framework.* A long-term goal is to improve the legal system and the institutional framework to handle insolvencies. But large-scale and expedited restructuring

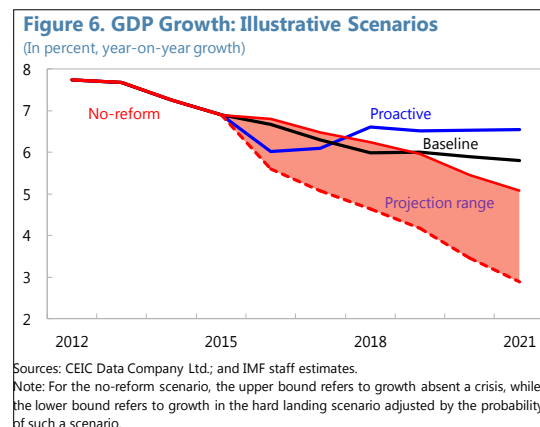
requires out-of-court mechanisms to complement the existing framework.

- *Minimizing the hit to near-term growth and employment* (and helping those that are affected). Corporate restructuring will have short-term economic costs. They will ultimately be offset by activity and employment created in new sectors, but supportive mechanisms to facilitate this transition—such as strengthening the social safety net, retraining, and easing restrictions on migration—are needed.
- *Improving local government fiscal discipline*. Boundaries between public and private debt are blurred. Local governments have been borrowing off-budget through local government financing vehicles, which are nominally part of the corporate sector, but in reality they are part of the public sector. Although the recent (2014) Budget Law regularized local government financing, they still face incentives to engage in such off-budget activity.

**10. The enhanced debt restructuring strategy could be deployed on a pilot basis** involving a small number of SOEs in a sector with clear overcapacity, and experiencing diverse degrees of distress. The pilot could be based on a predominantly out-of-court approach, conducted under the oversight of a SOE Restructuring Task Force consisting of the relevant institutions for corporate debt restructuring and using independent expert valuations. Once the target enterprises are selected, the pilot could proceed according to the following steps:

- *Determining fair value of claims* held by major creditors of the target enterprises by the China Banking Regulatory Commission.
- *Debt workouts*. Two alternative approaches could be considered: a) sale of the loans, at fair value, to a newly established asset management company (AMC); or b) establishment of a creditor committee by the relevant banks.
- *Restructuring or liquidation of the target enterprises*. The decision to restructure or to liquidate target enterprises must be taken by creditors, and should be based on market valuations, viability assessment, and restructuring plans prepared by independent experts.
- *Transfer of claims/ownership*. Equity acquired by banks in debt workouts could be sold to private investors or to SOEs with the appropriate governance mechanisms.
- *Assistance to laid-off workers*, utilizing the restructuring fund.

**11. The proactive strategy would have short-term costs, but these would be more than offset by longer-term gains.** Staff's illustrative scenarios suggest that the short-term growth slowdown is mainly driven by output and employment cuts in over-leveraged and overcapacity industries. This, however, gradually gives way to higher production and employment as labor is reallocated elsewhere, partly to services. The reallocation produces higher and more sustainable growth in the future, with less



investment and credit, but higher total factor productivity growth. The simulation shows that growth in the proactive scenario will temporarily dip to 6 percent by 2017 (which would be 5½ percent excluding some assumed high-quality fiscal stimulus), but pick up afterwards and maintain a growth rate of 6½ percent in the medium term. The credit/GDP ratio would stabilize in the short term, while gradually declining to more sustainable levels in the medium term.

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# CHINA'S EMERGING STATE-OWNED ENTERPRISES (SOE) REFORM STRATEGY<sup>1</sup>

- *SOE reform is central to China's rebalancing. Successful implementation can instill confidence, facilitate other reforms, and unleash new sources of growth.*
- *SOEs are less efficient than private enterprises and their leverage is higher. They benefit from substantial implicit support (about 2–3 percent of GDP each year on average) in the form of land, protected markets, and preferential access to finance. The implicit support generates distortions in the use of resources, particularly on credit allocation.*
- *The announced SOE reform aims to broaden ownership and improve efficiency. Gaps, however, remain and it is not clear if the reform will substantially improve resource allocation.*
- *Hardening budget constraints, restructuring highly-indebted SOEs, introducing greater competition to state-dominated sectors, providing on-budget social support for layoffs and public services, and advancing on complementary reforms will be critical. Such a package of reforms could raise output significantly (3–9 percent) over the medium term.*

**1. State-owned enterprise (SOE) reform featured prominently in China's reform strategy, but important details are still being defined.** Successful SOE reforms have the potential to improve resource allocation, strengthen confidence, facilitate other reforms, and unleash growth. It would leave China with a more dynamic set of SOEs that compete on a level-playing field with the private sector. They would feature modern forms of corporate governance with professional boards and management; nonviable ones would be restructured or allowed to exit.

## A. SOEs—Less Efficient and Higher Leverage

**2. Nonfinancial SOEs as a share of output and employment has declined, but they continue to take up a large share of resources.** SOEs' share of value added has fallen to 16 percent from 40 percent over the past decade and they account for about 10–15 percent of urban employment. Despite the decline, they account for about half of total bank credit and 40 percent of total industrial corporate assets.

**3. SOEs tend to enjoy implicit support on factor inputs, such as land, credit, and natural resources.** Given that many SOEs are endowed with land, they can use land as collateral and are able to borrow at favorable interest rates. Financing costs for listed SOEs, for example, tend to be about 40–50 basis points below the benchmark lending rate. Distortions arising from credit pricing are increasing and account for nearly half of the estimated implicit support (or 1½ percent of GDP). Adjusting for implicit support suggests that SOEs' return on equity would have fallen from an average of 8 percent to about -1 percent during the period 2011–15. Widespread implicit

<sup>1</sup> Prepared by W. Raphael Lam and Alfred Schipke (both APD).

guarantees are reflected in SOE's credit ratings that are about two to three notches above those of comparable private firms.

**4. SOEs continue to build up leverage rapidly, while their financial performance has deteriorated further.** Much of the rise in aggregate corporate leverage (the ratio of total liabilities to owners' equity) since 2009 was channeled to SOEs. Their leverage ratios have risen rapidly to around 200 percent on average, mostly concentrated in overcapacity and heavy industries. At the same time, returns on SOE assets have deteriorated to about 2–3 percent, well below those of private enterprises. Their productivity is only about 30–40 percent that of private enterprises (Hsieh and Song, 2015). Moreover, the efficiency of Chinese SOEs appears to be lower than that in other developing economies, further underscoring the urgency of SOE reforms.

## B. Current SOE Reform Plans

**5. The government has made SOE reform a cornerstone of its reform efforts and announced a number of initiatives.** The new Five-Year plan highlights the need to have “diverse forms of ownership and private participation in SOEs” as well as “restructuring zombie enterprises.” At the same time, it also stresses “making SOEs bigger and stronger to strengthen the influence and to serve national strategies.” Key principles include the following:

- *Repositioning the state as a capital investor rather than operator.* Mixed-ownership reforms envisage a spectrum of ownership structures (for example, cross-share holdings and public listings) and greater private sector participation in SOEs. The reforms envisage professional management and a better alignment of respective rights and responsibilities between owners and the board, with checks and balances.
- *Classifying SOEs into broad categories, each with specific ownership structures, reform plans, and assessment criteria:* (a) commercial strategic SOEs (such as defense, telecommunications, and major energy companies) will continue to have protected markets and will be entrusted to pursue national strategies such as “going global” and “creating global champions,” possibly through mergers—the state will continue to hold majority ownership; (b) commercial nonstrategic SOEs will compete directly in the market; and (c) SOEs with social functions will be tasked to improve public services.
- *Institutionalizing the leadership role of the communist party,* such as through mobility between Party and corporate ranks. A Party member will serve as the chairman of the board.
- *Resolving nonviable SOEs.* The State Council committed to cutting aggregate SOE losses by 2017 and expediting the exit of nonviable “zombie” SOEs, including resolving near 350 subsidiaries of central SOEs and near 4,000 local SOEs.

**6. In some areas, the current reform proposals are more closely aligned with international good practices, however, important details still need to be defined.** According to the Organization for Economic Co-operation and Development (OECD), the proposed governance



reforms would be broadly consistent with their Guidelines, provided that there is sufficient transparency on the role of state. The announced plan, however, leaves much room for interpretation given that it envisions both greater market discipline and state leadership in major decisions.

**7. So far implementation has been uneven.** Ten pilot programs with a few selected SOEs have started in 2016, focusing on mixed-ownership reforms and professional management through recruitment, compensation, and board of directors. The State Council recently announced the removal of certain social functions of SOEs (the provision of utilities and property management services for SOE employees). Coastal provinces have advanced faster, and in some cases, resolved near half of the identified zombies, while progress is slow in regions where SOEs play an outsized role in the local economy. Reform of central SOEs has advanced slowly, in part because of their complex multi-layer subsidiary structure.

## C. SOE Reforms to Unleash Growth

**8. Building on current reforms, measures should focus on improving efficiency and resource allocation.** Critical elements include:

- **Restructuring or resolving SOEs.** Triage the universe of SOEs to (i) identify those that are fundamentally sound; (ii) liquidate nonviable SOEs (which does not necessarily mean closure); (iii) establish a restructuring plan for viable but insolvent SOEs. Expedited out-of-court restructuring for priority distressed companies that would use independent experts may complement the existing insolvency framework. Given the size and complexity, progress should be kick-started with a few high-profile pilot cases for indebted SOEs. Noncore objectives such as social functions (e.g., hospitals, schools, and provision of utilities) should be transferred to the fiscal budget with the related assets and expenses accounted for.
- **Hardening budget constraints.** Gradually removing implicit guarantees through greater tolerance of defaults and carefully allocating losses to firm owners and creditors will improve the markets' assessment of credit risks in a financial system unaccustomed to defaults. Removing implicit SOE support through credit, land endowment, and natural resources would not only help address the existing debt overhang, but also improve the efficiency of new credit allocation. At the same time, increasing as soon as possible the transfer of SOE profit (a target of 30 percent by 2020), which is now mostly reinvested (including providing capital injections, subsidies and addressing their legacy costs) and well below the target, to the fiscal budget and allocating SOE capital to social security funds would contribute to hardening budget constraints.
- **Introducing greater competition.** Reducing entry barriers and phasing out restrictions that give SOEs a privileged role will send a clear signal. Allowing entry of private firms in the state-dominated services sector such as logistics and telecommunications (currently more stringent than in OECD markets), breaking up administrative monopolies, and promoting the growth of dynamic small and medium-sized enterprises would foster competition and promote growth.

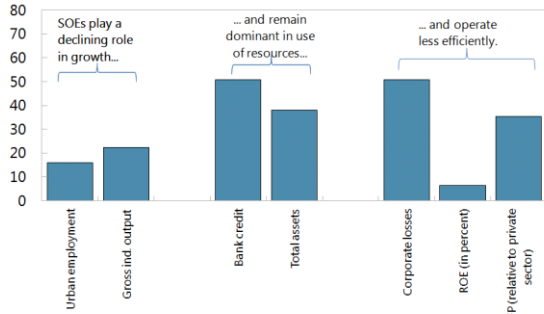
- **Providing social support.** To facilitate the restructuring process, on-budget fiscal support will be important. This would minimize the social costs of layoffs, retraining, and relocation of workers. The recently-established RMB 100bn restructuring fund for coal and steel industries is an important step into this direction.
- **Advancing complementary reforms.** To foster an enabling environment for SOE reforms, complementary reforms are needed. These include reforms on the household registration system, rural land property rights, and a framework for insolvency and resolution. Fiscal reforms to improve social security portability and align intergovernmental finances by matching expenditure responsibilities with revenue sources will help address SOE legacy issues.
- **Improving coordination.** SOE reforms are complex with vested interests and straddle many agencies. There is merit in establishing a well-staffed high level group with a clear mandate to promote and implement practical restructuring of SOEs. Strong coordination between the central and local governments, as well as financial regulators, will facilitate the process.

**9. SOE reforms could generate significant growth potential.** Using a two-sector model with reasonable parameters—including SOEs' share of the economy, productivity, and cost of capital differentials—suggests that such SOE reforms can improve growth prospects significantly over the medium term. A better allocation of capital and labor to the private sector and narrowing the productivity gap between SOEs and private enterprises could lift the level of output by 3–9 percent compared to baseline projections, or about 0.3–0.9 percentage points of growth a year if the effect is spread across a decade.

Figure 1. SOE Reforms

**SOEs Dominate Resource Use and Operate Less Efficiently**

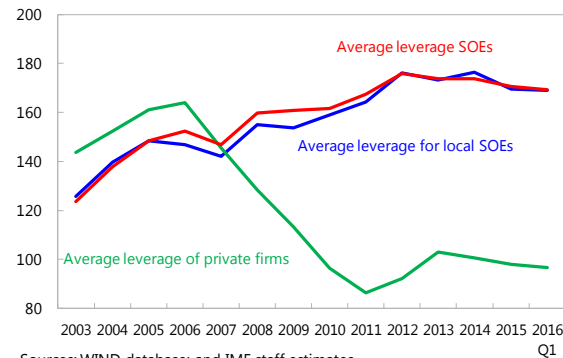
(SOEs' share of total unless otherwise stated) 1/



Sources: PBC, MOF, NBS, WIND, CEIC, and staff estimates. 1/ Sample period are as of end-2015 where data are available. Bank credit and TFP are average between 2011 and 2015.

**Leverage Ratios (Average Mean)**

(In percent)



Sources: WIND database; and IMF staff estimates. Q1

**Key Indicators of SOEs**

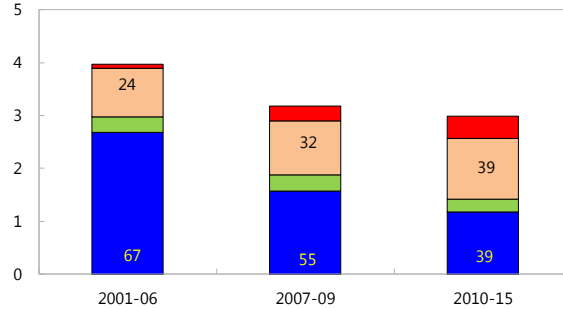
(In percent of GDP; unless otherwise stated)

	Sales Revenue	Net Profit	Asset	Market Value	Share in the Top 10 Firms
China	35	3	176	45	91
Brazil	12	2	51	18	50
India	16	4	75	22	59
Indonesia	3	0	19	12	69
Russia	16	3	64	28	81
South Africa	2	2	3	1	2

Sources: Kowalski and others (2003); and IMF staff estimates.

**Implicit Support to SOEs Still Significant**

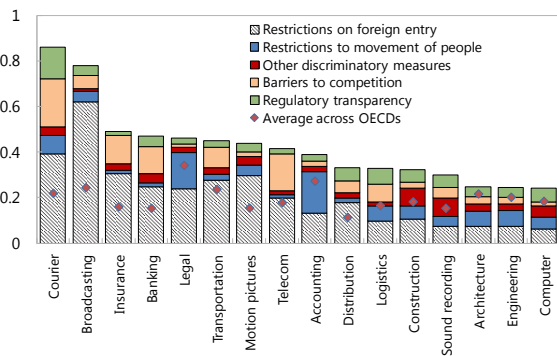
(In percent of GDP)



Sources: Unirule Institute of Economics; CEIC Data Company Ltd; and IMF staff estimates. Note: Numbers in the bar chart refer to the share of total implicit support.

**Room to Open up Services Sector**

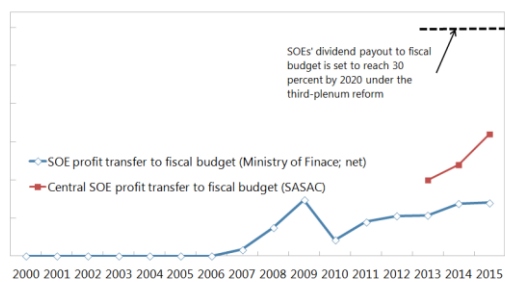
(Index between 0 and 1; higher index reflects more restrictive)



Sources: OECD Service Trade Restrictions Index (2015).

**SOE Dividend Payout to Fiscal Budget**

(in percent of aggregate SOEs' profit)



Sources: MOF, Unirule Institute of Economics, and staff estimates. 1/ SOEs were required to contribute their profits to fiscal budget since 2007. Data for 2007 did not cover all SOEs. The third plenum reform required the transfer 30 percent of SOE profits to fiscal budget by 2020.

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# CLIMATE MITIGATION POLICY IN CHINA: THE MULTIPLE ATTRACTIONS OF CARBON OR COAL TAXES<sup>1</sup>

- *China targets significant progress on domestic and global environmental challenges. Measures envisioned in the 13<sup>th</sup> five-year plan, along with economic rebalancing, will make some progress on these goals.*
- *There are, nevertheless, potentially huge environmental, health, fiscal, and economic benefits from additional fiscal reforms that could build on existing administrative structures.*
- *A carbon or coal tax progressively rising to RMB 455 per ton of carbon dioxide (CO<sub>2</sub>) by 2030 reduces CO<sub>2</sub> emissions by around 30 percent, raises over 3 percent of GDP in revenue, and generates economic benefits (domestic environmental benefits less economic costs) approaching 5 percent of GDP by 2030, while saving close to 4 million lives over 2017–30 from less exposure to local air pollution.*
- *An equivalently scaled emissions trading system (ETS) has roughly half the environmental, fiscal, economic, and health benefits, as it excludes coal use from small-scale users, while other fiscal and regulatory policies are substantially less effective than the ETS.*
- *Using around 5 percent of the revenue from carbon/coal taxes can fully compensate low income groups for increased energy prices, while 10 percent of the revenues could compensate vulnerable, trade-exposed firms (though less compensation is needed if other countries also act on their Paris mitigation commitments).*

**1. Methodology.** Parry and others (forthcoming) develop a practical spreadsheet model for evaluating a wide range of national-level fiscal and regulatory policy options for reducing energy-related CO<sub>2</sub> emissions in China. The model begins with energy flow data for China from the International Energy Agency (IEA) and projects this forward to 2030 using assumptions about GDP growth, trends in the energy intensity of GDP, future fuel prices, and exogenous technological change. The impacts of different policies hinge on behavioral response assumptions, such as for fuel use and energy efficiency, in different sectors, which are based on surveys of empirical evidence. Local air pollution deaths from fuel combustion are based on previous IMF estimates for China (Parry, Heine, Li, and Lis, 2014). Incidence analysis is conducted by linking the policy-induced impacts on energy prices from the spreadsheet tool to an input-output model to trace through price impacts on different industries and consumer goods, and combining that with survey data on spending for energy and other products by different household groups.

## 2. Findings:

- *With no new (or tightening of existing) policies beyond those implicit in observed data for 2013, the energy intensity of GDP in China is projected to decline by 37 percent between 2015 and 2030, with CO<sub>2</sub> per unit of energy remaining about constant (Figure 1, panel a). While the productivity of renewables grows faster than for coal, a counteracting factor is the recent decline*

<sup>1</sup> Prepared by Philippe Wingender (FAD).

in coal prices. Coal accounts for 83 percent of CO<sub>2</sub> in 2015, while natural gas accounts for 3 percent and oil products 13 percent.

- *A carbon tax rising from 15 RMB per ton from 2017 to reach 230 RMB by 2030<sup>2</sup>* reduces CO<sub>2</sub> by about 20 percent below baseline levels in 2030 (Figure 1, panel b), meeting China's CO<sub>2</sub> intensity target for Paris,<sup>3</sup> with less coal use accounting for about 95 percent of the CO<sub>2</sub> reductions. A carbon tax reaching 455 RMB per ton by 2030 reduces 2030 emission by 30 percent. Taxing coal only (at the same rate) achieves around 95 percent of the CO<sub>2</sub> reductions under the carbon tax.
- *An ETS* will be introduced in China in 2017 for the power sector and large industrial sources, building on seven regional pilot programs, and will be about twice as large as Europe's trading market.<sup>4</sup> Nevertheless, an ETS (establishing the same emissions price trajectories as in the carbon tax scenarios) is estimated by the model to generate only about half of the CO<sub>2</sub> reductions as the carbon and coal taxes because it excludes coal use from small-scale users. The effectiveness of other policies at reducing CO<sub>2</sub> emissions—including taxes on electricity and road fuels, and policies to reduce the CO<sub>2</sub> intensity of power generation, to increase energy efficiency in the power, transport, and other energy sectors, and to increase renewable generation fuels—is significantly, or in many cases, substantially less than for the ETS (Figure 1, panel b).
- *The carbon tax also has the greatest fiscal benefit*, raising revenues of 1.7 percent of GDP in 2030 or 3 percent for the RMB 230 and 455 tax scenarios, respectively (Figure 1, panel c), despite shrinkage in the tax base relative to GDP. Again, the coal tax is not far behind, raising revenues of about 83 percent of those under the carbon tax. The ETS—if *allowances are auctioned*—and the electricity tax raise revenues of about 45 and 35 percent, respectively, as from the carbon tax. Other policies raise much smaller amounts of revenue, no revenue, or lose revenue in some cases.
- *Lives saved* (the difference between deaths in the baseline and under different policies) progressively increases over time as cleaner local air lowers incidence of pulmonary diseases, lung cancer, strokes and heart disease in many Chinese cities. Cumulated over 2017 to 2030, the higher carbon and coal tax scenarios save about 4 million lives, and the ETS about 1.9 million (Figure 1, panel d).<sup>5</sup>
- *Net economic gains*. On economic grounds, the carbon and coal tax also perform far better than other policies, causing (in the high tax scenarios) costs of about 0.7 percent of GDP but domestic

<sup>2</sup> The carbon tax should be introduced progressively with rates announced in advance so firms and consumers have time to adapt and undertake mitigation investments (e.g., wind and solar plants, more efficient buildings).

<sup>3</sup> The target is to lower the CO<sub>2</sub> to GDP ratio by 60–65 percent below 2005 levels by 2030.

<sup>4</sup> The ETS will cover electricity, domestic aviation, iron and steel, chemicals, cement, paper and other sectors.

<sup>5</sup> The analysis may overstate the domestic health benefits of carbon mitigation policies as it assumes incremental benefits are the same, regardless of pollution concentrations. Recent evidence suggests a possible concave relation between mortality and pollution concentrations.

environmental benefits exceeding 5.5 percent of GDP, leaving a net economic gain approaching 5 percent of GDP. Net economic benefits are 2.15 percent of GDP under the ETS, and much lower under other policies (Figure 1, panel e).

**3. Administration.** The best way to administer the tax would be to levy it upstream at the point of entry in the economy (for example, at the mine mouth for coal, building off existing administrative structures for China's Resource tax,<sup>6</sup> and for petroleum products at the refinery or gas processing plants, while imported fuel would be taxed at the border). There are currently in China about 11,000 coal mines (though restructuring will likely close around 4,000 of them over the next few years) and far fewer petroleum refineries and gas processing plants. This would contrast, by orders of magnitude, with the number of transactions the tax administration would have to monitor to collect a carbon tax downstream. Alternatively, the tax could be levied on large emitters, but—besides missing about half the CO<sub>2</sub> emissions—measuring emissions is technically more challenging than measuring carbon content of fuel combustion, requiring a high level of technical expertise typically not found in tax administrations.<sup>7</sup>

**4. Incidence across households.** The analysis also reveals that a carbon or coal tax imposes a disproportionately large burden on low income households—50 and 25 percent larger relative to their consumption for the first and second income deciles respectively, compared with the tenth (top) income decile. Recycling about 5 percent of the tax revenues can, however, offset adverse impacts on the bottom two deciles, for example, through reduced social security contributions and increased welfare and social spending (areas where China has been lagging relative to advanced and other middle income countries).<sup>8</sup> An ETS with auctioned allowances is somewhat more regressive than carbon and coal taxes, and dramatically more regressive if allowances are freely allocated (with rents accruing to owners of capital).

**5. Incidence across firms.** A carbon or coal tax imposes a relatively large cost in industries most closely associated with traditional growth engines (e.g., heavy manufacturing, construction), though exporting sectors do not bear a disproportionate share of the tax burden compared with other sectors. While costs would increase in comparison to producers in other countries without carbon pricing, the analysis suggest that mitigating fiscal measures to provide some support would not be overly costly—around 10 percent of revenues collected through the carbon or coal tax would be sufficient to compensate the most energy-intensive and trade-exposed industries (assuming no mitigation actions in other countries).

**6. A carbon or coal tax can effectively address domestic environmental challenges, thereby promoting a more sustainable growth path.** Given that sectors most dependent on coal and energy

<sup>6</sup> That is, adding a specific component with rates determined based on quantities of carbon to the ad valorem structure recently introduced. Alternatively, the tax could be set on coal processing plants which are far fewer in number than coal plants.

<sup>7</sup> See Calder (2015).

<sup>8</sup> Lam and Wingender (2015).

are heavy industries associated with the 'old growth' model, these taxes will support China's effort to rebalance its economy towards high value-added services and consumption-led growth. Moreover, by contributing to coordinated efforts from the international community to slow global warming, these taxes will also reduce the negative impacts climate change will have in China, such as higher occurrence of natural disasters to which coastal areas are particularly vulnerable.<sup>9</sup> Although the government is committed to introducing an ETS in 2017, this should not preclude the simultaneous introduction of an upstream carbon or coal tax. This could be facilitated by providing some tax rebates for firms required to obtain emissions allowances to ensure all emitters pay the same unit price of carbon. Given the very large domestic benefits from these policies, China can move ahead unilaterally on its pledges for Paris and make itself better off, without waiting for others to act.

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<sup>9</sup> World Bank and Development Research Center of the State Council (2013).

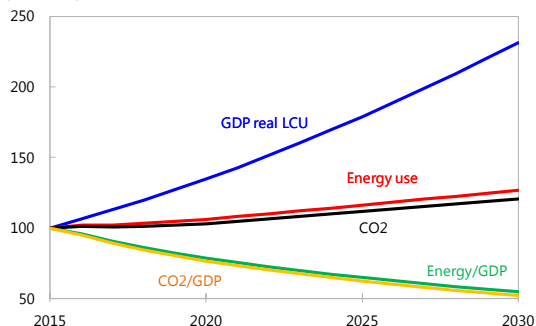


### Figure 1. Environmental Reform: The Huge Benefits from Taxing Carbon or Coal

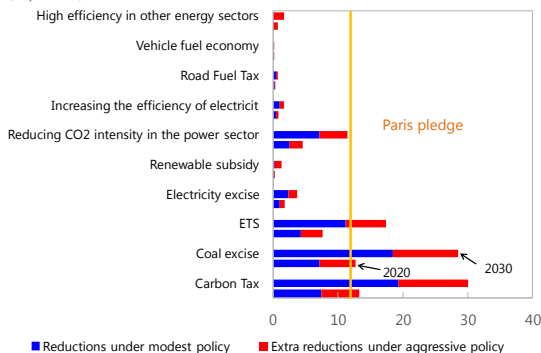
CO<sub>2</sub> intensity of GDP is projected to decline 37 percent over 2015–30, but is a third higher than China's Paris target.

A carbon tax will yield the largest decrease in CO<sub>2</sub> emissions...

(a) Energy Use and CO<sub>2</sub>: Baseline Scenario (2015=100)



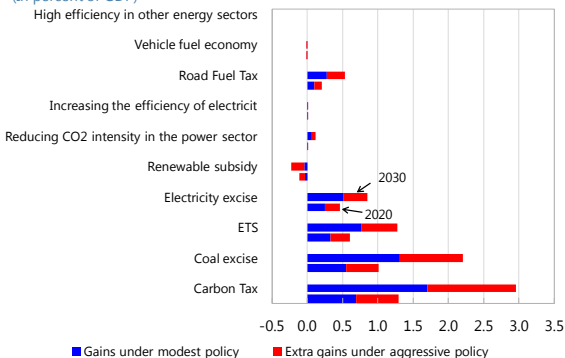
(b) Carbon Emissions Reductions in 2020 and 2030 (In percent)



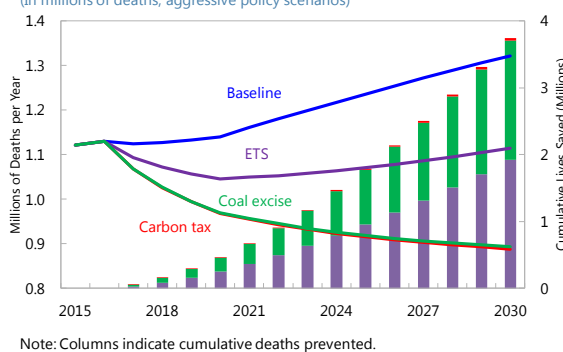
...while also generating the largest fiscal revenue...

...dramatic reductions in air pollution deaths...

(c) Fiscal Gains in 2020 and 2030 (In percent of GDP)



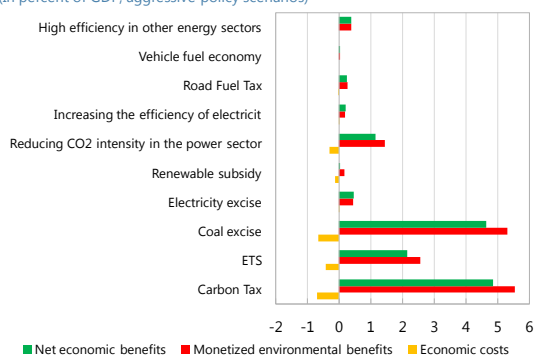
(d) Pollution-Related Premature Deaths: 2015-2030 (In millions of deaths, aggressive policy scenarios)



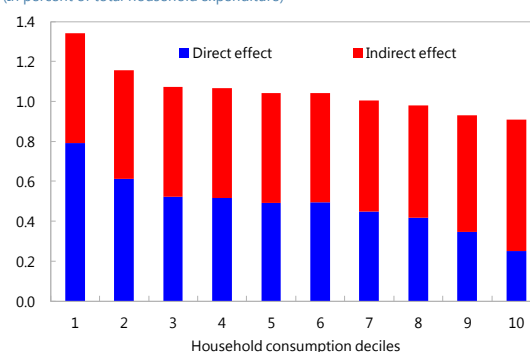
...and huge domestic economic benefits.

But fiscal measures will be needed to alleviate the burden on low income households.

(e) Domestic Economic Benefits and Costs in 2030 (In percent of GDP, aggressive policy scenarios)



(f) Impact of a Carbon Tax on Real Incomes (In percent of total household expenditure)



Source: IMF staff estimates.

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