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Spillovers from the Maturing of China's economy

by Allan Dizioli, Benjamin Hunt, Wojciech Maliszewski

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Abstract

China's transition to a new growth model continues and the impact has been felt across the globe. Several trends contribute to the 'maturing' of China's economy: i) structural slowing on the convergence path; ii) on-shoring deepening; and iii) demand rebalancing from investment towards consumption. In the short term, financial stress may lead to a cyclical slowdown. This paper discusses and quantifies spillovers to the global economy from these different developments. The analysis is undertaken using the APDMOD and G20MOD, both modules of the IMF's Flexible System of Global Models. For plausible values of these developments, the overall impact on the global economy is not large. However, the impact on China's closest trading partners and commodity exporters can be notable.

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Keywords: China's slowdown and rebalancing, international business cycle, spillovers, model based analysis.

Author's E-Mail Address: ADizioli@imf.org; BHunt@imf.org; WMaliszewski@imf.org;

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I. INTRODUCTION

The rise of China has had a profound impact on the global economy. During 2000–14, China accounted for one-third of global growth, becoming one of the largest economies in the world. Growth boosted trade, with exports to China increasing dramatically from 3 percent to 9 percent of world exports, and from 9 percent to 22 percent of Asian exports in the last 15 years. China was also a stabilizing force during the Global Financial Crisis: the 2009 policy stimulus package raised investment, boosting GDP growth and contributing to the increase in imports at the time when global demand was collapsing.

China's transition continues, and the impact will continue to be felt across the globe. Several trends contribute to the 'maturing' of China's economy: i) a structural slowdown on the convergence path to high-income status; ii) moving up the value-added chain, which is also reflected in on-shoring (moving production of previously imported goods to China); and iii) demand rebalancing from the stimulus-boosted investment towards consumption. It is clear that these trends will continue having a profound effect on China's trading partners. It is less clear, however, how they will play out over time, and their precise impact on China and the world. The uncertainty is amplified by the potential fallout from the stimulus-related credit boom, and the risk of a deep cyclical slowdown.

The individual country impacts will likely be differentiated by the underlying trend developments and the type of exposure countries have to China. Commodity exporters benefitting from the investment boom in China may be adversely affected by the consumption-oriented demand rebalancing, particularly in combination with the growth slowdown. The same demand rebalancing, however, may benefit exporters of consumer goods, and the negative impact of the slowdown on others could be offset by lower commodity prices. Moving up the value-added chain and on-shoring could crowd out producers from advanced economies, but at the same time create opportunities for lower-value-added producers from poorer developing countries.

There have been several empirical studies trying to estimate the average spillovers from a slowdown in China's economic growth. In fact, the topic has been explored in the IMF's Spillover Reports (IMF 2011, 2012, 2014a) and the Regional Economic Outlooks for Asia and the Pacific (IMF 2014b, 2015, 2016b). Cashin et al (2016) employ a GVAR model to estimate the spillovers from a growth slowdown in China. They find that a permanent 1 percent reduction in China's GDP growth translates into a reduction of 0.23 percentage points in global growth in the short-run. Dizioli et al (2016) employ a similar approach to estimate spillovers on ASEAN5 economies. For a 1 percent reduction in China's growth, they find that ASEAN5 GDP falls by 0.3 percent on average. Duval and others (2014) find similar growth spillovers, which are larger for economies that are more dependent on China's final demand. For a 1 percent fall in China's GDP, they found that a median Asian economy's GDP falls by 0.3 and 0.15 percent for a median non-Asian economy. Blagrave

and Vesperoni (2016) use a panel vector autoregression and a novel measure of export-intensity-adjusted final demand to study spillovers from China's economic transition on export growth in 46 advanced and emerging market economies. They find that a 1 percentage point decline to China's final demand growth would reduce export growth by about 0.1–0.2 percentage points for the average country. The impact is largest in Emerging Asia. Ahuja and Malhar (2012) explored the spillovers to Asian economies from changes in growth of components of China's demand. They estimated the spillovers from a reduction in fixed investment and found that the impact on some Asian economies is proportional to their exports to China. Finally, other empirical studies tried to estimate the impact of China's demand rebalancing. Hong and others (2016) studied the impact of a simultaneous fall in investment with an increase in consumption. Such rebalancing leads to a small reduction in the GDP of other Asian economies.

All these empirical models calculate average spillovers and cannot be used to disentangle the effects from different trends affecting China. This paper proposes a more structural approach to identify spillovers from different forces experienced by a maturing Chinese economy. We undertake such an analysis using the IMF's Flexible System of Global Models (FSGM, Andrle and others, 2015), simulating the effect of the structural slowdown, on-shoring, demand rebalancing, and a cyclical slowdown independently. These simulations use plausible assumptions about the magnitudes of the underlying developments considered, but the results are still only illustrative given the substantial uncertainty surrounding the transition process.[1]

The projected spillovers are not large overall, but the impact varies as expected:

- Slower growth in China will have a mild dampening effect on the world. The results indicate that although the potential structural developments in China will dampen the positive spillovers to its trading partners relative to the past, for plausible magnitudes of these developments, the dampening is generally mild.

- China's closest trading partners are likely to suffer the most. Reflecting stronger trade ties with China, Korea, Japan and Indonesia generally have strong spillovers. For example, in response to demand rebalancing in China, Korea's growth falls by roughly half of the decline in China's growth in the first year, while growth in Japan and Indonesia fall by a quarter of the decline in China's growth. The economy most affected by demand rebalancing is Hong Kong SAR, where growth is trimmed by about 80 percent of China's growth showdown in the first year.

[1] FSGM focuses on trade spillovers and abstract from financial spillovers. The latter could be notable for financial centers with high financial linkages with China, such as HK.

- For commodity exporters, the negative impact is not only large but also long lasting. Mongolia is particularly hard hit by demand rebalancing in China, with growth lower by over twice the drop in China's growth. Both the trade channel and the commodity channel affect Australia, where growth falls by a quarter of the fall in China's growth.

- The dampening effect of a cyclical slowdown would be the largest in the short-run. The negative spillovers from a cyclical shock hit particularly hard some ASEAN5 countries. In the first year of the shock, Malaysia and Thailand's impacts are about half of the decline in China's growth. Singapore and the Philippines' growth are also strongly impacted, falling by about a third of the fall in China. Once again, Mongolia experiences the largest negative spillover, with growth falling by 1.5 times the decline in China.

The remainder of the paper is structured as follows. Section 2 motivates the trends and discusses potential magnitudes. Section 3 presents a brief overview of the structure of FSGM. Section 4 contains the model-based simulation analysis and section 5 provides some conclusions.

II. THE MATURING OF CHINA'S ECONOMY

China's growth performance in the last four decades has been formidable. Growth averaged nearly 10 percent per year, income per capita has increased from $980 in 1990 to $14,239 in 2015 (at PPP prices), and 500 million people have been lifted out of poverty. Growth was underpinned by high rates of saving and capital accumulation, but also rising productivity. Several rounds of pro-market reforms contributed, including an opening up of the economy after the WTO accession. It allowed China to reap the benefits of globalization not only by transmitting external demand, but also by exposing the manufacturing sector to the discipline of international competition, facilitating technology transfers, and moving up the value chain. This is no different from the story of other fast-growing economies in Asia.

Remarkably, growth has remained high after the GFC. External demand has fallen sharply since the crisis, but it was replaced by a policy-induced investment boom, both in the broadly defined public sector and parts of the private sector (mostly real estate and upstream industries benefiting from the construction boom). While desirable and successful in the short run, the reliance on credit-financed investment created vulnerabilities. To be sustainable, such investment needs to generate rates of return that would ultimately allow the credit to be repaid. But the efficiency of investment—and relatedly corporate profitability—has been falling amid rapid credit growth, raising doubts about the sustainability of the investment-cum-credit-based stimulus (Maliszewski and others, 2016).

Where will China go from here? Growth will likely continue despite mounting vulnerabilities, but at a lower speed and under a different model. 'Bumps' along the growth path are also possible. This is the basis for our modelling exercise, which identifies and

simulates the illustrative impact of key factors in the ongoing transition. We discuss them below.

A. Structural slowdown

China's convergence potential remains considerable. The economy is only half-way in the journey to high-income status: at the current level of per-capita income, it is where Japan was in 1986, Korea was in 1996, and Taiwan Province of China was in 1994. Each of these economies had another two or three decades of high growth ahead of them at the comparable stage of development. Each of them faced periods of temporarily lower growth, often association with financial turbulences. Remarkably, however, they managed to combine the high rate of capital accumulation with relatively high productivity growth. Maliszewski and Zhang (2015) shows that that China's growth convergence path closely resembles those of the 'Asian Tigers', pointing to further convergence potential.

Several characteristics of the Chinese economy make the convergence more difficult though. First, China is bigger and cannot rely on external demand to the same extent as other 'Asian Tigers'. Domestic demand will be playing an increasing role as an engine of growth, shifting activity to services, likely resulting in lower productivity gains than the transition from agriculture to manufacturing experienced in the past. Second, several indicators show that market institutions in China are weaker than in other Asian Tigers, increasing the probability of a productivity slowdown. Third, productivity has been falling since the GFC stimulus, likely reflecting less efficient allocation of capital (a reflection of the massive run-up in investment projects).

A gradual reduction in productivity growth is therefore likely in the medium term. To illustrate the impact, we simulate a reduction in China's GDP growth driven by a productivity slowdown. The reduction is gradual, with growth slowing by 1.5 percentage points over a 5-year period. This cuts the level of China's GDP after 5 years by roughly 5 percent compared to no-slowdown. It is important to note that market-oriented reforms could arrest or even temporarily reverse the negative productivity trend (even though the economy will still gradually settle on a lower growth path).

B. On-shoring

The transition and moving up the value chain affects competitiveness patterns. For an extended period, China's exports have been in low-value-added, assembly-type categories with high import content. But China is now becoming competitive in sectors producing high-technology, knowledge-intensive, and more complex goods. Results reported in the recent Asia Regional Economic Outlook (IMF, 2016) suggest that exports from advanced economies are adversely affected by this shift in competitiveness. These sectors have been traditionally dominated by economies such as Germany, Japan, Korea, Taiwan Province of China, and the United States. They have seen a fall in exports of these higher-value-added goods, particularly to China, but also—even though to a lesser degree—to third markets. The

shift has been particularly pronounced since the GFC. Note that this exercise is not implying that China will diminish its production of low-value-added goods, it only assumes that China will import fewer goods from abroad and in turn produce them domestically. Naturally, the spillovers to other regions would be different if we had assumed that China would be reducing the production of low-value-added goods[2].

We simulate the impact of the continuation of this trend. It assumes a reduction in the import content of China's exports of roughly 5 percentage points over 5 years, extrapolating the post-GFC trend. It is in line with the experience of other fast-growing economies in the past, which suggests that this process still has some ways yet to go.

C. Demand Rebalancing

A pivot from investment to consumption is an important part of China's rebalancing. While the investment-based stimulus helped support growth after the GFC, the associated credit boom created vulnerabilities and investment efficiency has fallen. At the same time, private consumption demand has remained depressed by a number of distortions, such as the hukou system limiting access to public services and the social safety net. Removing these distortions would create a more sustainable source of demand. It would also potentially raise the efficiency of investment as it is re-directed towards meeting the new consumption demand. The effect, which is difficult to model, will likely make growth higher and more stable in the long run. Relatedly, rebalancing will reduce vulnerabilities. Less and more efficient investment will require less credit financing. Slower credit growth will in turn reduce the risk of a sharp slowdown, which could occur if the buildup of credit-related vulnerabilities were allowed to continue.

We model rebalancing as an increase in transfers to households financed by cuts in public investment. Reforms stimulating private consumption—such as strengthening of the social safety net—could have fiscal costs, but rolling back inefficient public and quasi-public investment would make the pivot fiscally neutral. This is in line with the authorities' plans, which include further reforms of the social safety net and the hukou system, combined with the strengthening of local government finances. Lam and Wingender (2015) estimate that additional social expenditures would amount to 7–8 percent of GDP in the medium term. This could be mostly financed by bringing public investment and infrastructure expenditures (mostly off-budget local government spending) back to the pre-GFC level. For the modelling exercise, similar to the illustrative proactive scenario in the China's 2016 Article IV (IMF 2016a), we assume a decline in the share of public investment in GDP of roughly 7.5 percentage points over five years. The saved public resources are used to increase transfers to

[2] In this alternative scenario, countries with low labor cost could benefit from China moving up the value chain by replacing China in producing low-value-added goods (Mathai et al, 2016).

(continued)

households who don't have access to capital markets. These resources then flow one-for-one into an increase in private consumption.[3]

D. Cyclical slowdown

The post-GFC investment boom has been associated with a massive credit boom. Credit has flown mainly to the corporate sector, increasing leverage. This, combined with a falling profitability, has raised concerns about corporate sector finances (Maliszewski and others, 2016). The rapid growth in credit has partly financed off-budget, local government spending (treated as part of the corporate sector), and a major retrenchment there is unlikely in this area. But private sector leverage has also been rising fast, and the fallout from credit events in this part of the corporate sector could be sizeable. China has policy buffers to cope with such an event, but coordination failures and the growing complexity of the financial system could prevent the government from deploying them in time (Maliszewski and others, 2016).

Financial stress would amplify the normal maturing of the investment cycle. For instance, lower growth prospects could trigger a sharp reassessment of risk and re-pricing of assets, tightening access to financing. This motivates our cyclical slowing experiment, which assumes a temporary decline in asset prices (equities and real estate) and a temporary increase in corporate risk premium.

III. The Flexible System of Global Models

A brief overview of the Flexible System of Global Models (FSGM) is presented in this section. The interested reader can find a detailed description of FSGM's theoretical structure and its simulation properties in Andrle and other (2015). Each FSGM module is an annual, multi-region, general equilibrium model of the global economy. Each country/regional block is structurally identical, but with potentially different key steady-state ratios and behavioral parameters. For the analysis presented in this note, the G20MOD and the APDMOD modules of FSGM are used. In APDMOD, a large number of individual Asian economies are modeled and thus using it as well will illuminate the possible spillovers to more of the economies that are not included individually in G20MOD.

Model Overview

FSGM is a semi-structural model combining both micro-founded and reduced-form formulations of various economic sectors. Real GDP in the model is determined by the sum of its demand components in the short run, and the level of potential output in the long run.

[3] Our simulations do not cover additional medium-term adjustment that China needs to maintain fiscal sustainability (IMF, 2016).

What follows is a brief overview of the components of aggregate demand, potential output, the price block, commodities, and finally monetary and fiscal policy.

The Real Side

Aggregate demand follows the standard national expenditure accounts identity, where real GDP is the sum of household consumption, private business investment, government absorption and exports of goods and services, less imports of goods and services.

The consumption block is micro founded and uses the Blanchard-Weil-Yaari overlapping generations (OLG) model of households. Using OLG households that have a finite expected lifetime rather than infinitely-lived households results in important non-Ricardian properties whereby the path for government debt, and thus fiscal policy actions, have significant implications for private consumption dynamics. The model also contains liquidity constrained (LIQ) households that do not have access to financial markets, do not save, and thus consume all their income each period. Adding LIQ households amplifies the non-Ricardian properties of the basic OLG household framework.

In the OLG framework, households treat government bonds as wealth since there is a chance that the associated tax liabilities will fall due beyond their expected lifetimes. The OLG formulation thus results in the endogenous determination of national savings given the level of government debt. Consequently, the world real interest rate is endogenous and adjusts to equilibrate the global supply of and demand for savings. The use of an OLG framework necessitates the tracking of all the stocks and flows associated with wealth, and thus the model has full stock-flow consistency.

Private business investment is also micro founded and uses an updated version of the Tobin's Q model, with quadratic real adjustment costs. Investment is negatively correlated with real interest rates. Investment cumulates to the private business capital stock, which is chosen by firms to maximize their profits. The capital-to-GDP ratio is inversely related to the cost of capital, which is a function of depreciation, the real interest rate, the corporate tax rate, and relative prices.

Government absorption consists of spending on consumption and investment goods. Government consumption spending only affects the level of aggregate demand. It is an exogenous choice determined by the fiscal authority. The level of government investment is also chosen exogenously, but in addition to affecting aggregate demand directly it also cumulates into a public capital stock, which can be thought of as public infrastructure (roads, buildings, etc.). A permanent increase in the public capital stock permanently raises the economy-wide level of productivity.

The real competitiveness index (RCI), which is the long-run determinant of the level of net exports, adjusts to achieve the current account balance required to support the net foreign asset position that reflects households' desired wealth holdings. Exports and imports, individually, are modeled using reduced-form equations. Exports increase with foreign activity, and are also an increasing function of the depreciation in the RCI. Imports increase with domestic activity, and are an increasing function of the appreciation of the real effective exchange rate (REER).

The current account and implied net-foreign-asset positions are directly linked to the saving decision of households. The model can be used to study both creditor and debtor nations as positive or negative net foreign asset positions can be a feature of the well-defined steady-state in the OLG framework.

Aggregate supply is captured by potential output, which is based on Cobb-Douglas production technology with trend total factor productivity, the steady-state labor force, the non-accelerating inflation rate of unemployment (NAIRU), and the actual capital stock. The unemployment rate varies relative to the NAIRU according to an Okun's law relationship with the output gap.

Prices

The core price in all regions is the consumer price index excluding food and energy, CPIX, which is determined by an inflation Phillips curve. CPIX inflation is sticky and reflects the expected paths of import prices and the economic cycle, as captured by the output gap. In addition, although the direct effects of movements in food and energy prices are excluded, there is a possibility that persistent changes in oil prices can leak into core inflation. In addition, there is a Phillips curve for nominal wage growth. Wage inflation exhibits stickiness and allows the real wage to return to its equilibrium only gradually depending on the expected evolution of overall economic activity.

There is also a full set of prices that mimic the structure of demand: consumption; investment; government; exports; and imports. The GDP deflator itself is a weighted average of the consumption, investment, government, export, and import deflators.

The model also incorporates three types of commodities – oil, food and metals and their associated prices. This allows for a distinction between core and headline inflation, and provides richer analysis of the macroeconomic differences between commodity-exporting and -importing regions arising from commodity-based terms-of-trade shocks.

Policy

In the short run, the nominal side of the economy is linked to the real side through monetary policy. The behavior of monetary authorities is represented by an interest rate reaction

function. The standard form is an inflation-forecast-based rule operating under a flexible exchange rate. However, the form of the interest rate reaction function is such that there is scope for a fixed exchange rate regime, monetary union, or a managed floating exchange rate regime.

Monetary policy can influence activity through both short-term and long-term interest rates. The long-term, 10-year, interest rate is based on the expectations theory of the term structure, plus a term premium. The interest rates on consumption, investment, government debt and net foreign assets are weighted averages of the 1-year and 10-year interest rates, reflecting their differing term structures, and allowing for a meaningful role for the term premium.

The government sector is much broader than government absorption. There is additional spending by the fiscal authority on transfers to all households, or targeted exclusively to LIQ households. The fiscal authority chooses a long-run level of debt relative to GDP. To meet its debt target and fulfill spending obligations, the government raises revenue via consumption (VAT), labor, corporate, and lump sum taxes. In the face of shocks to the economy under the standard fiscal reaction function, all tax rates remain fixed and spending on general transfers adjusts to ensure that the public debt-to-GDP ratio is maintained in the medium term. However, the fiscal reaction function can also be specified to use other instruments besides general transfers.

IV. Simulation Analysis

We turn to the simulation analysis to illuminate potential spillovers. Several structural developments (structural slowdown, on-shoring, and rebalancing) and one cyclical experiment (cyclical slowdown) are considered. The quantification of experiments is discussed above. But because there is considerable uncertainty about China's transition going forward, they should be interpreted as rules of thumb rather than projections.

There is considerable real-world uncertainty about how these processes in China will evolve. This is captured by assuming that each year the new development initially comes as a surprise, but once it has happened, everyone understand that the development is permanent. This approach has the benefit of avoiding the front-loaded dynamics that forward-looking rational expectations models can otherwise generate that are strikingly at odds with the type of dynamics seen in the data.

A. Structural Slowing

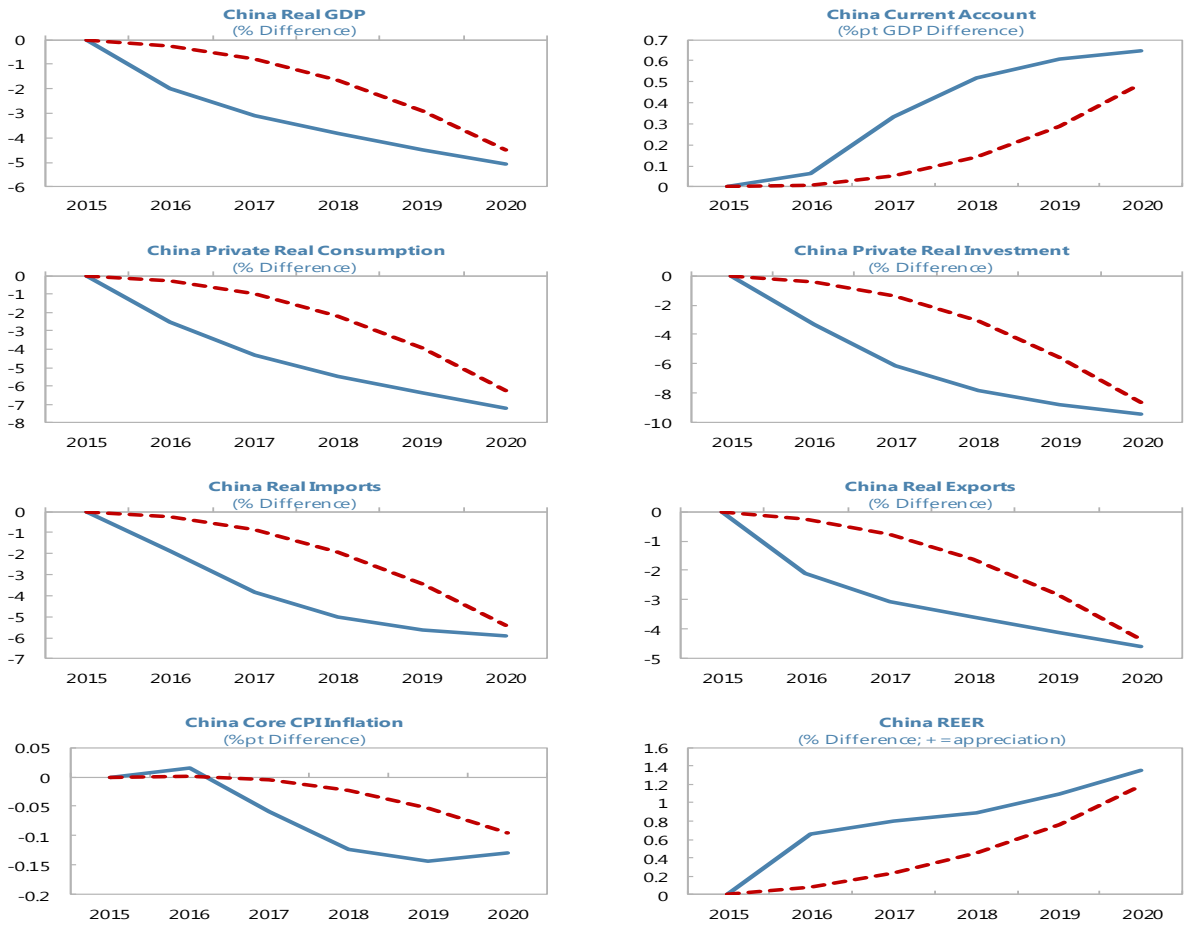
Economy-wide structural slowdown

The economy-wide structural slowing is generated with a reduction in productivity that lowers GDP in China by roughly 5 percent after 5 years. The impact on key macro variables in China is presented in Figure 1. Two alternatives are considered. In one alternative the

slowing in growth is front loaded (solid blue line). In the other the slowing is back loaded (dashed red line).

Lower productivity implies a reduction in the return to capital and, consequently, a reduction in firms' desired capital stock. Investment is cut to achieve the new lower level of private capital. Lower productivity also implies lower real wages and thus lower permanent income for households who respond by reducing consumption demand. The decline in domestic demand leads to import compression. To achieve its desired NFA position, China no longer needs to export as much and, consequently, the exchange rate appreciates. The appreciation reduces foreign demand for Chinese exports, but the net export position and the current account improve. This arises because Chinese households' desired net foreign asset position has risen. With the decline in the domestic capital stock, households need to replace domestic assets with foreign assets in their wealth portfolios to maintain the stock of wealth that supports their desired lifetime consumption path. Along the transition path, demand falls faster than the economy's supply capacity and so core inflation falls slightly.

Figure 1. Economy-Wide Structural Slowing in China - Domestic Impact

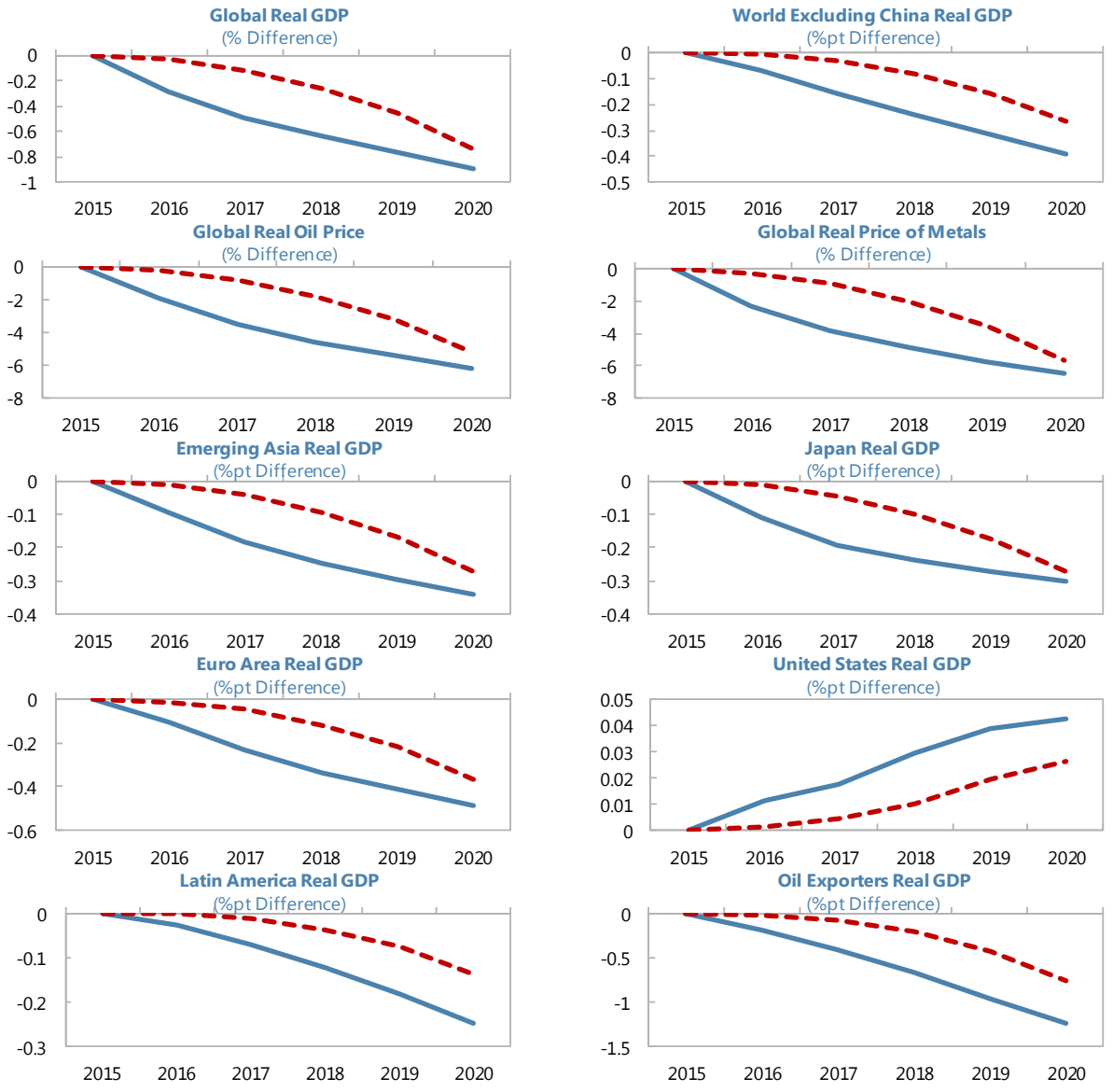


Source: FSGM simulations.

The impact on key global variables as well as the GDP impact on select countries and regions is presented in Figure 2. Again the front-loaded adjustment is given by the solid blue line and the back-loaded adjustment by the dashed red line. Slower growth in China reduces global GDP by roughly 1 percent after five years with the impact on the world excluding China equal to approximately 10 percent of the decline in China. Weaker global demand results in oil and metals prices lower by roughly 7 percent after five years.

Figure 2. Economy-Wide Structural Slowing in China - Spillovers

Structural slowdown front loaded
Structural slowdown back loaded



Source: FSGM simulations.

There is a notable amount of variability in the GDP impact across key countries and regions depending on the strength of trade links with China and commodity-net-export positions. For emerging Asia excluding China, the impact is close to the average spillover effect. Although for countries in the region that have strong trade links to China, lower commodity prices are a net benefit and help offset the negative impact of weaker Chinese demand. In Japan, the impact is slightly below the average, as trade links are slightly weaker than for emerging Asia and Japan has a large net import position in commodities. Differently from previous empirical work on spillovers (REO, IMF 2016b), the Euro Area impact is slightly larger than the impact on Emerging Asia. One of the explanations for the difference in this study compared to empirical studies is that we assume that the zero lower bound on nominal interest is not violated. Thus, the negative spillover on the Euro area is amplified by the lack of monetary policy space. For the United States, the impact is small and positive as the United Sates exports little to China, but benefits from lower commodity prices. In Latin America the impact is below average and reflects primarily the impact of lower commodity prices as non-commodity trade links with China are limited. Not surprisingly, the impact on oil exporters is much larger than average.

Tradable-Sector Structural Slowing

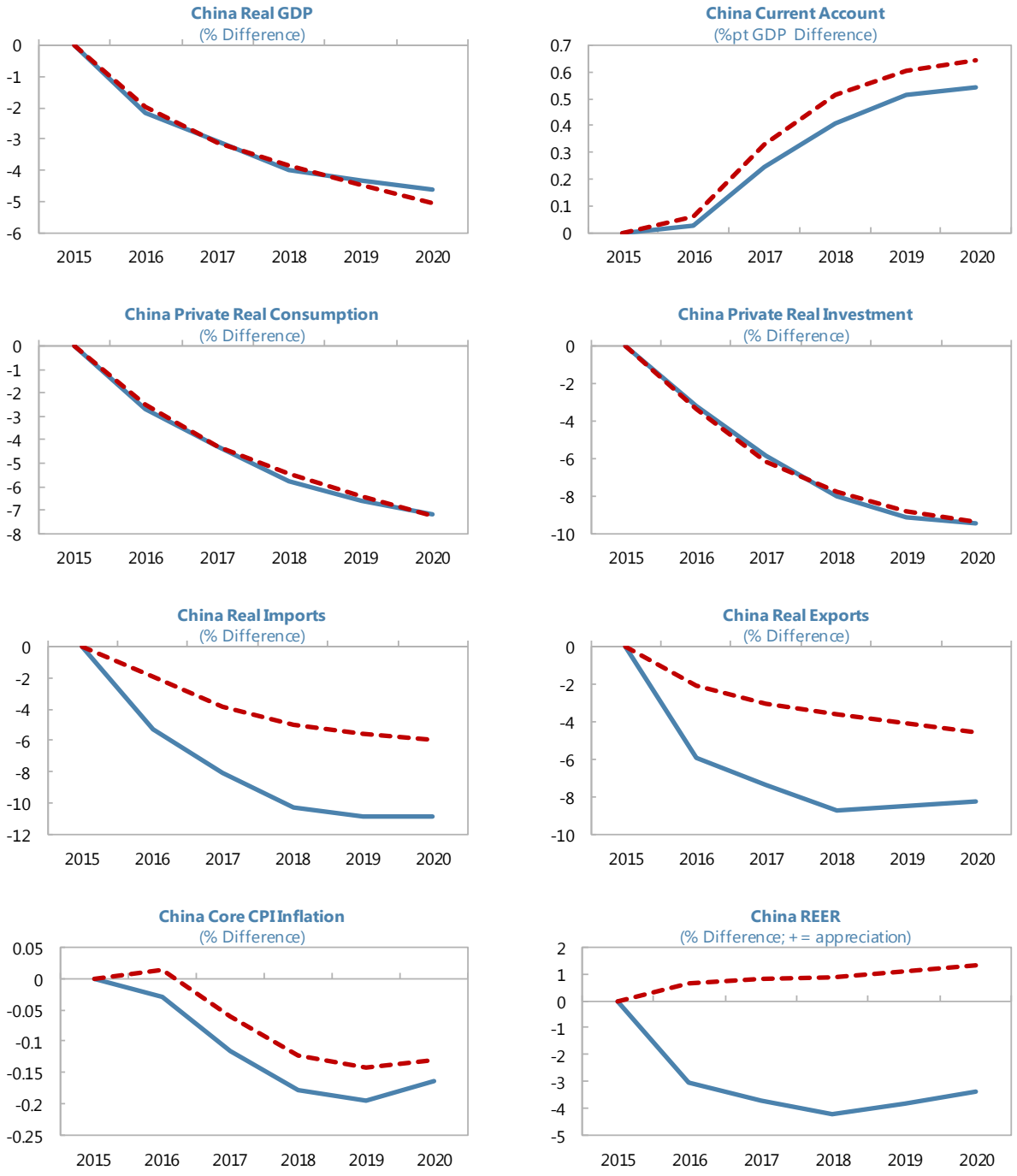
In addition to the economy-wide slowing, a structural slowing that occurs only in the tradable goods sector is also considered. As was done above, the slowing lowers China's GDP by roughly 5 percent after five years, but the underlying decline in productivity is assumed to be only in the tradable goods sector. The slowing is assumed to be front loaded and the impact on key macro variables in China are presented in Figure 3 (solid blue line) where they are compared to the outcomes under the front-loaded economy-wide slowing (dashed red line).

The main difference in outcomes in China between the economy-wide and the tradable-sector slowing is in the behavior of the exchange rate. Under the tradable-sector slowing the exchange rate depreciates while the currency appreciates under the economy-wide slowing. With lower productivity growth in the tradable sector, the relative price of Chinese tradable goods will be higher. Although import demand in China is falling owing to the decline in domestic demand, there is a partial offset as households and firms substitute towards the now relatively more competitive foreign tradable goods. In addition, foreign demand for Chinese tradable goods is declining owing to their relative price increase. With a lower domestic capital stock, households need to replace domestic assets with foreign asset in their wealth portfolios. To achieve the required current account surpluses, the currency must depreciate to restore competitiveness to Chinese tradable goods in both domestic and foreign markets.

Figure 3. Tradable-Sector Structural Slowing in China - Domestic Impact

Tradable sector front loaded slowing

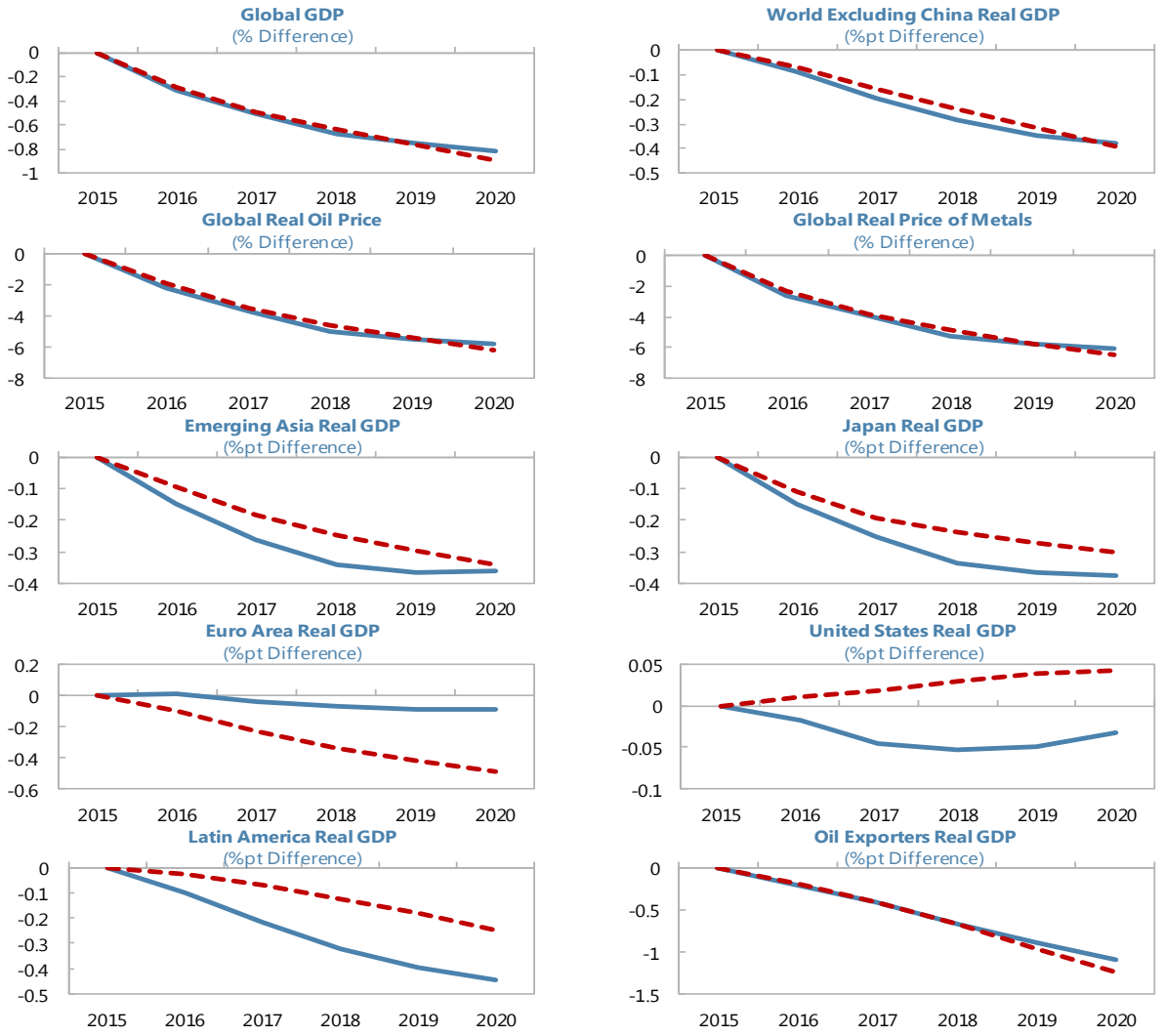
Economy-wide front loaded slowing



Source: FSGM simulations.

The spillovers from the tradable-sector slowing, presented in Figure 4, illustrate that the negative spillovers to the rest of the world are virtually identical to the case where the structural slowing in China is economy wide. There are, however, some interesting differences in how the spillovers are allocated across regions. For countries that import more from China than they export to China, the impact is more negative and this reflects the fact that these countries are suffering a negative terms of trade shock owing to the relative increase in the price of Chinese imports. However, for the euro area, with significant exports to China the gain in their competiveness more than offsets the impact of the higher cost of Chinese imports and output in the euro area declines less when the slowing is concentrated in China's tradable goods sector.

Figure 4. Tradable-Sector Structural Slowing in China - Spillovers
Tradable sector front loaded slowing
Economy-wide front loaded slowing



Source: FSGM simulations.

B. On-shoring

In this exercise, we model the effect of further progress in on-shoring. In the last 15 years, the share of imported inputs for production/re-exports has been declining by about 1 percentage point every year. In this exercise, we assume that this process still has some way to go, as the Chinese economy keeps transforming. Specifically, we assume that the share of imported inputs for exports falls by 1 percentage point a year for the next 5 years. The impact on key macro variables in China is presented in Figure 5.

The first thing to note is that the process of on-shoring permanently raises the level of output in China. This comes from two distinct channels. First, those goods that are replacing imports need to be produced and to do so firms must permanently raise investment and the level of the capital stock. Second, because those goods are now produced onshore and imports decline, China no longer needs to export as much to achieve its desired NFA position and, consequently, the exchange rate appreciates. This reduces the cost of imported investment goods which eventually raises the level of the desired capital stock adding to the permanent increase in investment. The resulting increase in labor demand also raises real wages and, combined with the currency appreciation that lower the cost of imported consumption goods, supports a higher level of household consumption. Although the appreciation lowers demand for Chinese exports, the net export position and the current account improve. Even though the appreciation puts downward pressure on headline inflation, demand grows at a faster pace than the economy's supply and so core inflation initially rises.

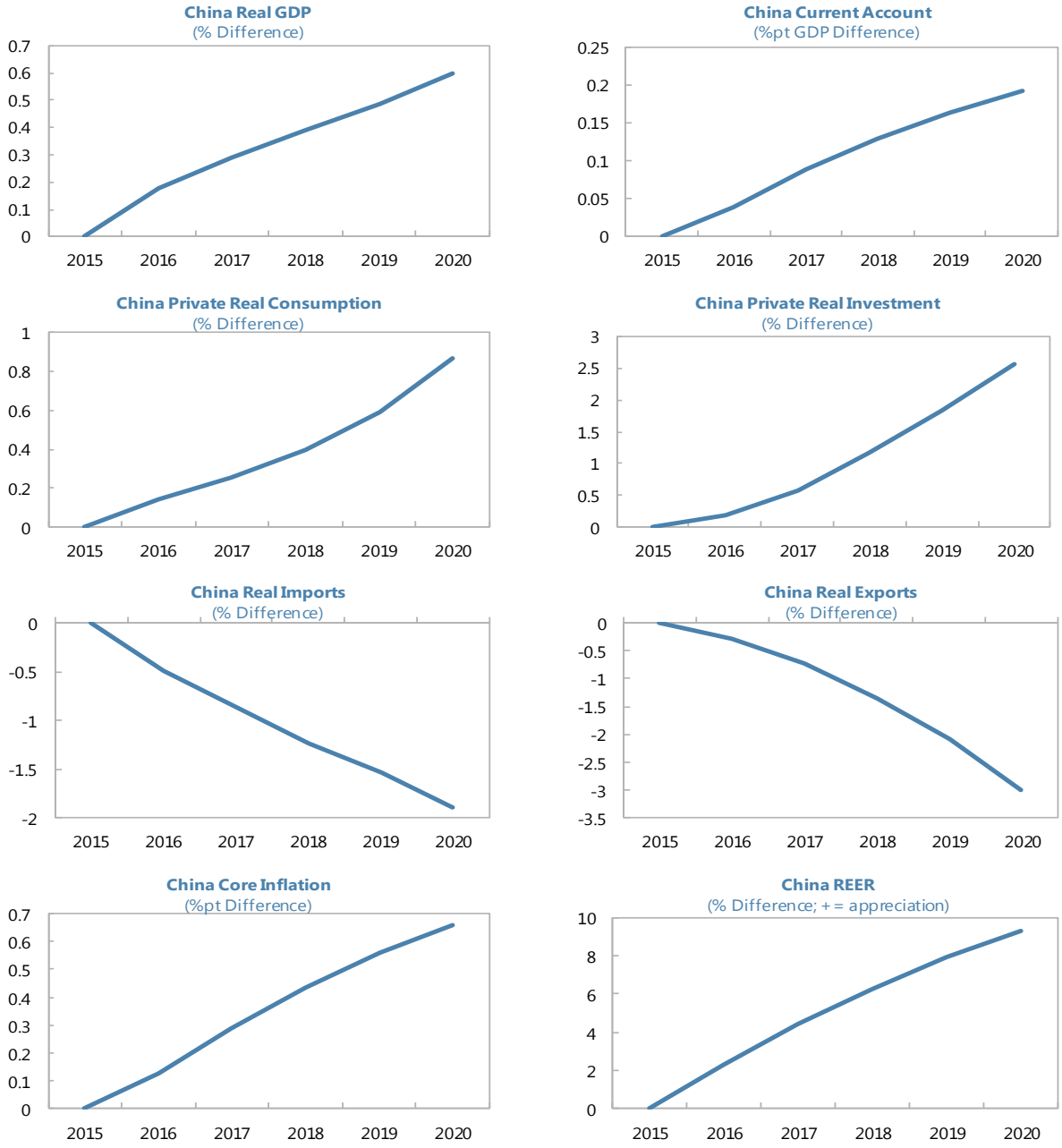
Figure 6 presents the impact on global variables as well as the GDP impact on select countries and regions. Assuming that the degree of on-shoring follows historical trends, the spillovers from this exercise are relatively small. World GDP excluding China falls by a trivial amount and is more than offset by the increase in output in China. The net increase in global GDP leads to a slight increase in demand for commodities, resulting in slight increases in oil and metals prices over time.

Unlike the previous exercises, the lower demand for imports from China is not offset by lower commodity prices. Consequently, higher commodity prices reinforce the negative spillovers from the lower demand for emerging Asia and Japan's exports. It is important to highlight that this exercise only assumes that China produces domestically goods that it previously imported. The results on emerging Asia could have been different if the on-shoring was a result of China moving up the value chain and reducing the production of low-value-added goods. In this case, emerging Asian countries could benefit from the on-shoring process[4]. Japan is particularly impacted by the on-shoring in China, with the negative

[4] Mathai et al (2016) shows that current data indicates that even though China is producing more sophisticated goods, it did not stop producing low-value-added goods.

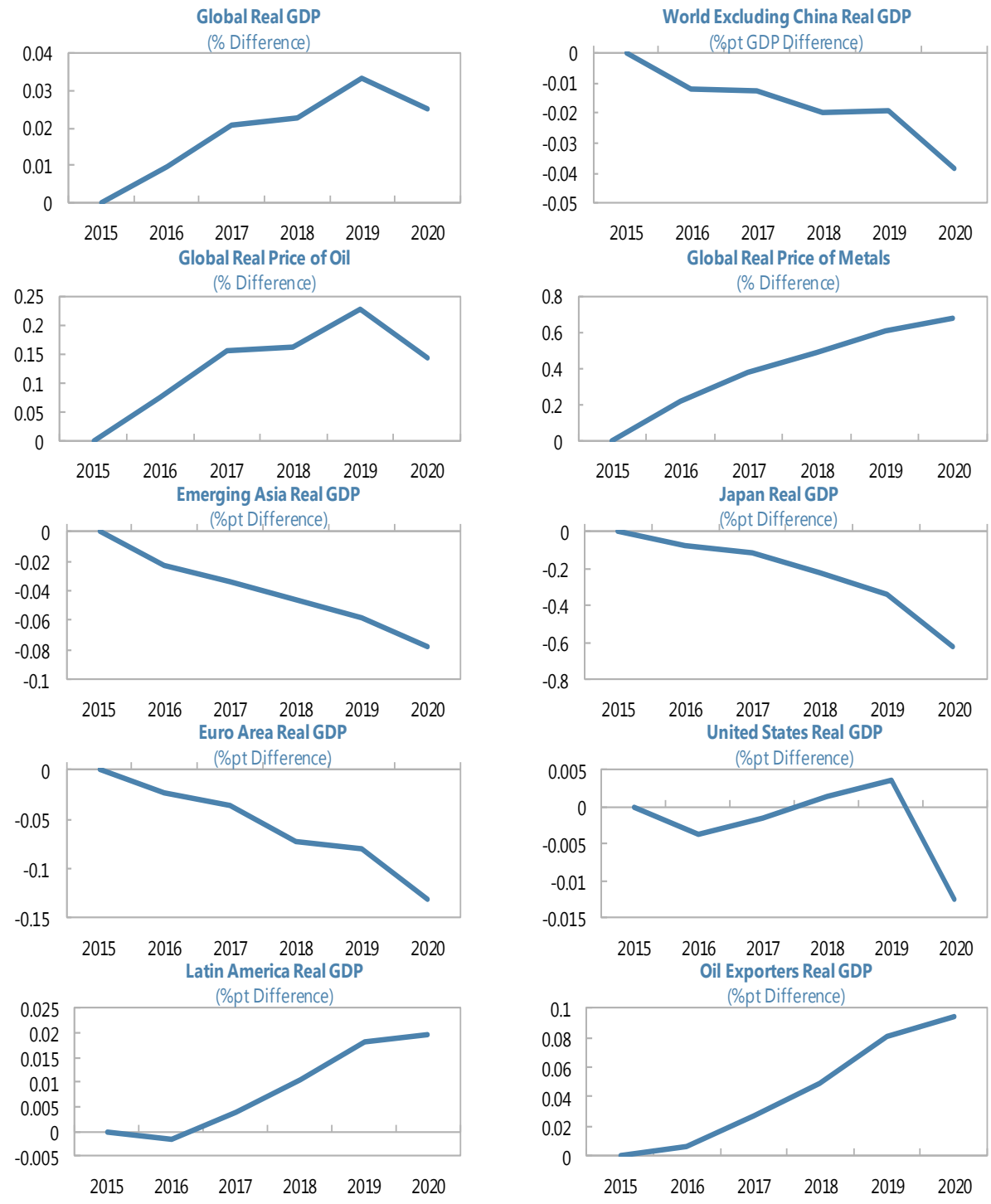
spillovers considerably larger than the average spillover after 5 years. Comparably to the slowdown scenario, the lack of policy space combined with the relatively larger exposure to trade explain why the Euro Area impact is larger than average. The United States and Latin America hardly have any impact from the on-shoring in China. Lastly, as expected, oil exporters benefit from the higher oil prices and their GDP level increases by about 15 percent of the increase in China's GDP after 5 years.

Figure 5. On-shoring in China - Domestic Impact



Source: FSGM simulations.

Figure 6. On-shoring in China - Spillovers



Source: FSGM simulations.

C. Demand Rebalancing

Under demand rebalancing, public investment as a share of GDP declines and the saved resources are transferred to liquidity constrained households. Each year for five years, public investment declines by 1.5 percent of GDP and remains 7.5 percent of GDP permanently lower thereafter. Transfers to liquidity constrained households rise by an equivalent amount each year for five years and then remain permanently at that higher level thereafter. Two variant are considered with respect to the productivity of the forgone public investment. In the first case it is assumed that the foregone public investment was totally inefficient and thus added nothing to private productivity. In the second case it is assumed that the foregone public investment did add to private productivity, but only mildly, at ¼ of the rate of the model's standard impact of public capital on private productivity. The impact of the demand rebalancing on key variables in China is presented in Figure 7 with the solid blue line tracing out the impact when public investment makes no contribution to private productivity and the dashed red line tracing out the outcomes when public investment makes a mild contribution.

Since the resources saved from the reduction in public investment are used to increase transfers to households that do not have access to capital markets, they flow immediately into an increase in private consumption. Because investment goods have a higher import content than do consumption goods, shifting demand away from investment goods towards consumption goods results in a net increase in demand for domestically produced goods. The higher demand for domestically produced goods increases the return to private capital and, consequently, stimulates new private investment to raise the level of the private capital stock to that required to satisfy this demand. With the decline in real imports coming from the demand rebalancing, China no longer needs to export as much to achieve its desired NFA position. Consequently, the exchange rate appreciates. The appreciation reduces foreign demand for Chinese exports, but the net export position and the current account improve.

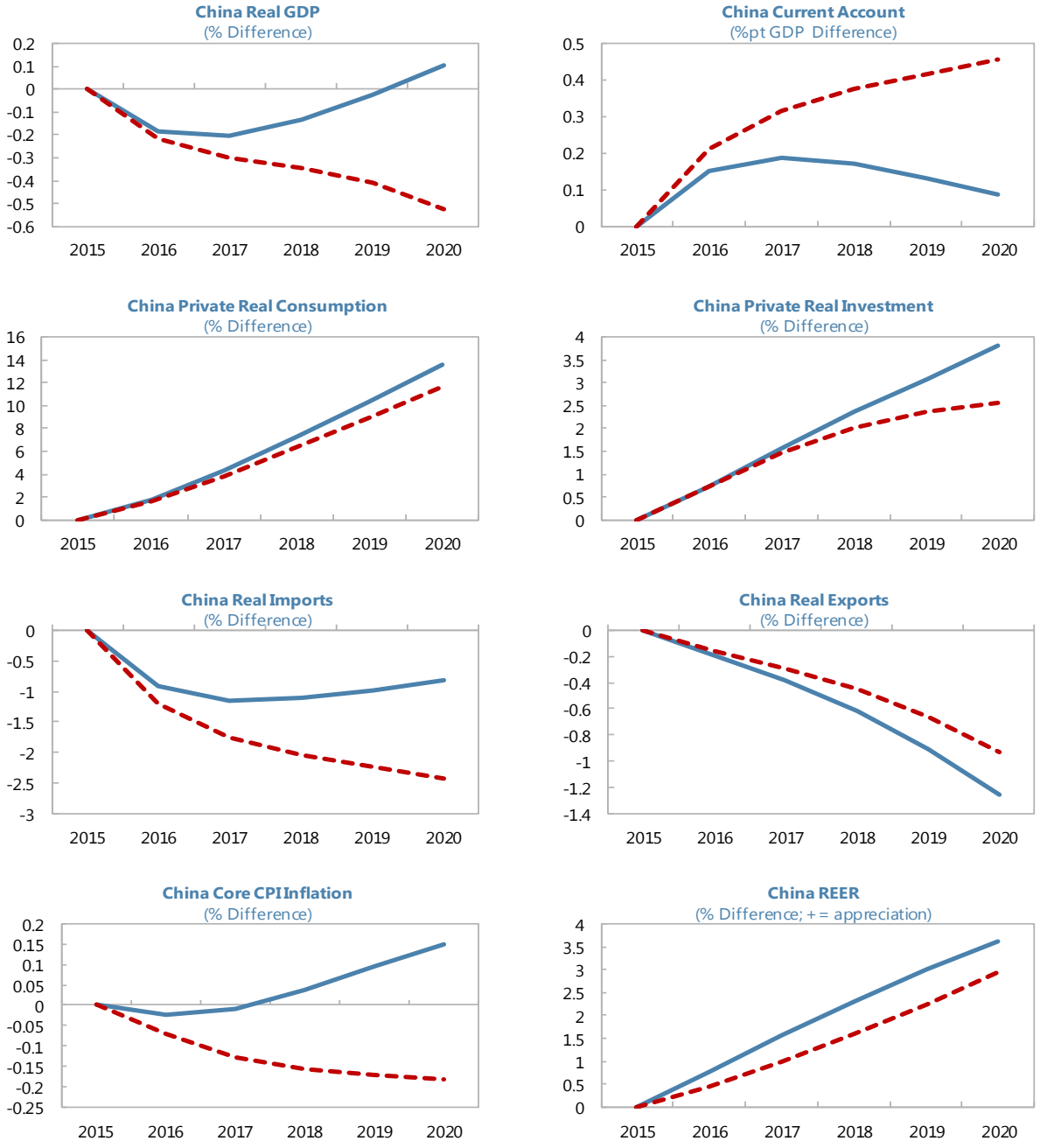
The net impact on GDP of the demand rebalancing depends on the relative efficiency of public capital. In the case where there is no impact on private productivity from the lower public investment, GDP falls slightly in the short run, but then recovers and is 0.1 percent above baseline by 2020. In the case where capital is mildly efficient, GDP falls below baseline permanently. This arises because the reduction in public investment results in a permanently lower level for the public capital stock and, consequently, a permanently lower level for private productivity. As a result, the return on private capital declines which puts downward pressure on private investment demand. For several years, private investment still remains above baseline because the upward pressure on investment from the increase in demand for domestically produced goods more than offsets the downward pressure from lower productivity. However, now the increase in private demand is notable below the reduction in public demand permanently, resulting in a permanently lower level for GDP that

is supported by lower productivity and a lower level of the private capital stock. The level of GDP in China is lower than baseline by 0.5 percent in 2020.

Figure 7. Demand Rebalancing - Domestic Impact

Demand rebalancing inefficient capital

Demand rebalancing mildly efficient capital



Source: FSGM simulations.

The impact on global variables as well as the GDP impact on select countries and regions is presented in Figure 8. The solid blue line represents the case where public investment makes no contribution to private productivity and the dashed red line the case where it makes a mild contribution. At the world excluding China level, GDP declines the most when public investment does not contribute to private productivity. This reflects the fact that when public investment contributes to private productivity, GDP in China and global GDP both decline more which leads to lower commodity prices. Lower commodity prices in turn buffer the impact of lower Chinese import demand. Although oil exporters domestic demand declines owing to lower oil prices, GDP is roughly unchanged, as import compression is sufficient to allow net exports to offset weaker domestic demand.

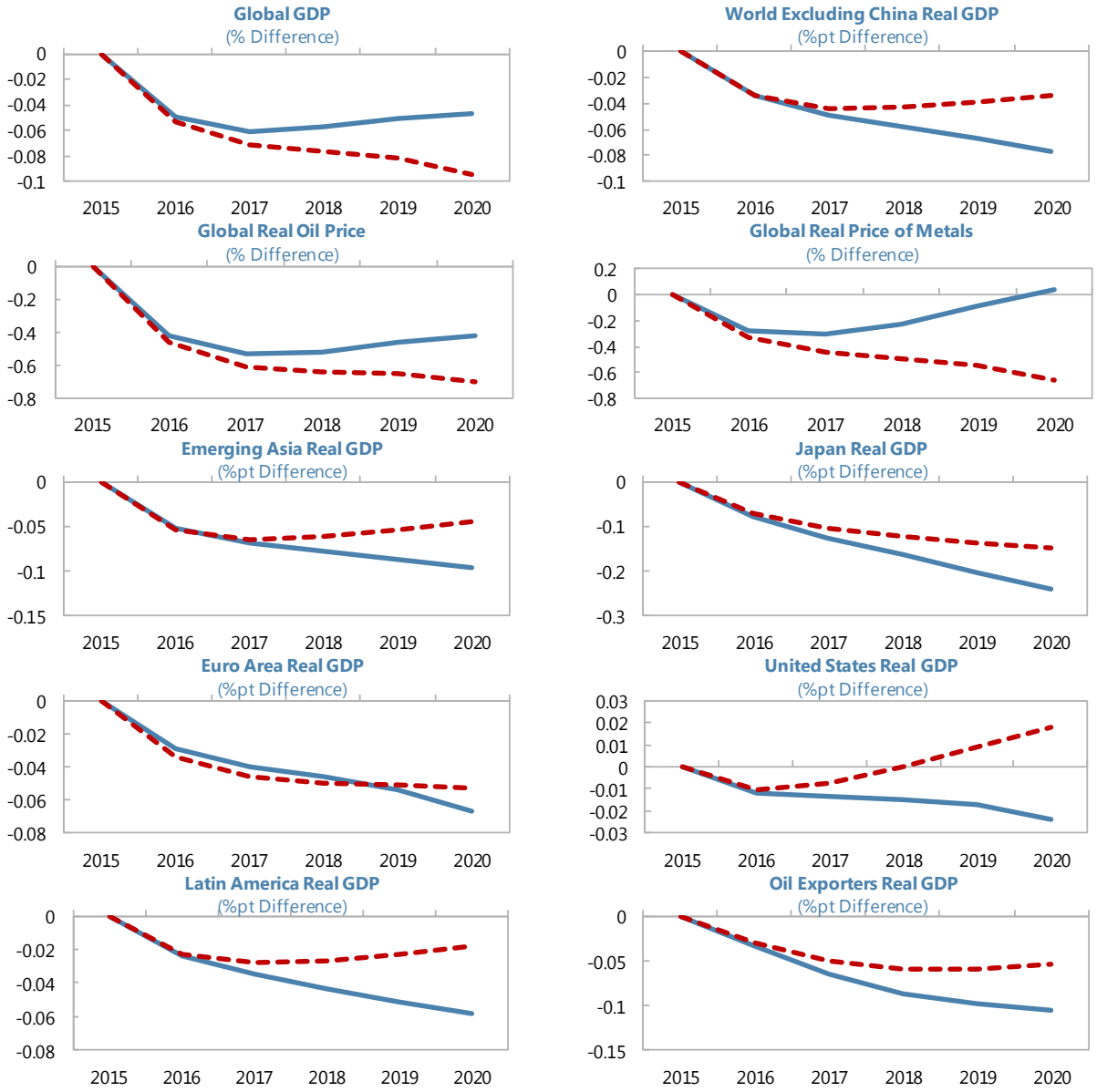
Similar to the structural slowdown exercises, the GDP impact across countries and regions depend on the strength of trade links with China and commodity-net-export positions. For emerging Asia excluding China, the negative impact of weaker Chinese demand is partially offset by the lower commodity prices and the spillovers are around average. In Japan, the impact is above average in the case where public capital is mildly efficient and is below average when it is inefficient. Once again, the larger the fall in commodity prices, the better for commodity importer economies, such as Japan. The Euro Area impact follows very closely the average impact. For the United States, the impact is small and positive. In Latin America, the impact is also around average and reflects primarily the impact of lower commodity prices. Finally, the impact on oil exporters is much larger than average and reflects the fall in oil prices.[5]

[5] This change in the composition of demand could spur some change in the composition of imports. For example, China could import more consumption goods and less commodities. This change in the composition of imports could alter country spillovers, but this channel is not captured in this model.

Figure 8. Demand Rebalancing - Spillovers

Demand rebalancing inefficient capital

Demand rebalancing mildly efficient capital

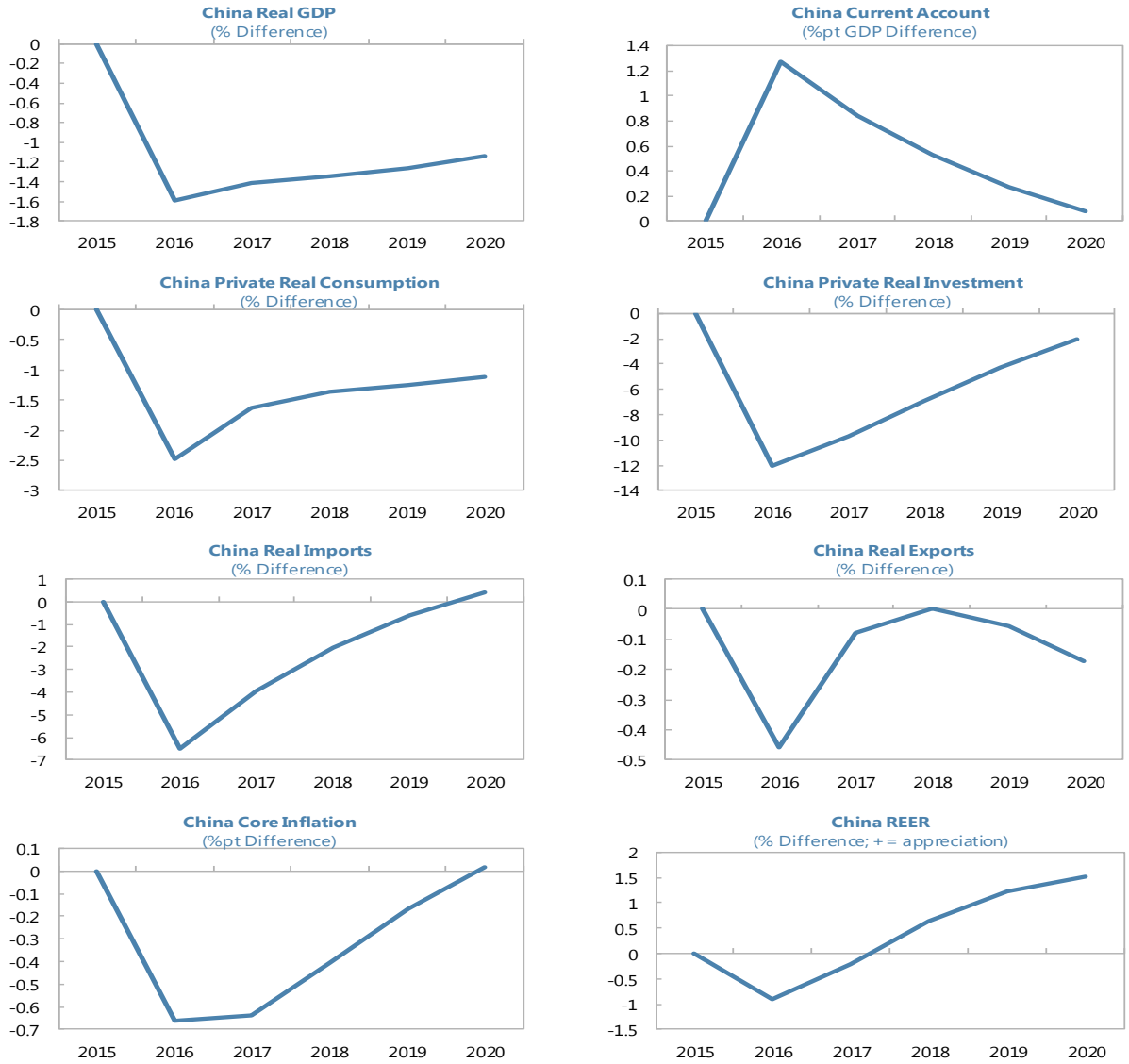


Source: FSGM simulations.

D. Cyclical Slowdown

Potential financial stress in China's highly leveraged economy motivates the cyclical slowing experiment. Financial stress could be in response to a credit event, a reassessment of growth prospects, or another shock. It is assumed that——asset prices (equities and real estate) fall by 10 percent in the first year, returning to baseline in the second year. We also assume that the corporate risk premium increases by 150 basis points in the first year and returns to baseline in the second year. The impact on key macro variables in China is presented in Figure 9.

Figure 9. Cyclical Slowing (Financial Stress) - Domestic Impact



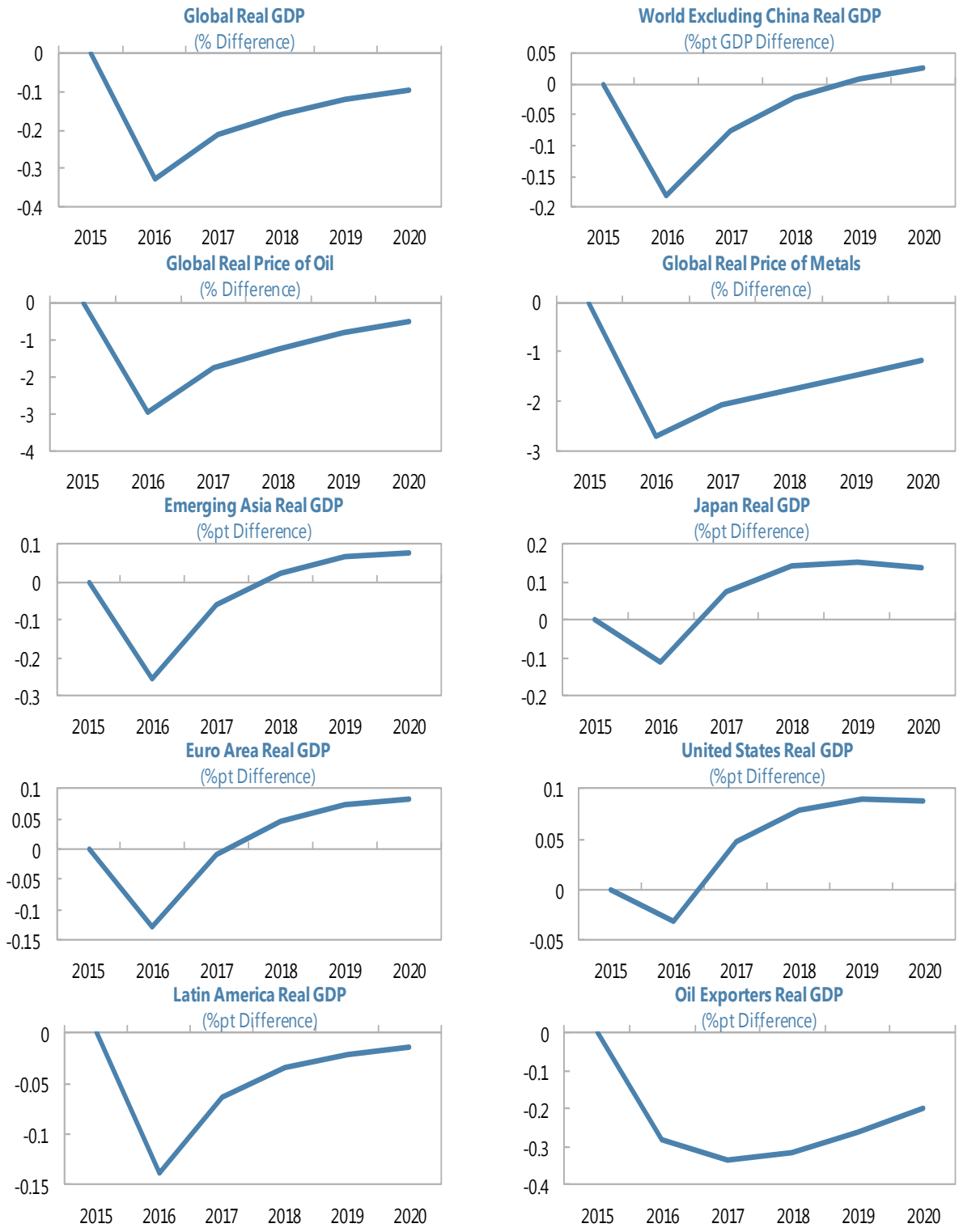
Source: FSGM simulations.

Differently from the other exercises, which represent structural changes to the Chinese economy, this cyclical shock hits the economy mostly in the first year. The direct and most important impact from the financial stress, both the increase in corporate risk premium and the fall in asset prices, is on the return to capital. This lower return reduces firm's desired level for the capital stock. To achieve this new level of capital stock, private investment falls dramatically. Lower investment by firms reduces the demand for labor and the real wage falls. In response to this fall in labor income, households cut consumption demand. This decline in domestic demand leads to notable import compression in the first year. Import compression leads to an improved net export position and an increase in the current account. To return NFA to its desired position, the currency eventually appreciates. Since this is primarily a demand shock, core inflation falls markedly.

Figure 10 presents the impact on global variables as well as the GDP impact on select countries and regions. This is the shock with the largest negative impact on China. However, given its large impact on commodity prices, the impact on the rest of the world excluding China is largely muted. World excluding China GDP falls by 10 percent of the decline in China in the first year and is above baseline after five years. The large domestic demand slowdown in China hits commodity prices hard. Oil and metal prices fall by 3 percent in the first year, and remain about 1 percent below baseline after 5 years.

Given this impact on commodity prices, commodity-net-import countries see the positive impact from lower commodity prices more than offset the negative impact from lower external demand. In Japan, for example, the negative impact in the first year is reversed in the second year and the GDP level peaks at 0.2 percent above the baseline in 2019. The United States experience similar effects, with its GDP level peaking at 0.1 percent above baseline in 2020. For emerging Asia excluding China, the lower commodity prices are not large enough to offset the negative impact of weaker Chinese demand, and the spillovers are larger than average. Finally, the Euro Area and Latin America impacts follow very closely the average impact owing to the stronger trade links to China. Finally, the impact on oil exporters is not only large but also long lasting. The impact is almost twice as large as the average in the first year and remains well below baseline after five years.

Figure 10. Cyclical Slowing (Financial Stress) - Spillovers



Source: FSGM simulations.

E. Detailed Country-by-Country Total Impacts

This section provides detailed country-specific spillovers from China for each of the individual experiments discussed in the sections above. It includes the GDP impacts for all the individual countries in G20MOD and APDMOD. As previously discussed, there is a notable amount of variability in the GDP impact across countries and regions depending on the strength of trade links with China and the commodity-net-export positions.

Table 1 sorts the countries by the relative magnitude of the average spillovers. Since the order of the relative spillovers depends on the exercise analyzed, some countries may be ranked low in the table even though for some specific exercise the impact may be quite large. The numbers in the table present each country's GDP level impact normalized with respect to a 1 percent change in China's GDP level after 5 years. However, because the cyclical slowing is temporary, the spillovers effects are shown only for the first year impact.

With no surprise, Mongolia is the country most affected by the changes coming from the maturing of China's economy. Not only do over 80 percent of Mongolia's exports end up in China, but also commodities account for almost the entirety of these exports. Thus, the changes that reduce commodity prices and China's demand for imports greatly affect Mongolia's economy. For some exercises, the fall in Mongolia's GDP is even larger than the initial fall in China's GDP.

Hong Kong SAR, Vietnam and the ASEAN5 economies also experience large impacts from the slowing of the Chinese economy. These economies have in common the strong trade links with China and with one another. On average over the different exercises, GDP in Hong Kong SAR falls by over half of the GDP change in China. Vietnam's GDP falls by about a quarter and the ASEAN5 economies' GDP falls by about a fifth of the change in China's GDP. Of these countries, given our assumptions on technology externalities, the structural slowdown in China affects mostly Hong Kong SAR, where GDP falls by about 70 percent of the fall in China's GDP. The demand rebalancing produces the largest negative spillover to ASEAN5 economies, where their output declines by 30 percent of the fall in China's GDP after 5 years.

Among the G20 economies, Japan, South Korea and Germany, which all have strong trade links with China, are hit with the largest negative spillovers. The deepening of on-shoring in China has a particularly large impact for these economies, with Japan's GDP falling by 90 percent, Korea's by 70 percent and Germany's by almost 60 percent of the change in China GDP after 5 years. For the countries exposed to commodity prices, exercises that drive oil prices down hit Saudi Arabia particularly hard. For example, Saudi Arabia's GDP falls by almost 50 percent of the fall in China GDP following China's demand rebalancing.

Conversely, countries that do not trade much with China and are net commodity importers experience only a mild negative impact or may even benefit from the maturing of China's economy. Among the G20 economies, these countries include India, Turkey, the United Kingdom, and the United States. These countries experience almost no output effect from the developments considered. The negative effects that arise from lower external demand are offset by the positive effects from lower commodity prices.

Table 1. Detailed Country-by-Country Spillovers Impact

	Structural Slowdown	Demand rebalancing	On-shoring	Cyclical slowdown
Countries - Asian and Pacific Economies				
China	-1.00	-1.00	1.00	-1.0
Mongolia	-0.60	-1.01	-0.47	-1.0
Hong Kong SAR	-0.69	-0.42	-0.68	-0.3
South Korea	-0.06	-0.41	-0.70	-0.3
Japan	-0.13	-0.35	-0.91	-0.2
Vietnam	-0.24	-0.13	-0.24	-0.2
Thailand	-0.09	-0.33	-0.23	-0.3
Malaysia	-0.12	-0.32	-0.15	-0.3
Singapore	-0.08	-0.37	-0.62	-0.2
Philippines	-0.01	-0.20	-0.19	-0.2
Indonesia	-0.12	-0.09	0.01	-0.2
Cambodia	-0.18	0.11	-0.19	0.0
Australia	-0.07	-0.11	0.11	-0.2
New Zealand	-0.04	-0.07	-0.04	-0.1
Bangladesh	-0.09	0.06	-0.09	0.0
Sri Lanka	0.00	0.02	-0.03	0.0
India	0.03	0.01	0.07	0.0
Countries - G20 Economies				
China	-1.00	-1.00	1.00	-1.00
Japan	-0.13	-0.35	-0.91	-0.18
South Korea	-0.06	-0.41	-0.70	-0.35
Germany	-0.10	-0.28	-0.57	-0.13
Saudi Arabia	-0.24	-0.49	-0.01	-0.29
France	-0.05	-0.20	-0.44	-0.07
Italy	-0.03	-0.20	-0.47	-0.05
Spain	-0.03	-0.16	-0.47	-0.02
Indonesia	-0.12	-0.09	0.01	-0.18
South Africa	-0.01	-0.13	-0.02	-0.20
Canada	-0.08	-0.03	-0.05	-0.12
Australia	-0.07	-0.11	0.11	-0.19
Mexico	-0.11	0.00	0.05	-0.09
Russian Federation	-0.13	0.08	0.11	-0.16
United Kingdom	0.01	-0.01	-0.05	-0.02
United States	0.00	0.01	-0.02	-0.04
Brasil	-0.02	-0.02	0.13	-0.08
Argentina	-0.01	0.01	0.03	-0.02
India	0.03	0.01	0.07	0.00
Turkey	0.07	0.03	0.15	0.06

Source: FSGM simulations.

V. CONCLUSIONS

After decades of consistently rapid growth, China has become one of the largest economies in the world and the leading contributor to global growth. However, China's economic maturing appears to have been intensifying since early 2015. Along with the gradual slowdown, the associated structural changes will undoubtedly have important implications for the rest of the world. Its growth is slowing to more sustainable levels. There has been some demand rebalancing, with consumption playing a larger role as a driver of growth. The import content of China's exports has fallen as China has moved its manufacturing sector up the value added chain and it has relied less and less on intermediate inputs from other economies in the region. The growth model based on the high leverage of the corporate sector may have made the economy highly susceptible to rapid changes in investor sentiment given evolving views of China's growth prospects.

This paper uses G20MOD and APDMOD, two modules of the Flexible System of Global Models (FSGM), to estimate the global spillover effects of each of these key developments associated with China's maturing economy. The key developments are analyzed separately so that their individual implications for both China and the rest of the world can be assessed. Further, since the precise magnitude of each of these developments is highly uncertain, relatively stylized experiments are considered. Clearly the final outcomes for both China and its trading partners will depend on the magnitudes of each of these developments and thus their relative importance going forward.

The different components of China's maturing process have differing impacts on China's GDP. Both the structural and cyclical slowing are negative for China's GDP by design. However, the rebalancing could in fact be positive for China's GDP if the foregone public investment is totally unproductive. Although not considered here, the rebalancing could also have a positive impact even if the forgone public investment is productive if failing to reduce public investment allowed the buildup of financial imbalances that eventually unwind in a future crisis. The on-shoring is unambiguously positive for China.

Although some of the developments examined result in higher output in China, they all imply negative spillover to output for almost all the other countries considered. In most cases, the spillovers from developments of plausible magnitudes are notable, but mild. The analysis indicates that while China in all likelihood will continue to be an engine of growth for the world economy, the boost that it provides to other countries can be expected to moderate relative to that provided in the recent past. Among the G-20 economies, Japan, South Korea and Germany are likely to see the largest moderations owing to their strong non-commodity trade links with China. The deepening of on-shoring in China is particularly significant for these economies. For G-20 countries heavily exposed to commodity prices, such as Canada,

Mexico, Russia, Saudi Arabia and South Africa, developments in China that result in downward pressure on commodity prices will have important moderating effects.

Among the non-G20 Asian economies, the results suggest that the ASEAN5 economies, Hong Kong SAR, Mongolia, and Vietnam can be expected to see large moderating impacts from the maturing of China's economy. On average over the different exercises, the impact on Mongolia's GDP is well over half of the impact on China's GDP and for Hong Kong SAR it is just over half. The impact on Vietnam's output is roughly a quarter of the impact on China and the ASEAN5 economies see about a fifth of this change. The demand rebalancing produces the largest negative spillover to ASEAN5 economies.

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