ADBI Working Paper Series

Impact of the People's Republic of China's Growth Slowdown on Emerging Asia: A General Equilibrium Analysis

Fan Zhai and Peter Morgan

No. 560
March 2016

Asian Development Bank Institute

Fan Zhai is Managing Director at China Investment Corporation.

Peter Morgan is a Senior Consultant at the Asian Development Bank Institute (ADBI).

The authors thank Abdul Abiad and other participants of the ADBI conference, The Implications of a Possible PRC Growth Slowdown for Asia, in November 2015 for their comments.

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Suggested citation:

Zhai, F., and P. Morgan. 2016. Impact of the People's Republic of China's Growth Slowdown on Emerging Asia: A General Equilibrium Analysis. ADBI Working Paper 560. Tokyo: Asian Development Bank Institute. Available: http://www.adb.org/publications/impact-prc-growth-slowdown-emerging-asia-general-equilibrium/

Please contact the authors for information about this paper.

Email: zhaifan@china-inv.cn; pmorgan@adbi.org

Asian Development Bank Institute
Kasumigaseki Building 8F
3-2-5 Kasumigaseki, Chiyoda-ku
Tokyo 100-6008, Japan

Tel: +81-3-3593-5500
Fax: +81-3-3593-5571
URL: www.adbi.org
E-mail: info@adbi.org

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Abstract

As an important global and regional economic power, the PRC's growth slowdown may cause large spillover effects to its neighboring economies. Using a multi-sectoral global computable general equilibrium model, this paper quantitatively investigates the impacts of a growth slowdown in the PRC for emerging Asian economies through trade linkages. The results suggest that a growth slowdown of 1.6 percentage points in the PRC would bring about a growth deceleration of 0.26 percentage points in developing Asia as a whole. However, the impacts vary dramatically by economy within developing Asia, reflecting their difference in economic and trade structure.

JEL Classification: C68, F44, F47, F62

Contents

1. INTRODUCTION

With its rapid economic growth and integration into the global economy over the last three decades, the People's Republic of China (PRC) has emerged as a major economic power and an important source of growth for the world economy. Now it is the second-largest economy at market exchange rates and the largest exporter in the world. The PRC accounted for about one-fourth of the world's growth using purchasing power parity based gross domestic product (GDP) during 2001–2014, and in the years ahead, the PRC is likely to account for between one-third and half of growth in global income, trade, and commodity demand (Summers 2015). In Asia, the PRC's role as a growth pole is even more prominent. Over the last 10 years, spurred by strong processing exports and domestic demand, the PRC's imports from Asia in United States (US) dollar terms have increased at an average annual rate of 9%. The PRC is currently the key driver of intra-regional trade and its rapidly rising imports have buoyed the strong growth performance of neighboring Asian economies.

The increasing importance of the PRC for other Asian economies represents not only opportunities for them, but also a potential source of macroeconomic risk. With increased integration in the regional economy, a downturn in the PRC's economy may spill over to elsewhere in Asia. Actually, after peaking at 10.6% in 2010, the PRC's GDP growth has decelerated sharply since then, dropping to below 7% in the first three quarters of 2015. With its traditional growth drivers—exports and investment—losing the momentum, the PRC's current growth model may have reached its limits. In the face of growing excess industrial capacity, high financial leverage ratios in the corporate sector, and potential bubble risks in property and stock markets, the government is unwilling to introduce massive monetary and fiscal stimulus to boost growth as it did after the 2008–2009 global financial crisis. Rather, the government wishes to rely on supply-side measures, including accelerating structural reforms and promoting innovation, to sustain long-term economic growth and facilitate the transition of the growth model to one based more on consumer spending. The efforts towards structural reform, complemented with some mini-stimuli on the fiscal front, may support the economy to grow at a more balanced path of a 6%–7% annual rate. However, the risk of a hard landing also exists.

This paper assesses the likely implications of a growth slowdown in the PRC for emerging Asian economies. Specially, we use a multi-sectoral computable general equilibrium (CGE) model of the global economy to investigate the macroeconomic and structural impacts of the PRC's slowdown through the trade channel. The CGE model is an economy-wide model that characterizes interactions among industries, consumers, and governments across the global economy. The detailed regional and sector disaggregation of the model makes it possible to capture the spillover effects of sector- or country-specific shocks.

Section 2 analyzes the economic linkages between the PRC and other Asian economies and examines the major channels through which the effects of the PRC's growth slowdown may be transmitted. Section 3 discusses the methodology and describes the specifications of the CGE model used in this study. Then in Section 4 we quantify the potential impacts on production, trade, and the macroeconomy using the CGE model simulations. Finally, Section 5 presents some conclusions and policy implications.

2. TRANSMISSION CHANNELS

Trade linkage dominates the economic relationship between the PRC and its Asian neighbors. Through the trade channel, a slowdown of the PRC's economic growth could be transmitted to the rest of the Asian economies by affecting export demand and the terms of trade. As the PRC has become a major source of demand for final goods produced in Asian economies, a significant downturn in its economy would have a negative impact on their exports, which in turn reduce the trade balance and national income through short-run trade multiplier effects. Furthermore, the absorption reduction in affected economies would spill over to their trade partners, resulting in second-round demand reduction effects. The PRC's imports have also contributed the strength of the world commodity market in the past decade. Now it is the world's largest importer of copper and steel, and among the largest importers of other raw materials. The downturn of the PRC's economy may drive down the prices of commodities and thereby negatively impact those countries that rely on exports of commodities and other primary products for much of their export earnings.

The degree of these effects depends on the characteristics of individual economies and their trade relationships with the PRC. The remainder of this section briefly discusses the trade linkage between the PRC and its Asian neighbors, which will facilitate the understanding of the likely impacts of the PRC's downturn.

Based largely on trade relationships, Asian economies have been significantly intensifying their economic ties with the PRC in recent years. Table 1 shows the PRC's exports to a number of Asian economies, while Table 2 shows the PRC's imports. The PRC's exports to these countries grew at a compound rate of 13.6% from 2005–2014. The growth rates of exports to Brunei Darussalam, the Lao People's Democratic Republic (Lao PDR), Myanmar, and Viet Nam have been rising fastest, while those to Japan rose the slowest. The share of imports from the PRC in those economies' total imports increased substantially. The share of Japan's imports from the PRC was relatively stable at 21%–22%, and that for the Republic of Korea rose only modestly, but the PRC import shares in India, Indonesia, Malaysia, Philippines, Thailand, and Viet Nam rose substantially.

The PRC's imports from these countries grew at a compound rate of 9.2% over 2005–2014. The average growth rates of imports from the Lao PDR, Myanmar, Cambodia, Viet Nam, Indonesia, Malaysia, Thailand, and the Republic of Korea rose more than 10% per year. The PRC's share of total exports rose significantly for Indonesia, Japan, Malaysia, the Philippines, the Republic of Korea, Singapore, and Thailand, with Japan and the Republic of Korea having the largest shares.

Table 3 further compares the trade dependence of emerging Asia on the PRC against those on the developed world. It shows a massive rise in the importance of the PRC in Asia over the past 10 years. For ASEAN and South Asia, the PRC's shares in their total trade have doubled from 2004 to 2014. The PRC has outpaced the US, the European Union, and Japan as the largest trade partner of most Asian developing economies.

Table 1: PRC Exports to Asian Economies, 2005–2014

Destination Economy	Export Value ($ billion)			Compound Growth Rate 2005–2014 (%)	PRC Share of Total Imports (%)		
	2005	2010	2014		2005	2010	2014
Brunei Darussalam	0.1	0.4	1.7	47.4	N/A	N/A	0.9
Cambodia	0.5	1.3	3.3	22.3	0.5	1.2	N/A
India	8.9	40.9	54.2	22.2	7.2	7.9	4.2
Indonesia	8.4	22.0	39.1	18.7	7.8	9.9	10.0
Japan	84.0	121.0	149.4	6.6	13.5	19.4	18.3
Lao PDR	0.1	0.5	1.8	37.7	N/A	N/A	N/A
Malaysia	10.6	23.8	46.4	17.8	6.6	12.6	12.1
Myanmar	0.9	3.5	9.4	29.2	N/A	27.1	6.2
Philippines	4.7	11.5	23.5	19.6	9.9	11.1	13.0
Rep. of Korea	35.1	68.8	100.3	12.4	21.8	25.1	25.4
Singapore	16.6	32.3	48.9	12.7	8.6	10.3	12.6
Thailand	7.8	19.7	34.3	17.9	8.3	11.0	11.0
Viet Nam	5.6	23.1	63.7	30.9	10.0	10.7	N/A
Total	183.4	368.9	576.0	13.6	N/A	N/A	N/A

Lao PDR = Lao People's Democratic Republic; N/A = not available; PRC = People's Republic of China.
Source: UN Comtrade database. http://comtrade.un.org (accessed 15 September 2015).

Table 2: PRC Imports from Asian Economies, 2005–2014

Destination Economy	Export Value ($ billion)			Compound Growth Rate 2005–2014 (%)	PRC Share of Total Imports (%)		
	2005	2010	2014		2005	2010	2014
Brunei Darussalam	0.2	0.7	0.2	–1.0	N/A	N/A	9.9
Cambodia	0.0	0.1	0.5	37.6	16.6	24.2	N/A
India	9.8	20.8	16.4	5.9	7.2	11.8	12.7
Indonesia	8.4	20.8	24.5	12.6	10.1	15.1	17.2
Japan	100.4	176.7	162.8	5.5	21.0	22.1	22.3
Lao PDR	0.0	0.6	1.8	60.2	N/A	N/A	N/A
Malaysia	20.1	50.4	55.7	12.0	11.5	12.6	16.9
Myanmar	0.3	1.0	15.6	56.7	N/A	N/A	N/A
Philippines	12.9	16.2	21.0	5.6	6.3	8.5	15.2
Rep. of Korea	76.8	138.3	190.1	10.6	14.8	16.8	17.1
Singapore	16.5	24.7	30.8	7.2	10.3	10.8	12.1
Thailand	14.0	33.2	38.3	11.8	9.4	13.3	16.9
Viet Nam	2.6	7.0	19.9	25.6	16.0	23.8	N/A
Total	262.0	490.6	577.5	9.2	N/A	N/A	N/A

Lao PDR = Lao People's Democratic Republic; N/A = not available; PRC = People's Republic of China.
Source: UN Comtrade database. http://comtrade.un.org (accessed 15 September 2015).

Table 3: Regional Distribution of Merchandise Trade in Emerging Asia
(%)

	PRC	US	EU	Japan
2004				
NIEs (excluding Hong Kong, China)	13.7	13.9	9.3	13.0
Hong Kong, China	43.7	11.0	11.0	8.8
ASEAN (excluding Singapore)	8.2	13.9	11.4	16.0
South Asia	5.9	11.6	20.3	3.1
2014				
NIEs (excluding Hong Kong, China)	18.7	9.8	9.8	7.5
Hong Kong, China	50.2	7.1	8.2	5.3
ASEAN (excluding Singapore)	16.2	8.6	9.4	10.6
South Asia	10.4	8.0	13.8	2.2

ASEAN = Association of Southeast Asian Nations; EU = European Union; NIEs = newly industrialized economies; PRC = People's Republic of China; US = United States.

Source: Haver Analytics database. http://www.haver.com/our_data.html (accessed 25 September 2015).

Because a substantial part of Asia's exports to the PRC is comprised of intermediate goods that will be processed and again exported overseas, the PRC's import growth reflects the rise in both domestic demand and external demand from outside the region. As a result, the role of the PRC's demand in supporting regional growth may be exaggerated by the amount of total trade. However, there have been two important structural changes in the PRC's trade pattern in the years since the global financial crisis. First, the PRC has been moving rapidly up the value-added chains of global production, leading to high domestic content and value-added in the PRC's exports. Second, the domestic demand of the PRC has been increasingly contributing to the value-added of its trading partners (IMF 2011). This suggests a larger impact of the PRC's demand shock on its trading partners.

3. METHODOLOGY

Two types of economic models have been widely used to assess the impact of international transmission of shocks. The first is the multi-country, vector auto-regressions (VARs) model, which captures the linear interdependencies among multiple time series of macroeconomic variables, such as GDP, inflation, and exchange rate, among others. In a VAR, each variable has an equation explaining its evolution based on its own lags and the lags of the other variables. However, such econometrically estimated reduced-form VARs fail to offer clear economic interpretations in examining the effects of structural shocks. The second type of model is the New-Keynesian dynamic stochastic general equilibrium (DSGE) model. This model captures macroeconomic transmission mechanisms with rigorous microeconomic foundations, but often is highly aggregated by region and sector.[1]

We complement the model-based literature on international spillover of economic growth by using a global trade simulation model to evaluate the effect of the PRC's growth on its Asian neighbors. The model is a dynamic, multi-sectoral global CGE model built on the LINKAGE model developed at the World Bank (van der

[1] See Gauvin and Rebillard (2015) and Inoue, Kaya, and Ohshige (2015) for a global VAR analysis of the spillover effects of the PRC's growth slowdown, and Anderson et al (2015) for a DSGE analysis of spillovers from the PRC on sub-Saharan Africa.

Mensbrugghe 2005). The CGE model has its intellectual roots in the group of multi-country applied general equilibrium models used over the past two decades to analyze trade and tax issues (Shoven and Whalley 1992; Hertel 1997). However, different from the supply-driven neoclassical assumptions employed in most CGE models for long-term analysis, we utilize the demand-driven Keynesian closure rule in this model. This makes the model more appropriate for analyzing the short- to medium-term impacts of growth shocks.

The key features of the model are as follows. Production in each economic sector was modeled using nested constant elasticity of substitution (CES) functions and constant returns to scale was assumed. At the top level, output is produced as a combination of aggregate intermediate demand and value-added. At the second level, aggregate intermediate demand is split into each commodity according to Leontief technology specifications, that is, no substitutability between inputs. Value-added is produced by a capital-land bundle and aggregate labor. Finally, at the bottom level, aggregate labor is decomposed into unskilled and skill labor, and the capital-land bundle is decomposed into capital and land (for the agriculture sector) or natural resources (for the mining sector). At each level of production, there is a unit cost function that is dual to the CES aggregator function and demand functions for corresponding inputs. The top-level unit cost function defines the marginal cost of sectoral output.

The model assumed differentiation of products by regions of origin; that is, the Armington assumption (Armington 1969). Top-level aggregate Armington demand was allocated between goods produced domestically and aggregate imports following a CES function. At the second level, aggregate imports were further disaggregated across the various trade partners using an additional CES nest. On the export side, it was assumed that firms treat domestic markets and foreign markets indifferently. Thus the law of one price would hold; that is, the export price was identical to that of domestic supply.

Incomes generated from production were assumed to accrue to a single representative household in each region. A household maximizes utility using the extended linear expenditure system, which is derived from maximizing the Stone-Geary utility function.[2] The consumption/savings decision is completely static. Savings enter the utility function as a "good" and its price is set as equal to the average price of consumer goods. Investment demand and government consumption are specified as a Leontief function.

All commodity and factor markets were assumed to clear through prices. There are five primary factors of production: agricultural land, skilled labor, unskilled labor, capital, and natural resources. Agricultural land and the two types of labor were assumed to be fully mobile across sectors within a region. Some adjustment rigidities in capital markets were introduced through the vintage structure of capital, under which the "new" capital was fully mobile across a sector, while "old" capital in a sector could be disinvested only when this sector was in decline. In the natural resource sectors of forestry, fishing, and mining, a sector-specific factor was introduced into the production function to reflect the resource constraints. These sector-specific factors were modeled using upward sloping supply curves. For other primary factors, stocks were fixed for any given year. The numéraire of the model was defined as the GDP deflator of the US, which was held fixed.

[2] The Stone-Geary utility function takes the form $U = \prod_i (q_i - \gamma_i)^{\beta_i}$, where U is utility, q_i is consumption of good i, γ_i is the subsistence level of consumption and β_i is the marginal propensity to consume out of income.

The model was recursive dynamic, beginning with the base year of 2011 and being solved annually through 2020. Dynamics of the model were driven by exogenous population and labor growth and technological progress, as well as capital accumulation, which was driven by investment. Population and labor force projections were based on the United Nations' medium variant forecast. Technological progress was assumed to be labor augmenting, so the model could reach a steady state in the long run.

There are three macro closures in the model: the net government balance, the trade balance, and the investment and savings balance. We assume that government consumption and saving are exogenous in real terms. Any changes in the government budget are automatically compensated by changes in income tax rates on households. For the current account balance, the foreign savings are endogenously in each region to achieve the equilibrium of foreign account, while the relative price across regions, that is, the real exchange rate (GDP deflator based), are assumed constant.

Domestic investment is exogenously set to reflect the shock in investment demand. As government savings are exogenous and foreign savings are determined by the foreign account balance, the investment–savings account has to be balanced through the changes in the levels of household saving. The equilibrium is achieved through an endogenously adjusted economy-wide factor capacity utilization rate for both capital and labor, which in turn results in changes in household income and savings. This closure rule corresponds to the Keynesian macro closure in the CGE literature (Dewatripont and Michel 1987; Taylor 1990; Robinson 1991) and makes the model behave like a Keynesian trade-multiplier model.

The model was calibrated to the Global Trade Analysis Project (GTAP) version 9, using 20 economies/regions and 22 sectors. Eleven emerging Asian economies are explicitly modeled as individual regions in the model.

It should be noted that the model is only intended to capture the trade channels through which a slowdown of the PRC would exert short- to medium-term impact on the rest of the world. It is not aimed at modeling the impacts of a more severe crisis in the PRC—in which the financial channel and sentiments may play much larger roles in crisis contagion. Nor does it attempt to take account of countercyclical macroeconomic policies that countries might adopt. However, we believe this is an appropriate approach for addressing the question at hand—the effects of a trend slowdown in PRC growth.

4. SIMULATIONS AND RESULTS

We establish a baseline first, in which economic growth and other macroeconomic indicators are broadly assumed to be consistent with the projections of the International Monetary Fund's most recent World Economic Outlook (October 2015). In the baseline the PRC is set to achieve a soft landing and its GDP growth rate would slow to 6.2% in 2016–2020. Then we consider a set of counterfactual scenarios. In the counterfactual scenarios, growth shocks are imposed in each year of 2016–2020 only and all economic variables before 2016 are kept to be with the same baseline, assuming that the risk factors for a slowdown would not exert significant impact over the remainder of 2015. We considered three counterfactual scenarios:

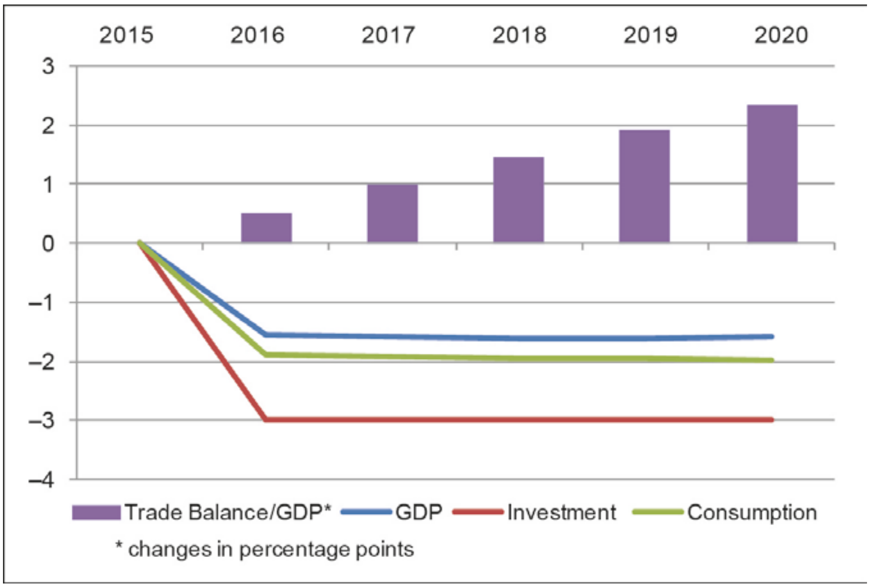
1) The PRC's slowdown: a cut in the PRC's real investment growth by 3 percentage points during 2016–2020
2) The PRC's slowdown plus growth acceleration in the US: an identical investment cut in the PRC and an acceleration of growth in the US by 1 percentage point from the baseline
3) The PRC's slowdown plus India's growth acceleration: an identical investment cut in the PRC and an acceleration of growth in India by 2 percentage points from the baseline

4.1 Impact on Output and Trade

The first counterfactual scenario looks at the potential results of a slowdown of the PRC economy. It assumed the real investment growth of the PRC would be lowered by 3 percentage points in each year of 2016–2020. Lower investment depresses income and employment through the multiplier effect. The annual average growth rate of the PRC's private consumption drops by 1.8 percentage points and its income growth would fall from an annual average of 6.2% to 4.8% during the same period (Figure 1). Falling domestic demand drags down imports growth, leading to improvement in the trade balance, which rises by 0.5% of GDP in 2016 and 2.5% of GDP in 2020. As a result of the growth slowdown, the PRC's real GDP declines by 7.2% in 2020 relative to the baseline (Figure 2).

Figure 1: Macroeconomic Effects of Investment Slowdown of the PRC, 2015–2020

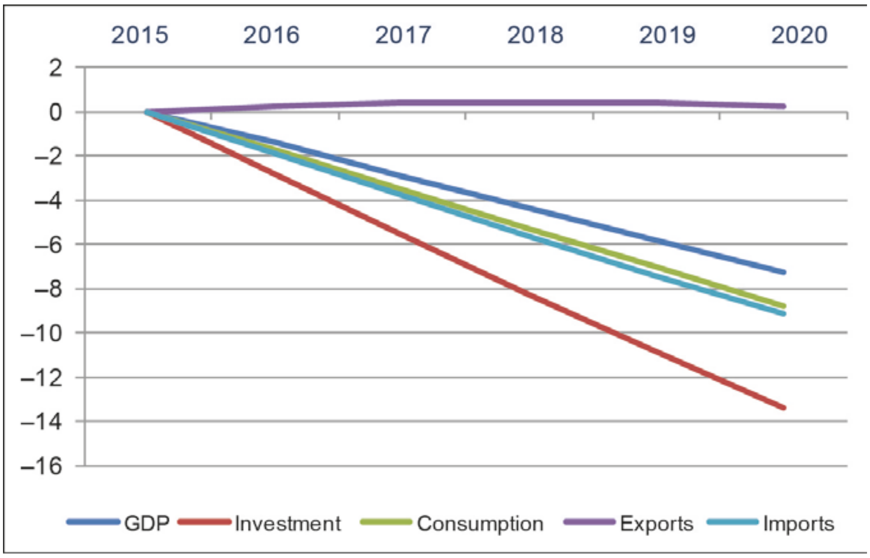
(changes relative to the baseline, percentage points of growth rate or ratio to GDP for trade balance)



GDP = gross domestic product; PRC = People's Republic of China.

Source: Prepared by authors.

Figure 2: Macroeconomic Effects of Investment Slowdown of the PRC, 2015–2020
(% changes relative to the baseline)



GDP = gross domestic product; PRC = People's Republic of China.
Source: Prepared by authors.

The simulation results suggest that such a slowdown would have a moderate regional impact. The average GDP growth rate of developing Asia as a whole (excluding the PRC) would decelerate by 0.26 percentage points in the coming 5 years because of the PRC's slowdown. Taipei,China and Hong Kong, China would be most affected, with losses of 0.54 percentage points and 0.51 percentage points in annual GDP growth respectively, reflecting their strong integration with the PRC. The other newly industrialized economies (Singapore and the Republic of Korea) would experience smaller output losses, owing to their relatively lower trade dependence on the PRC. In Southeast Asia, the Philippines and Malaysia would be hardest hit, with GDP growth slowing down by more than 0.40 percentage points, due to their strong trade linkages with the PRC. The adverse growth effects on other ASEAN countries (Indonesia, Thailand, Viet Nam, and other Southeast Asia) are generally smaller, ranging from 0.27 to 0.35 percentage points. India is most insulated from the PRC's slowdown—its annual GDP growth would be lowered by a slight 0.14 percentage points in 2016–2020 (Table 4).

The PRC's slowdown would also negatively impact developed economies, though the magnitudes would be smaller. Australia and New Zealand appear be more exposed than other developed economies because of their stronger export dependence on the PRC, especially in view of their reliance on commodity exports. In other parts of the world, Latin America would experience a modest growth reduction of 0.29 percentage points annually, while the rest of the world would suffer a larger growth deceleration of 0.36 percentage points, mainly due to the latter's larger trade openness and higher exposure to the PRC's import demand. Through the trade linkage and multiplier effects, a slowdown in the PRC's economy is estimated to lower world GDP growth by 0.42 percentage points.

Table 4: Effects of the PRC's Slowdown on GDP and Trade, 2016–2020
(percentage point changes in annual growth rates relative to the baseline, except for trade balance)

	GDP	Exports	Imports	Trade balance as % of GDP
Australia and New Zealand	–0.37	–0.80	–0.31	–0.35
Japan	–0.24	–0.61	–0.30	–0.18
PRC	–1.59	0.05	–2.01	1.45
Developing Asia (excl. the PRC)	**–0.26**	**–0.50**	**–0.35**	**–0.25**
Hong Kong, China	–0.51	–0.66	–0.49	–0.38
Republic of Korea	–0.26	–0.51	–0.42	–0.28
Taipei,China	–0.54	–0.72	–0.64	–0.37
Indonesia	–0.29	–0.58	–0.20	–0.29
Malaysia	–0.42	–0.53	–0.41	–0.34
Philippines	–0.47	–0.75	–0.45	–0.29
Singapore	–0.34	–0.40	–0.37	–0.32
Thailand	–0.27	–0.39	–0.33	–0.24
Viet Nam	–0.35	–0.40	–0.30	–0.30
Other Southeast Asia	–0.31	–0.58	–0.29	–0.24
India	–0.14	–0.35	–0.19	–0.13
Other South Asia	–0.22	–0.34	–0.17	–0.12
Canada	–0.19	–0.32	–0.18	–0.16
United States	–0.17	–0.40	–0.16	–0.10
European Union	–0.19	–0.31	–0.23	–0.14
Latin America	–0.29	–0.51	–0.24	–0.19
Rest of the world	–0.36	–0.46	–0.27	–0.29
The World	**–0.42**	**–0.35**	**–0.42**	**0.00**

GDP = gross domestic product; PRC = People's Republic of China.

Source: Authors' model simulations.

Changes in the trade balance driven by the PRC's slowdown are key factors to determine the above growth effects. The simulation results show that the investment cut and growth slowdown would reduce the PRC's import growth by 2.0 percentage points from the baseline, and increase its trade balance by 1.45% of GDP. This would be accompanied by a global trade adjustment. As shown in Table 4, world trade growth would fall by 0.42 percent points relative to the baseline due to PRC's slowdown. The economies with closer trade linkages to the PRC would suffer more export deceleration. Australia and New Zealand would be worst hit in terms of exports, whose growth would fall by 0.80 percent points annually with respect to the baseline in 2016–2020, mainly due to the PRC's weakening demand for commodity imports. The PRC's slowdown would dampen the exports growth of the Philippines; Taipei,China; and Hong Kong, China by 0.66–0.75 percentage points, reflecting the central role the PRC plays in the regional production chains of textiles, apparel, and electronics. The exports slowdown for other Asian economies would be more modest, ranging from 0.35 percentage points for India to 0.61 percentage points for Japan.

Reflecting the increased trade surplus of the PRC would be a reduction of trade balances in other economies. The trade balances of Hong Kong, China; Taipei,China; and Australia and New Zealand would be reduced by 0.38%, 0.37% and 0.35% of their GDP, respectively. The reduction of trade balances in other East and Southeast Asian economies would be generally in the range of 0.24%–0.34% of GDP. The South Asian economies would experience only small adjustments in their external accounts, with their trade balances declining by 0.12–0.13% of GDP. The fall in external demand significantly contributes the output reductions in these economies.

The extent of the impact on economic growth also depends on the magnitude of the Keynesian demand multiplier in individual economies. The Keynesian multiplier is the rate at which changes in the exogenous demands are magnified into changes in the overall level of income. The economies with higher propensities to consume tend to have larger multipliers. This explains why the Philippines and other South Asia would suffer relatively large output adjustments although the reduction in their trade balances as ratios to GDP would be smaller. This factor also partially contributes to the relatively smaller growth impact on the Republic of Korea, as Korean households have a relatively low propensity to consumption.

4.2 Sectoral Impacts

Table 5 presents the impact of the PRC's investment-induced growth slowdown on sectoral output of developing Asian economies, and shows percent changes with respect to the baseline in 2020. It shows that the output reduction would vary across sectors. In the PRC, the construction sector would be hard hit, with a loss of 13.1% of annual production in 2020 compared with the baseline. Other service sectors (including trade and transportation and private services) and capital goods sectors such as motor vehicles and metals would also be the major losers, with outputs shrinking by around 8.2–9.5% relative to the baseline in 2020. Textiles, apparel, and other crops would be the least-hit sectors. But they would also suffer output contractions of around 2.5% because of the general economic downturn.

Commodity sectors and investment goods sectors would be the major losers in other developing Asian economies, reflecting the investment-induced nature of the PRC's slowdown. The output reductions in agricultural sectors are generally small, ranging from 1% to 2%. However, commodities sectors such as coal, oil and gas, and other mining would experience large production losses, as their export dependence on the PRC is large in most developing Asian economies. Output declines would be relatively evenly distributed across manufacturing sectors. However, for economies that are more deeply integrated with the PRC through regional production chains, such as Hong Kong, China; Taipei,China; the Republic of Korea; and the Philippines, their machinery, electronics, and chemicals sectors would be more negatively impacted.

Tables 6 and 7 present the sectoral changes in real exports and imports. As a result of its growth slowdown, the PRC's imports of metals, vehicles, machinery, coal, other mining and some agricultural products would experience double-digit reductions in 2020 relative to baseline. This would directly affect the exports of the PRC's Asian neighbors. Given the geographical proximity and the high transportation costs incurred in commodity trade, the PRC is the dominant destination for commodity exports of most Asian emerging economies. The shrinking import demand for coal and other minerals from the PRC would hit developing Asia's exports in these sectors hard. Beside these commodity sectors, machinery exports of Hong Kong, China; the Republic of Korea; and Taipei,China and electronics exports of the Philippines would be significantly affected as well, largely due to the high participation of these sectors in PRC-centered Asian production chains.

Table 5: Effects of the PRC's Slowdown on Sectoral Output, 2020
(% changes relative to the baseline level)

	PRC	HKG	KOR	TAP	INO	MAL	PHI
Grain	–5.1	–1.0	–0.9	–1.3	–1.3	–1.0	–1.7
Other crops	–2.7	–1.0	–0.7	–0.6	–1.1	–1.5	–1.7
Livestock	–6.1	–2.1	–1.0	–1.5	–1.1	–1.7	–1.5
Forestry & Fishing	–5.4	–1.6	–1.1	–1.3	–1.1	–2.0	–1.7
Coal	–5.8	–3.2	–3.1	–3.8	–3.2	–4.2	–5.3
Oil & Gas	–2.9	–2.3	–1.6	–2.1	–1.7	–2.7	–3.1
Other mining	–7.0	–1.8	–3.0	–3.3	–3.1	–4.9	–6.5
Food	–4.9	–2.3	–1.0	–1.2	–1.4	–1.8	–1.8
Textiles	–2.2	–3.5	–2.0	–2.5	–2.0	–2.3	–3.5
Apparel	–2.6	–3.6	–1.4	–2.3	–1.6	–1.9	–2.5
Wood	–5.6	–3.7	–1.4	–2.4	–1.5	–2.1	–2.4
Chemicals	–5.8	–5.7	–1.9	–3.0	–1.8	–2.7	–2.8
Metals	–8.5	–2.5	–1.5	–3.3	–0.7	–2.8	–2.9
Electronics	–3.7	–3.4	–1.9	–3.0	–1.5	–2.8	–4.7
Vehicles	–9.5	–2.3	–0.9	–1.2	–1.3	–1.6	–1.4
Machinery	–7.8	–5.0	–3.1	–4.4	–1.2	–1.9	–2.8
Other manufacturing	–6.0	–2.4	–1.5	–1.7	–1.0	–2.5	–2.6
Utilities	–7.2	–2.6	–1.4	–2.7	–1.3	–2.2	–2.3
Construction	–13.1	–0.1	–0.1	–0.5	–0.1	–1.3	–0.1
Trade & Transportation	–8.2	–2.8	–1.6	–2.7	–1.4	–2.0	–2.7
Private services	–8.5	–2.0	–1.3	–2.7	–1.7	–2.1	–2.9
Government	–3.0	0.0	–0.5	–1.4	–0.5	–0.4	–0.8

	SIN	THA	VIE	Other SEA	IND	Other SA
Grain	–0.5	–0.5	–1.2	–0.9	–0.5	–0.9
Other crops	–0.9	–1.9	–1.6	–1.2	–0.6	–1.0
Livestock	–1.7	–0.7	–1.1	–1.1	–0.4	–1.0
Forestry & Fishing	–1.0	–1.0	–1.6	–1.4	–0.5	–0.8
Coal	–	–2.8	–3.9	–3.8	–1.6	–3.3
Oil & Gas	–1.9	–2.1	–2.6	–2.8	–1.4	–2.1
Other mining	–3.7	–2.1	–4.5	–6.1	–4.0	–1.8
Food	–1.8	–0.7	–1.3	–1.4	–0.5	–1.0
Textiles	–2.0	–1.9	–2.1	–1.8	–1.0	–1.8
Apparel	–1.7	–1.2	–1.0	–1.3	–1.1	–1.2
Wood	–1.6	–1.8	–2.0	–2.6	–0.6	–1.0
Chemicals	–1.6	–2.0	–2.5	–2.5	–0.5	–1.6
Metals	–2.0	–1.2	–1.8	–2.4	–0.4	–1.0
Electronics	–2.3	–2.5	–2.0	–1.7	–0.6	–1.0
Vehicles	–1.4	–0.7	–1.5	–1.4	–0.4	–0.9
Machinery	–1.8	–1.3	–2.2	–2.3	–0.3	–1.0
Other manufacturing	–1.3	–1.0	–1.6	–4.2	–0.8	–1.1
Utilities	–1.6	–1.4	–1.9	–1.8	–0.6	–1.1
Construction	–0.2	0.0	–0.1	–0.1	–0.1	–0.2
Trade & Transportation	–2.1	–1.5	–1.9	–1.9	–0.7	–1.2
Private services	–1.6	–1.7	–2.3	–1.7	–0.9	–1.2
Government	–0.7	–0.4	–0.8	–0.3	–0.4	–0.3

HKG = Hong Kong, China; KOR = Republic of Korea; TAP = Taipei,China; INO = Indonesia; MAL = Malaysia; PHI = Philippines; SIN = Singapore; THA = Thailand; VIE = Viet Nam; SEA = Southeast Asia; IND = India; SA = South Asia.

Source: Authors' model simulations.

Table 6: Effects of the PRC's Slowdown on Sectoral Exports, 2020
(% changes relative to the baseline level)

	PRC	HKG	KOR	TAP	INO	MAL	PHI
Grain	9.4	–4.8	–0.3	–1.4	–1.4	2.0	–1.0
Other crops	12.9	–3.5	–2.3	–1.6	–1.6	0.0	–2.9
Livestock	12.1	–4.8	–4.1	–4.0	–3.0	–1.2	–1.2
Forestry & Fishing	6.8	–1.8	–0.9	–0.9	–4.6	–3.6	–3.7
Coal	11.2	3.0	–7.5	–	–3.4	–13.5	–10.8
Oil & Gas	7.3	–	–1.6	0.2	–1.7	–2.5	–2.8
Other mining	5.8	–8.9	–8.4	–5.6	–8.4	–8.4	–9.7
Food	6.2	–3.4	–1.4	–0.9	–2.5	–2.1	–2.1
Textiles	0.9	–4.1	–2.0	–2.5	–2.4	–2.0	–3.1
Apparel	0.9	–4.3	–2.6	–2.6	–1.7	–1.4	–2.8
Wood	0.8	–6.2	–2.1	–2.0	–2.7	–1.8	–2.6
Chemicals	–0.4	–7.3	–2.9	–3.5	–2.8	–3.0	–3.1
Metals	0.9	–3.4	–2.0	–3.7	–2.2	–3.5	–4.0
Electronics	–0.4	–3.7	–2.4	–3.1	–2.3	–2.9	–4.7
Vehicles	–0.1	–3.0	–1.0	–0.8	–1.6	–1.6	–1.8
Machinery	0.4	–7.2	–4.5	–5.3	–1.7	–2.2	–3.3
Other manufacturing	–0.2	–2.2	–1.9	–1.3	–1.3	–2.2	–3.0
Utilities	0.3	–2.2	–1.0	0.0	–1.0	–1.6	–2.5
Construction	2.1	0.4	–0.7	–1.2	–1.0	–0.8	–1.2
Trade & Transportation	–1.2	–3.3	–1.6	–1.9	–2.1	–1.8	–2.3
Private services	–2.7	–1.4	–1.2	–1.3	–1.7	–1.8	–2.3
Government	–3.7	–0.6	–0.5	–1.8	–1.4	0.3	0.3

	SIN	THA	VIE	Other SEA	IND	Other SA
Grain	–0.5	0.9	–0.8	–4.3	–2.1	0.3
Other crops	–0.9	–5.5	–2.3	–2.2	–4.0	–0.8
Livestock	–2.0	–1.3	–0.7	–4.8	–2.3	–0.6
Forestry & Fishing	–1.2	–2.4	–5.8	–4.9	–2.8	–3.4
Coal	–	–4.4	–9.3	–8.1	–3.7	–6.4
Oil & Gas	–2.4	–2.9	–2.9	–2.9	–3.1	–4.0
Other mining	–3.7	–6.1	–8.1	–8.0	–7.2	–8.0
Food	–2.3	–0.6	–1.3	–2.1	–1.1	–1.7
Textiles	–2.0	–2.1	–1.9	–1.3	–1.8	–1.9
Apparel	–1.9	–1.7	–0.9	–1.2	–1.5	–1.6
Wood	–1.7	–2.7	–2.1	–3.3	–1.1	–1.5
Chemicals	–1.7	–2.6	–2.8	–3.2	–0.9	–2.3
Metals	–2.4	–1.4	–1.8	–2.8	–2.1	–2.1
Electronics	–2.4	–2.6	–2.0	–1.8	–1.3	–1.9
Vehicles	–1.9	–0.9	–1.7	–1.1	–0.9	–1.3
Machinery	–1.9	–1.6	–2.3	–3.0	–0.9	–1.4
Other manufacturing	–1.5	–1.0	–1.3	–9.2	–1.3	–1.5
Utilities	–2.8	–1.2	–2.7	–2.3	–2.2	–1.8
Construction	–0.8	–0.4	–0.7	–0.9	–0.4	–0.9
Trade & Transportation	–2.4	–1.6	–2.0	–2.4	–2.4	–1.9
Private services	–1.6	–1.7	–2.5	–2.1	–1.9	–1.8
Government	–0.3	–1.2	0.1	–1.1	–0.8	0.5

HKG = Hong Kong, China; KOR = Republic of Korea; TAP = Taipei,China; INO = Indonesia; MAL = Malaysia; PHI = Philippines; SIN = Singapore; THA = Thailand; VIE = Viet Nam; SEA = Southeast Asia; IND = India; SA = South Asia.

Source: Authors' model simulations.

Table 7: Effects of the PRC's Slowdown on Sectoral Imports, 2020
(% changes relative to the baseline level)

	PRC	HKG	KOR	TAP	INO	MAL	PHI
Grain	–12.6	–1.5	–0.9	–1.1	–1.3	–2.1	–1.8
Other crops	–8.9	–1.2	–1.0	–0.7	–0.8	–2.2	–1.1
Livestock	–11.8	–2.5	–1.2	–1.4	–1.2	–2.4	–1.7
Forestry & Fishing	–9.3	–2.1	–1.3	–2.1	–0.7	–1.4	–1.2
Coal	–11.9	–2.7	–1.5	–2.9	–2.2	–2.1	–2.3
Oil & Gas	–6.9	–2.6	–1.8	–3.0	–1.9	–2.6	–2.8
Other mining	–10.0	–2.1	–1.4	–2.1	–0.4	–2.2	–2.3
Food	–8.7	–1.6	–1.0	–1.5	–0.5	–1.6	–1.0
Textiles	–5.5	–1.3	–1.4	–2.3	0.0	–1.4	–0.8
Apparel	–7.4	–0.8	–0.3	–1.4	0.3	–0.9	1.0
Wood	–8.5	–2.2	–1.2	–2.5	–0.5	–1.3	–1.0
Chemicals	–7.1	–2.7	–2.0	–3.1	–0.7	–1.9	–1.8
Metals	–11.0	–1.6	–1.6	–3.1	0.2	–1.7	–1.3
Electronics	–6.6	–2.2	–1.7	–2.9	–0.4	–2.0	–3.0
Vehicles	–11.4	–1.5	–1.1	–1.9	–0.6	–1.4	–0.5
Machinery	–10.7	–1.5	–1.4	–2.1	–0.3	–1.0	–1.0
Other manufacturing	–9.4	–2.6	–1.1	–2.4	–0.4	–1.6	–0.5
Utilities	–9.1	–2.4	–2.4	–4.5	–1.6	–2.0	–1.3
Construction	–14.9	–0.4	–0.2	–0.9	0.4	–1.1	0.5
Trade & Transportation	–8.8	–2.9	–1.9	–3.1	–1.0	–1.9	–2.1
Private services	–7.4	–2.6	–1.7	–3.6	–1.5	–1.8	–2.1
Government	–1.4	–0.3	–0.5	–0.8	0.0	–0.8	–1.2

	SIN	THA	VIE	Other SEA	IND	Other SA
Grain	–0.6	–1.5	–1.6	–0.5	–0.9	–1.3
Other crops	–0.7	–1.1	–1.4	–0.4	–0.6	–1.3
Livestock	–1.0	–1.1	–1.3	–0.2	–0.6	–1.4
Forestry & Fishing	–1.1	–1.2	–1.2	–0.7	–0.3	–0.5
Coal	–2.2	–0.7	–1.4	0.6	0.0	0.0
Oil & Gas	–1.6	–2.0	–2.7	–1.8	–0.4	–1.0
Other mining	–1.7	–0.2	–1.2	–2.6	–0.6	–0.3
Food	–0.9	–0.9	–1.0	–0.8	–0.6	–0.5
Textiles	–1.2	–0.5	–0.9	–1.0	1.1	–0.1
Apparel	–0.7	0.4	–0.5	–0.6	0.9	1.0
Wood	–1.3	–0.9	–1.1	–1.0	–0.3	–0.3
Chemicals	–1.8	–1.6	–1.3	–1.6	–0.7	–0.4
Metals	–1.1	–0.9	–0.9	–0.7	–0.3	–0.1
Electronics	–1.9	–1.8	–1.3	–1.1	–0.1	0.0
Vehicles	–0.7	–0.8	–0.9	–1.1	–0.1	–0.4
Machinery	–1.2	–0.7	–1.1	–1.3	–0.1	–0.2
Other manufacturing	–1.2	–1.2	–1.2	–0.4	–0.6	–0.4
Utilities	–1.7	–1.7	1.1	–0.9	–0.6	–0.7
Construction	0.2	–0.2	0.1	0.3	0.2	0.1
Trade & Transportation	–1.9	–1.5	–1.7	–1.1	–0.6	–0.9
Private services	–1.7	–1.5	–1.3	–1.1	–0.5	–1.0
Government	–1.0	0.1	–1.1	0.2	–0.2	–0.8

HKG = Hong Kong, China; KOR = Republic of Korea; TAP = Taipei,China; INO = Indonesia; MAL = Malaysia; PHI = Philippines; SIN = Singapore; THA = Thailand; VIE = Viet Nam; SEA = Southeast Asia; IND = India; SA = South Asia.

Source: Authors' model simulations.

Table 8: Effects of the PRC's Slowdown on Sectoral Employment, 2020
(% changes relative to the baseline level)

	PRC	HKG	KOR	TAP	INO	MAL	PHI
Grain	–5.3	–1.4	–1.2	–1.5	–1.8	–1.5	–2.1
Other crops	–3.0	–1.5	–1.1	–0.8	–1.6	–2.0	–2.1
Livestock	–6.3	–2.5	–1.4	–1.7	–1.6	–2.2	–1.9
Forestry & Fishing	–5.3	–2.1	–1.4	–1.6	–1.5	–2.2	–2.0
Coal	–7.2	–5.0	–3.9	–4.6	–4.5	–4.5	–6.7
Oil & Gas	–3.5	–3.7	–2.7	–3.0	–2.8	–3.2	–4.8
Other mining	–8.3	–2.6	–3.8	–3.7	–3.8	–5.9	–7.6
Food	–3.9	–2.4	–1.1	–1.3	–1.6	–2.2	–2.5
Textiles	–1.4	–3.5	–2.1	–2.5	–2.3	–2.8	–4.5
Apparel	–2.0	–3.6	–1.5	–2.3	–1.8	–2.2	–3.3
Wood	–4.6	–3.8	–1.5	–2.4	–1.8	–2.3	–3.0
Chemicals	–4.7	–5.7	–2.2	–3.2	–2.0	–3.1	–3.6
Metals	–7.4	–2.6	–1.7	–3.4	–0.9	–3.1	–3.8
Electronics	–2.9	–3.5	–2.1	–3.2	–1.8	–3.2	–6.3
Vehicles	–8.5	–2.4	–1.1	–1.4	–1.6	–1.8	–1.8
Machinery	–6.9	–5.1	–3.2	–4.5	–1.5	–2.2	–3.6
Other manufacturing	–4.7	–2.5	–1.6	–1.8	–1.3	–2.8	–3.2
Utilities	–5.8	–2.8	–1.7	–3.0	–1.5	–2.4	–2.9
Construction	–12.2	–0.3	–0.2	–0.5	–0.2	–1.3	–0.2
Trade & Transportation	–7.0	–3.0	–1.7	–2.8	–1.5	–2.1	–3.4
Private services	–7.1	–2.1	–1.5	–2.9	–2.0	–2.3	–3.5
Government	–2.8	0.0	–0.6	–1.5	–0.6	–0.4	–0.8
Total	**–6.1**	**–2.4**	**–1.3**	**–2.5**	**–1.4**	**–2.0**	**–2.3**

	SIN	THA	VIE	Other SEA	IND	Other SA
Grain	–0.9	–1.1	–1.7	–1.4	–0.7	–1.1
Other crops	–1.3	–2.4	–2.1	–1.7	–0.8	–1.2
Livestock	–2.1	–1.2	–1.6	–1.6	–0.7	–1.2
Forestry & Fishing	–1.5	–1.4	–1.8	–1.7	–0.7	–0.8
Coal	–	–3.5	–5.1	–7.2	–2.4	–5.0
Oil & Gas	–2.6	–3.0	–3.5	–3.8	–2.2	–2.9
Other mining	–3.7	–2.6	–5.5	–8.6	–5.2	–2.0
Food	–1.9	–0.9	–1.4	–1.9	–0.6	–1.0
Textiles	–2.2	–2.2	–2.2	–2.3	–1.1	–1.9
Apparel	–1.8	–1.5	–1.0	–1.7	–1.2	–1.3
Wood	–1.7	–2.0	–2.2	–3.4	–0.6	–1.0
Chemicals	–1.9	–2.3	–2.6	–3.2	–0.7	–1.7
Metals	–2.2	–1.4	–1.8	–2.9	–0.6	–0.9
Electronics	–2.6	–2.8	–2.1	–2.3	–0.8	–0.9
Vehicles	–1.6	–1.0	–1.5	–1.8	–0.4	–0.9
Machinery	–2.1	–1.5	–2.3	–2.7	–0.4	–1.0
Other manufacturing	–1.5	–1.2	–1.6	–5.1	–0.8	–1.1
Utilities	–1.8	–1.6	–2.0	–2.3	–0.7	–1.1
Construction	–0.2	–0.2	0.0	–0.3	–0.1	0.0
Trade & Transportation	–2.3	–1.7	–2.0	–2.2	–0.7	–1.2
Private services	–1.7	–1.9	–2.4	–2.3	–0.9	–1.3
Government	–0.8	–0.4	–0.8	–0.3	–0.5	–0.2
Total	**–1.6**	**–1.3**	**–1.8**	**–1.5**	**–0.6**	**–1.0**

HKG = Hong Kong, China; KOR = Republic of Korea; TAP = Taipei,China; INO = Indonesia; MAL = Malaysia; PHI = Philippines; SIN = Singapore; THA = Thailand; VIE = Viet Nam; SEA = Southeast Asia; IND = India; SA = South Asia.

Source: Authors' model simulations.

Accompanying the changes in output and exports, total employment also declines in the PRC and its Asian neighbors. As shown in Table 8, total employment in the PRC would lose by 6.1% in 2020 compared with the baseline. This is slight smaller than the real GDP loss of 7.2%, as some heavily impacted capital goods sectors are less labor intensive. Losses in total employment in other emerging Asian economies range from 0.6% of the baseline level in India to 2.5% of the baseline level in Taipei,China. The sectoral distribution of job losses relative to the baseline are largely in line with that of output and exports, with largest job losses (in relative terms) taking place in coal and other mining sectors in most emerging Asian economies. In Hong Kong, China; the Republic of Korea; and Taipei,China, the machinery sector would also suffer a large job cut relative to the baseline.

4.3 Impacts on Commodity Markets

Given the enormous importance of the PRC in global commodity markets, it is worthwhile to look at the effects of the PRC's slowdown on commodity demand and prices. Table 9 indicates that the PRC's growth slowdown would lower global grain demand by a modest 1.6% in 2020 relative to the baseline. The PRC's grain consumption would contract by 4.4%, contributing to around 60% of the global demand reduction. The world real price of grain, deflated by the numéraire of the model, would only be marginally affected, falling by 0.6% in 2020 relative to the baseline.

Table 9: Effects of the PRC's Slowdown on Commodity Demand and Prices, 2020
(% changes relative to the baseline level)

	Grain	Coal	Oil & Gas	Other mining
World Price	–0.6	–1.4	–0.9	–1.0
Domestic Demand				
Australia and New Zealand	–1.3	–1.9	–1.8	–2.6
Japan	–0.5	–1.6	–1.7	–1.6
PRC	–4.4	–6.9	–5.8	–8.4
Hong Kong, China	–1.1	–2.7	–2.6	–1.8
Republic of Korea	–0.7	–1.5	–1.8	–1.5
Taipei,China	–0.6	–2.8	–3.0	–2.6
Indonesia	–1.0	–1.2	–1.8	–0.9
Malaysia	–1.7	–2.3	–2.7	–2.3
Philippines	–1.4	–2.5	–2.8	–2.5
Singapore	–0.6	–1.9	–1.6	–1.6
Thailand	–0.8	–1.3	–2.0	–0.9
Viet Nam	–1.2	–1.8	–2.4	–1.7
Other Southeast Asia	–1.1	–2.2	–2.3	–1.7
India	–0.4	–0.6	–0.5	–0.3
Other South Asia	–1.0	–1.0	–1.5	–1.1
Canada	–0.5	–1.0	–1.1	–0.9
United States	–0.5	–0.9	–1.1	–1.0
European Union	–0.6	–1.2	–1.4	–1.0
Latin America	–0.9	–1.7	–1.7	–1.7
Rest of the world	–1.1	–1.6	–1.5	–1.4
The World	**–1.6**	**–3.8**	**–2.0**	**–4.9**

PRC = People's Republic of China.

Source: Authors' model simulations.

The impacts of the PRC's slowdown on energy and metal commodities are more profound. In the face of falling investment and slowing economic growth, the PRC's demand for coal and oil and gas would decline by 6.9% and 5.8% in 2020, respectively. Amplified by the spillover effects to other economies, global demand for these two energy goods would fall by 3.8% and 2.0%, respectively. They would experience price drops of 1.6% and 0.9%, respectively, reflecting a more elastic coal supply in the world. The other mining sector, which contains metal and non-metal minerals, would experience a sharp reduction of 8.4% in demand from the PRC. With the PRC accounting roughly half of the global demand in this sector, this would cause a 4.9% drop in the world demand and a 1.0% fall in its real price.

4.4 The Roles of the United States and India

As Asia's economies generally have large exposures to the US economy, it would be useful to examine the consequences of the interaction between the PRC's slowdown and the changes of growth conditions in the US. Moreover, with the Indian economy likely continuing its rapid growth spurred by economic reforms, a natural question is: will a growth pickup in India be able to offset a slowdown in the PRC? This subsection examines two alternative scenarios to investigate the spillover effects of the US and India for emerging Asia. In addition to a 3 percentage points investment deceleration in the PRC simulated in the first scenario, the two alternative scenarios further assume a GDP growth acceleration in the US by 1 percentage point, and a GDP growth acceleration in India by 2 percentage points, respectively. The major simulation results are reported in Table 10.

In the scenario of a stronger pickup in the US combined with the PRC's slowdown, the results for GDP indicate that the adverse effects of the PRC's slowdown would be partially offset by the stronger growth of the US. The impact on global growth would be negligible, and the growth of developing Asia as a whole (excluding the PRC) would be reduced by only 0.10 percentage points. In comparison with the first scenario, this suggests that around 60% of the adverse growth effect of the PRC's slowdown for developing Asia would be offset by a 1 percentage point growth acceleration in the US.

Looking at individual economies, only Hong Kong, China and Taipei,China would suffer negative growth shocks of above 0.20 percentage points annually under the combined effects of the PRC's slowdown and the pickup of the US economy. The growth deceleration of the Republic of Korea and Southeast Asian economies would range from 0.09 percentage points in Thailand and Viet Nam to 0.17 percentage points in the Philippines. The growth pickup in the US would almost fully offset the negative impact from the PRC for South Asia, whose growth would decelerate by a minimal 0.03 percentage points.

As shown by the differences between Table 4 and Table 10, most economies would enjoy 0.2–0.3 percentage point gains in GDP growth from the US growth pickup. Malaysia, the Philippines, and Taipei,China would benefit most as their GDP growth would increase by 0.26–0.29 percentage point compared with the scenario of a the PRC's slowdown alone. On the contrary, the GDP gains of India and the PRC from the US pickup are only 0.11 percentage points and 0.15 percentage points, respectively.

Table 10: Growth Effects of the PRC's Slowdown plus Changes in the United States and India, 2016–2020

(Percentage point changes in annual growth rates relative to the baseline)

	Scenario 2: The PRC slowdown plus faster US growth	Scenario 3: The PRC slowdown plus faster Indian growth
Australia and New Zealand	–0.27	–0.28
Japan	–0.09	–0.20
PRC	–1.46	–1.55
Developing Asia (excl. the PRC)	–0.10	0.54
Hong Kong, China	–0.22	–0.42
Republic of Korea	–0.12	–0.22
Taipei,China	–0.28	–0.49
Indonesia	–0.16	–0.17
Malaysia	–0.14	–0.27
Philippines	–0.17	–0.40
Singapore	–0.10	–0.21
Thailand	–0.09	–0.20
Viet Nam	–0.09	–0.24
Other Southeast Asia	–0.12	–0.16
India	–0.03	2.00
Other South Asia	–0.04	–0.11
Canada	0.12	–0.13
United States	1.00	–0.13
European Union	–0.04	–0.13
Latin America	–0.05	–0.21
Rest of the world	–0.12	–0.18
The World	–0.03	–0.27
Developing Asia excl. the PRC and India	–0.14	–0.25

PRC = People's Republic of China; US = United States.

Note: Scenario 2 assumes 1 percentage point faster growth in the US and Scenario 3 assumes 3 percentage points faster growth in India.

Source: Authors' model simulations.

In the case where Indian growth accelerates while the PRC's growth slows, global economic growth would fall by 0.27 percentage points on average during 2016–2020. The negative growth impact for developing Asian economies (excluding the PRC and India) would be reduced from 0.33 percentage points for the scenario of only the PRC's slowdown to 0.25 percentage points, suggesting India's growth pickup would provide an offset of one-fourth to them for shielding from the PRC's slowdown. This is largely in line with India's smaller economic size and its relatively weak trade linkages with other emerging Asian economies. For individual economies, the growth spillover from India's 2 percentage points growth acceleration would range from 0.04 percentage points in the PRC, the Republic of Korea, and Taipei,China to 0.15 percentage points in Malaysia and other Southeast Asian economies.

5. CONCLUSIONS

The PRC's emergence as a major economic power brings the regional economies both opportunities and challenges. An immediate risk faced by its Asian neighbors is the potential spillover effects of the economic slowdown in the PRC. However, our model-based analysis suggests that its adverse impacts on regional economies would be relatively modest. Given the economic size of the PRC, the character of its slowdown and the nature of Asia's trade pattern, a growth slowdown of 1.6 percentage points in the PRC would bring about a growth deceleration of 0.26 percentage points in developing Asia as a whole (excluding the PRC). In most regional economies, the induced growth losses are less than 0.5 percentage points. Taipei,China and Hong Kong, China are most vulnerable to the PRC's economic downturn, while South Asia is the most isolated from changes in the PRC.

Furthermore, two counterfactual scenarios, which take into account the changes in growth conditions of the US and India, show that strengthened growth in the US and India would help dampen the negative shock from the PRC's slowdown, but not fully offset it. This suggests the important role of the PRC as the largest regional economy.

Although the simulation results lie in the range of other alternative estimations in literature,[3] several important limitations in this modeling exercise need to be mentioned. First, the modeling analysis captures the trade channel of international business cycle linkage only. It does not include some other transmission channels, such as private capital flows, contagion in regional financial markets, as well as services trade in tourism. Second, as a real CGE model focusing on global trade analysis, the model lacks financial variables and nominal prices changes. This absence limits its ability to incorporate macroeconomic adjustment behaviors and policies that are important to determine the transmission of macroeconomic fluctuations. For instance, the model assumes bilateral real exchange rates are constant throughout the simulations. This may lead to underestimation of the spillover effect of the PRC's slowdown as economies experiencing a negative demand shock often face pressure of real depreciation. Third, the multi-sector model is still highly aggregated, as it has only 20 sectors. It may underestimate the impact of a slowdown of the PRC's investment growth in some special commodity markets. Fourth, as vertical specialization and the fragmentation of productive processes are not explicitly modeled in the CGE framework, the simulation results may overestimate the effect of demand shock originating from the PRC. Therefore, the results reported in this paper should be viewed as indicative rather than forecasts.

[3] Duval et al (2014) estimated a macro panel model and found that a 1 percentage point increase in the PRC's growth would raise GDP growth in the median Asian economy by over 0.3 percentage points after a year, and in the median non-Asian economy by about 0.15 percentage points at the same horizon. Using a global VAR model, Gauvin and Rebillard (2015) found large growth spillover effects of the PRC: the output multiplier of the PRC's growth is estimated to be 0.67 for Hong Kong, China, 0.66 for ASEAN, 0.42 for India, and 0.22 for the Republic of Korea. However, Inoue, Kaya, and Ohshige's VAR exercises showed very small spillover effects from the PRC's growth slowdown. The output multipliers they estimated are 0.12 for Indonesia, 0.095 for Thailand, 0.07 for the Republic of Korea, 0.05 for Singapore and Malaysia, and 0.018 for India. Global DSGE model simulations often come out with small estimates of the spillovers effects, e.g., the simulation by Anderson et al (2015) using the flexible system of global models suggested that a 12% drop in the PRC's GDP would lower GDP of developed economies by around 0.7%.

Two major policy implications emerge from the above analysis. First, most Asian economies have relied on exports as the major source of growth. This has rendered their economies vulnerable to the business cycles of either the developed markets or the PRC. To maintain a stable macroeconomic environment and enhance economic flexibility is important to mitigate the external shocks. However, a switch of development strategy from export-led growth to domestic demand-led growth would be more important for Asian economies to achieve sustainable growth. Over the past 7 years since the global financial crisis, there have been some favorable signs to show the strengthening of domestic consumption in regional economies. Further policy reforms to improve income distribution and domestic financial market would be necessary to implement the structural shift towards domestic demand.

Second, looking forward, the PRC will play an even larger role in the world economy and provide a strong support for the regional demand growth in the longer term. Stronger growth in the PRC's domestic economy, together with increasing links through regional production chains and outward direct investment, would make Asian developing economies more exposed to economic fluctuations in the PRC and lead to higher business cycle synchronization in regional economies. This would call for Asian economies to strengthen coordination of macroeconomic policies.

As noted above, the model is only intended to capture the trade channels through which a slowdown of the PRC would exert short- to medium-term impact on the rest of the world. It is not aimed at modeling the impacts of a more severe crisis in the PRC—in which the financial channel and sentiments may play much larger roles in crisis contagion. Nor does it attempt to take account of countercyclical macroeconomic policies that economies might adopt. However, we believe this is an appropriate approach for addressing the question at hand—the effects of a trend slowdown in PRC growth.

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* The Asian Development Bank refers to China by the name People's Republic of China.