BOJ Reports & Research Papers

December 2016

Slow Trade: Structural and Cyclical Factors in Global Trade Slowdown

International Department, Bank of Japan

Jouchi Nakajima
Kosuke Takatomi
Tomoko Mori
Shinsuke Ohyama

December 2016
International Department, Bank of Japan

Slow Trade: Structural and Cyclical Factors in Global Trade Slowdown*

Jouchi Nakajima†, Kosuke Takatomi‡, Tomoko Mori§, and Shinsuke Ohyama¶

Abstract

Global trade growth has slowed down since the global financial crisis in 2008 and has been below the global GDP growth rate. This sluggish growth of global trade, the so-called "Slow Trade," has been remarkable in emerging economies and for capital, intermediate, and consumer durable goods.

There are three main backgrounds of this global trade slowdown: (1) a decline in the global real GDP growth, (2) a structural decline in the long-run income elasticity of trade due to changes in the global demand structure, expanding in-house production in China, and deceleration in the expansion of global value chains, and (3) short-term negative shocks. Our quantitative analysis indicates that structural factors such as declines in global potential output growth and in the long-run income elasticity of trade explain about 70 percent of the global trade slowdown, and cyclical factors such as remaining negative output gap and temporary negative shocks explain the rest, about 30 percent.

It is unlikely that the part of the slowdown caused by structural factors will be immediately restored, while the negative impact of cyclical factors is expected to gradually become smaller. Our empirical result indicates that the current estimate of the long-run income elasticity of trade is about 1.0, which implies that the growth rate of global trade is expected to recover up to the growth rate of global real GDP. However, there still remain large uncertainties in terms of global trade, such as the economic

* We are grateful for helpful comments from the staff of the Bank of Japan. We also would like to thank Kenji Nishizaki and Hiroki Inaba for their ideas at the initial stage of analysis for this paper, and Charlotte Emlinger (CEPII) for providing data. Any errors or omissions are the responsibility of the authors. The views expressed herein are those of the authors alone and do not necessarily reflect those of the Bank of Japan or the Bank for International Settlements.

† International Department, Bank of Japan (currently at Bank for International Settlements; E-mail: jouchi.nakajima@bis.org)

‡ International Department, Bank of Japan (currently at University of Wisconsin-Madison; E-mail: takatomi@wisc.edu)

§ International Department, Bank of Japan (E-mail: tomoko.mori@boj.or.jp)

¶ International Department, Bank of Japan (E-mail: shinsuke.ooyama@boj.or.jp)

relationship between the United Kingdom and the European Union and the development of rebalancing in emerging countries, and thus the effects of those uncertainties on global trade should be noted.

1. INTRODUCTION

Global trade growth has slowed down since the global financial crisis (GFC) in 2008. The growth rate of global trade, measured by real import volumes, dropped from around 8 percent in the period of 2003−2006 to below 2 percent in the period of 2012−2015, as shown in Figure 1 (left panel).[1] Global trade growth, which was higher than global GDP growth before the GFC, has clearly stayed at a level lower than global GDP growth after the GFC. As a result, the global trade volume has been remarkably below the pre-crisis trend estimated from the relation between global trade and global GDP before the GFC, as shown in Figure 1 (right panel). This sluggish trade growth has been referred to as the "Slow Trade," and its backgrounds and implications have been intensively discussed by academics and international organizations.[2]

Figure 2 shows a long-term history of the global trade volume. Global trade grew more rapidly than global GDP growth from the 1960s to the mid-1970s with the introduction of free trade systems such as the General Agreement on Tariffs and Trade (GATT), which emerged after World War II. From the mid-1970s to the mid-1980s, the increase in transportation costs due to the two oil shocks in 1973 and 1979 and strengthened trade protectionism caused global trade growth to weaken to the level of GDP growth. After the mid-1980s, movements such as China's participation in the free trade system and the end of the Cold War at the Malta Summit in 1989 helped to strengthen economic interactions between the West and the East, and also between advanced and emerging economies. With these backgrounds, the global trade volume again began to expand more rapidly than the GDP growth rate. However, after the GFC in 2008, global trade growth has slowed, which implies that the global trade structure

[1] This paper uses volumes of real imports as a measure of the trade volume. Although conceptually the volumes of global real exports and real imports should be equal, due to differences in methods of aggregation in trade statistics among countries, they do not necessarily match. In this paper, we employ the real import volumes in order to focus on the relation between real imports and domestic demand. As an exception, Figure 2 plots the volume of real exports because of the availability of long-term time series data.

[2] According to Google Trends, the number of web searches for the term "Slow Trade" has been increasing since 2008. CEPR (2015) provides comprehensive surveys and discussions on this issue. Meanwhile, international organizations have increasingly published speeches and research papers on the issue (e.g. Lagarde, 2015).

may have changed.

This paper assesses the backgrounds of the global trade slowdown focusing on both structural and cyclical factors. Section 2 uncovers features of the global trade slowdown by exploring the trade volumes disaggregated by region and category of goods. Section 3 summarizes the backgrounds of the global trade slowdown, following existing discussions by academics and international organizations. In Section 4, we provide a quantitative analysis to decompose the global trade slowdown into structural and cyclical factors with a time series model. Section 5 concludes and discusses implications for the future course of global trade.

2. REGIONAL AND SECTORAL PATTERN OF THE TRADE SLOWDOWN

2.1 Slowdown in regional trade volumes

Figure 3 plots the trade growth for advanced and emerging economies. For advanced economies, the relative trade growth rate to the real GDP growth rate seems to have remained mostly unchanged. For emerging economies, trade growth was higher than GDP growth before the GFC, but then slowed down to a level below GDP growth.

We run a simple regression for the relationship of real import volumes on the real GDP for the pre-crisis period and extrapolate the trade volume to the post-crisis period. Figure 4 shows the estimated pre-crisis trend and the realized trade growth for advanced economies and for emerging economies. The trade volume of advanced economies deviated downward after the GFC, mainly because imports of petroleum-related goods in the United States decreased due to the so-called "shale revolution." Excluding petroleum-related goods in the United States, the volume of real imports has generally followed the pre-crisis trend.[3]

The trade volume of emerging economies has deviated largely downward from the pre-crisis trend since the GFC. This finding indicates that the global trade slowdown is mainly attributable to the sluggish growth of real imports in emerging economies. Existing studies point out that one of the background factors is the decline in trade growth of capital and intermediate goods as a result of the slowdown of the trend of increasing capital investment in Asia in line with the slowdown of expansion of global

[3] Still, real imports excluding petroleum-related goods in the United States have been slightly below the pre-crisis trend since 2011. This deviation is partly attributable to a slowdown in real imports in the Euro area at the time of the European debt crisis in 2011. Another source of the deviation could be a shift in the demand structure from investment to consumption, which is discussed below.

value chains (GVCs). Another factor is the expanding in-house production of capital and intermediate goods mainly in China and other countries.

2.2 Slowdown in goods categories of trade volume

We explore the sectoral pattern of the trade slowdown across countries, disaggregating changes in trade volumes by manufactured goods. Since the classification of categories of goods is not unified among countries, in this paper we create a complete dataset of disaggregated real trade volumes by region and category of goods. We first obtained a dataset of regional and good-specific nominal import volumes from UN Comtrade, which is the United Nations database, and then calculated real import volumes, deflated by the price index for each good.[4]

Figure 5 plots the contributions of real imports of each goods category to the growth rate of the global trade volume. In the top panel, the greater the downward deviation from the 45-degree line exhibited by a goods category, the more it contributes to the slowdown of global trade after the GFC (2012−2014), compared with the pre-crisis period (2004−2006). The bottom panel shows the difference of the contribution of each goods category to the global trade slowdown between the pre- and post-crisis periods. Both panels show that capital goods (except transport equipment), intermediate goods, and consumer goods (durable) exhibit large slowdowns which contribute to the global trade slowdown. In particular, the decline in the contribution of capital goods (except transport equipment) explains about 20 percent of the overall global slowdown.

Figure 6 shows a heat map which decomposes the contribution of each region and each goods category to the deviation of the growth rate of import volumes from the pre-crisis trend. A darker shadow indicates a larger negative contribution to the total deviation. The figure suggests three features. First, real imports of capital goods (except transportation equipment) and intermediate goods are largely downward in a wide range of countries, particularly China and the NIEs-ASEAN countries. This possibly reflects decelerating capital investments mainly in Asia, which has slowed the trade growth of

[4] Specifically, we downloaded nominal import volumes for 1,224 HS-category items by country, and deflated them by the import price index for each HS-category item in the United States. We then converted the HS-category figures to the BEC-category and aggregated to 10 categories of goods in our analysis. In our dataset, transport equipment, such as passenger cars, cannot be distinguished between capital goods and final goods. Therefore, note that it is labeled as "Capital and consumer goods (transport equipment)" in Figures 5 and 6. Also, note that "Fuels" include both primary and processed fuels.

capital goods, and their upstream, intermediate goods; and the expanding in-house production of capital and intermediate goods mainly in China. Second, real imports of consumer goods (durable) have declined in a wide range of countries. This presumably reflects changes in the demand structure mainly in advanced economies, such as the demand shift from consumer durable goods to consumer nondurable goods and services, and an increasing local production ratio. Third, real imports of fuels have declined in advanced countries, probably reflecting the "shale revolution" in the United States and economic sanctions on Iran, that is, the restrictions on imports of petroleum-related products from Iran, imposed by the United States and European countries.

3. BACKGROUND OF THE GLOBAL TRADE SLOWDOWN

This section discusses the background of the trade slowdown for various regions and goods categories observed in the previous section. An idea we follow in our discussion here is the long-run equilibrium relationship of trade and income. As in the literature, we assume the trade volume measured by real imports has a long-run relationship with the real income, which is usually measured by the real GDP.[5] In this case, the global trade slowdown can be attributable to three factors as shown in Figure 7: the slowdown of global GDP growth, a structural decline in the long-run income elasticity of trade, and short-term negative shocks.

Further, the slowdown of global GDP can be decomposed into the slowing potential output growth and the remaining negative output gap after the GFC. The decline in the long-run income elasticity is likely caused by various factors such as secular changes in demand structure, expanding in-house production in China and other emerging countries, deceleration in the expansion of GVCs, and a decline in trade liberalization. The short-term negative shocks are likely associated with temporary changes in the demand structure. We focus on each of these factors in the following subsections.

3.1 Decline in real GDP growth – slowdown of potential output growth and remaining negative output gap

Figure 8 (left panel) shows that the global potential output growth has clearly declined after the GFC. In particular, the potential output growth of emerging economies exhibits a larger drop than advanced economies. This suggests that the declining potential

[5] See, e.g. Constantinescu et al. (2015).

growth rate is one of the factors behind the global trade slowdown. In addition, although the global economy has been gradually growing after the GFC, the global output gap remains negative, as shown in Figure 8 (right panel). This negative output gap is regarded as a temporary downturn of global income, which has decelerated global trade growth (e.g. Hoekman, 2015).

3.2 Decline in income elasticity due to structural changes in global demand structure

Following the idea of the long-run equilibrium relationship, the slowdown of global GDP growth, whether it is caused by structural or cyclical factors, causes global trade growth to slow down. However, the downward deviation of global trade from the pre-crisis GDP trend observed in the previous section implies that factors other than the slowdown of global GDP growth are relevant. The deviation indicates that not only the global real GDP growth rate but also the long-run income elasticity of trade declined. We discuss reasons for this in Sections 3.2−3.5.

The first factor for the decline in long-run income elasticity is a secular change in demand structure mainly in advanced economies. Figure 9 plots the global I/Y ratio, which is the proportion of gross fixed capital formation in the total demand, which clearly dropped after the GFC. In particular, the I/Y ratio has been declining in advanced economies, reflecting the shift in demand structure from investment to consumption. Figure 10 shows that the import-inducing effects of capital investment are higher than those of other demand items such as government and private consumption. This suggests that the decline in the global I/Y ratio is one of the factors that led to the downward deviation of global trade from the pre-crisis trend, as discussed by Bussière et al. (2013), Constantinescu et al. (2015), and IMF (2016a).

3.3 Decline in income elasticity due to expanding in-house production in China

In Figure 9, the I/Y ratio of emerging countries except China has remained roughly flat since 2000, and that in China even exhibits an upward trend. This looks inconsistent with the finding that the real import volume of emerging economies is significantly below its pre-crisis trend. Constantinescu et al. (2015) discuss the expansion of in-house production in China and other countries, which is the second factor of the decline in long-run income elasticity in our discussion.

China and the ASEAN countries, which once used to specialize in the processing

industry for advanced economies, have gradually focused on in-house production for conventionally-imported intermediate goods in line with their improving technological level. In fact, Figure 11 shows that the ratio of imports of intermediate goods to exports has been declining, indicating an expansion of in-house production in those countries. It is likely that this expansion has been contributing to the slowdown of real import growth in emerging economies.

The expansion of in-house production not only puts downward pressure on import volumes of intermediate goods for the processing industry, but also reduces the induced impact of gross fixed capital formation on imports. As mentioned above, China's I/Y ratio is rising. Figure 12 shows the decomposition of gross fixed capital formation in China into induced domestic and imported goods, which is calculated based on the World Input-Output Table. The rise of I/Y ratio mainly caused increasing demand for domestic goods after the GFC. In contrast, the demand for imported goods induced by gross fixed capital formation has declined since the early 2000s. The progress of in-house production is one of the reasons why real imports in China have slowed down, in particular for capital goods (except transport equipment) and intermediate goods, in spite of the recent rise of I/Y ratio.

3.4 Decline in income elasticity due to slowdown of GVC expansion

The third factor for the decline in long-run income elasticity of trade is that the expansion of the GVCs, which emerged from the early 1990s between advanced and emerging economies, has paused after the GFC. Crozet et al. (2015) show that trade volumes of goods of "high GVC participation," i.e., deeply associated with the GVCs, increased more rapidly than those of goods of "low GVC participation" in the pre-crisis period. However, this relatively strong performance of GVC goods has not been observed since 2012.[6] Boz et al. (2015) discuss that the rise of added-value ratio of domestic to foreign traded goods, which was observed mainly in China before the GFC, has paused since the GFC, indicating the slowdown of the GVC expansion.[7]

From a long-term perspective, the GVCs have expanded since the end of the Cold War in 1989. Inward direct investment significantly increased in China following the

[6] Crozet et al. (2015) define that "GVC participation is considered 'high' if both the exporter and the importer exhibit a GVC participation index in this sector above the world median," which includes sectors such as chemicals, metals, and electro-optical equipment. The sector of "low GVC participation" includes sectors such as textiles, clothing, and food.

[7] In the process of GVC expansion, more intermediate goods are traded among countries, which increases the proportion of foreign added value of the traded goods.

establishment of the "socialist market economy" in 1992, and also in Central and Eastern Europe after East European countries acceded to the EU in 2004, as can be seen in Figure 13. These movements promoted the expansion of the GVC. In recent years, however, direct inward investment has been sluggish, which suggests that most of the major manufacturing bases have already been built. In addition, the relative size of intra-regional trade to the global trade volume recently declined compared to the early 2000s, as shown in Figure 14 (left panel).

Another factor behind the recent slowdown of the expansion of GVCs is the declining wage gap between advanced and emerging economies. Figure 14 (right panel) plots average wages of the manufacturing sector in the United States and China. The average wage in China has increased since the late 2000s and the ratio of wages in the United States to wages in China has remarkably decreased.[8] This decline in wage gap reduced the incentive to expand the GVCs between advanced and emerging economies due to increasing production costs.

3.5 Decline in income elasticity due to stagnation of trade liberalization

The last major factor for the decline in income elasticity is a stagnation of trade liberalization (e.g. Boz et al., 2015). In Figure 15, global tariffs exhibited a downward trend after the 1990s, but then started to increase again around 2010. Constantinescu et al. (2015) point out that non-tariff barriers increased around the globe after the GFC, which suggests that the protectionist movement has been growing. Such a stagnation of trade liberalization may be one of the factors behind the decline in long-run income elasticity of global trade.

3.6 Temporary negative shock due to rebalancing

The growth rate of gross fixed capital formation decelerated after the GFC mainly in emerging economies, as shown in Figure 10 (right panel). In addition, Figure 9 (right panel) indicates that the I/Y ratio is below its trend line in recent years in China and other emerging countries. This decline in the I/Y ratio in emerging economies can be attributable to a rebalancing of excess capacity that was built up before the GFC. A realized income elasticity of trade falls temporarily below the long-run elasticity, which

[8] Note that the effect of fluctuations in the yuan's exchange rate against the U.S. dollar limits the rise of US-dollar dominated average wage in China and the decline in the relative wage to the United States.

can be caused by the temporary decline of the I/Y ratio. This cyclical negative shock is considered to be one of the factors behind the global trade slowdown.

4. EMPIRICAL ANALYSIS

Given the previous discussions on the structural and cyclical factors for the global trade slowdown, this section provides an empirical analysis in line with the idea of the long-run equilibrium relationship between global income and trade volumes. To analyze the time series data with this idea, we employ an error correction model with a structural break. Based on the long-run equilibrium equation shown in Figure 7, we assume that a structural break occurs in the long-run relationship at a certain time point around the GFC, the time at which the intercept a_0 and the long-run income elasticity a_1 discretely change. We jointly estimate equations of a standard error correction model including the long-run equilibrium and short-term dynamics with an error correction term. We also assume the structural break on the parameters in the short-term dynamics. The details of the error correction model are described in the Appendix. The analysis uses the data from 1995/Q1 to 2015/Q4. The structural break point is estimated by the maximum-likelihood method, which results in 2008/Q4, coincident with the period when the GFC occurred.

Figure 16 shows the estimated long-run income elasticity a_1, which dropped significantly from about 1.5 to 1.0 after the GFC. This result implies that we face a slower long-run equilibrium growth rate of global trade in the post-crisis period compared to the pre-crisis one. The figure also indicates that the recent trade volume is below the long-run equilibrium. Figure 17 decomposes global trade growth into the long-run equilibrium growth and short-term factors.[9] After the GFC, the long-run equilibrium growth rate markedly declined, and the short-term factors have had negative impacts on global trade growth.

Global trade growth declined from 2003−2006 to 2013−2015. Figure 17 (right panel) indicates that the decline in the long-run income elasticity explains about 40 percent of the trade slowdown; the decline in potential output growth explains about 30 percent, the negative output gap explains about 10 percent, and other short-term shocks explain the remaining 20 percent . This finding implies that the structural factors of the

[9] The contributions of the trade growth rate were computed by taking log differences of both sides of the long-run equilibrium equation in Figure 7. Regarding the term of the income elasticity multiplied by the global GDP, we calculated each contribution with the other components fixed at the value in the previous period, and assigned the cross term proportionally to each contribution. Note that the global GDP is further decomposed to the potential output growth and the output gap.

declines in the long-run income elasticity and potential output growth explain about 70 percent of the global trade slowdown, and the cyclical factors such as negative output gap and temporary decline in the I/Y ratio due to the rebalancing explain the rest, about 30 percent.[10] In sum, the global trade slowdown is relatively more attributable to structural factors, according to our analysis.[11]

5. IMPLICATIONS ON THE OUTLOOK FOR GLOBAL TRADE

In this paper, we explored the backgrounds of the global trade slowdown after the GFC. We assessed the disaggregated trade volume data by region and category of goods and discussed the three main backgrounds: the decline in the global real GDP growth, the decline in long-run income elasticity of trade to the real GDP, and the short-term negative shocks. We then estimated the error correction model with the structural break based on the idea of the long-run equilibrium of trade and income. The estimation result revealed that the structural factors of the declines of the potential output growth and the long-run income elasticity explain about 70 percent of the global trade slowdown, and the cyclical factors such as the negative output gap and the rebalancing from the excess capacity explain the rest, about 30 percent.

If we assume that the changes such as the global demand structure, the expansion of in-house production in China, the deceleration of the GVC expansion, and the stagnation of trade liberalization are irreversible, the long-run income elasticity of trade is unlikely to recover up to the pre-crisis level. In addition, because the global potential output growth has significantly declined, the potential output growth is unlikely to rebound quickly. These conjectures imply that global trade growth is unlikely to recover to the pre-crisis period in the short term.

The cyclical factors behind the global trade slowdown are expected to diminish,

[10] In addition to the error correction model with the structural break, we estimated the one without the break and conducted the likelihood ratio test for these two models. The null hypothesis that the former model is better than the latter is not rejected even at the 10 percent significance level. This result implies that we cannot be statistically sure that the structural break occurred during the sample period. Note that the model without the break yields a higher long-run equilibrium growth after the GFC compared to the model with the break.

[11] In the quantitative analysis by IMF (2016b), a real import function is estimated using the global demand with a change in import inducement coefficient adjusted. It does not assume changes in income elasticity. The empirical result indicates that weak economic activity with sluggish investment explains about 75 percent of the global trade slowdown since 2012. The analysis points out that other factors such as the stagnation of trade liberalization, a recent rise of protectionism, and the slowdown of the GVC expansion contribute to the slowdown, although their impacts are relatively small.

because the negative output gap is likely to decrease with the growing global economy and the rebalancing from excess capacity will presumably proceed. If so, our empirical analysis suggests that global trade growth will recover up to the real GDP growth rate, because the long-run income elasticity is estimated to be about 1.0. However, there remain large uncertainties in terms of global trade, such as the economic relationship between the United Kingdom and the European Union and the development of rebalancing in emerging countries, and thus the effects of those uncertainties on global trade should be noted.

APPENDIX. ERROR CORRECTION MODEL WITH STRUCTURAL BREAK

Let m_t denote the logarithm of global trade volume (real imports) and y_t denote the logarithm of global GDP. A standard error correction model is formed as follows:

(Long-term relationship) $m_t = a_0 + a_1 y_t + e_t$,

(Short-term dynamics) $\Delta m_t = b_0 + b_1 \Delta y_t + b_2 e_{t-1} + u_t$,

where a_1 is the long-run income elasticity; e_t is a deviation from the long-term relationship; b_1 is the income elasticity of short-term dynamics; and b_2 is the speed of error correction, which is assumed to be negative.

To incorporate the structural break, define $D_t \equiv 1\{t < \tau\}$ as a time dummy variable, which takes one before the structural break point $t = \tau$, and zero afterwards. The error correction model with the structural break is formulated as follows:[12]

(Long-term relationship) $m_t = a_0 D_t + \tilde{a}_0(1 - D_t) + a_1 D_t y_t + \tilde{a}_1(1 - D_t) y_t + e_t$,

(Short-term dynamics) $\Delta m_t = b_0 D_t + \tilde{b}_0(1 - D_t) + b_1 D_t \Delta y_t + \tilde{b}_1(1 - D_t)\Delta y_t + b_2 D_t e_{t-1} + \tilde{b}_2(1 - D_t) e_{t-1} + u_t$.

The structural break point τ is estimated as the one where the likelihood of the model is maximized, which results in 2008/Q4. Table A1 reports parameter estimates. The long-term income elasticity a_1 dropped from 1.5 to 1.0. This drop, $a_1 - \tilde{a}_1$, is statistically significant at the one percent significance level.

The estimation result reported above is based on the model with the structural break point fixed. From another viewpoint, the long-run income elasticity may have already declined before the GFC. To address this point and check the robustness of the above result, we estimate the model with the structural break unknown as a parameter.[13]

Figure A1 plots the estimation of the break point τ, namely, the probability that the structural break occurs in each quarter. It shows that the structural break may have occurred at some points after 2003, though its probability is relatively small. The probability of τ increases approaching the GFC and the period which maximizes the probability is 2008/Q4, as in the previous result. Figure A2 plots an estimated long-run

[12] We add a dummy of the GFC to avoid an irregular influence of the shock in the quarter of the collapse of Lehman Brothers.

[13] Specifically, we assume a prior that τ is uniformly distributed over the sample period and implement the Markov chain Monte Carlo (MCMC) method to estimate the model. Figure A1 plots the posterior distribution of τ. The model assumes only one structural break point during the sample period and excludes the case of no structural break or multiple break points.

income elasticity with uncertainty in the break point, which shows a gradual decline in the elasticity after 2003. The levels of the long-run income elasticity before and after the break are still consistent with the previous result.

References

Boz, E., M. Bussière, and C. Marsilli (2015), "Recent slowdown in global trade: Cyclical or structural?" *The Global Trade Slowdown: A New Normal?* VoxEU.org eBook, pp. 50−77.

Bussière, M., G. Callegari, F. Ghironi, G. Sestieri, and N. Yamano (2013), "Estimating trade elasticities: Demand composition and the trade collapse of 2008−09," *American Economic Journal: Macroeconomics*, vol. 5, pp. 118−151.

CEPR (2015), *The Global Trade Slowdown: A New Normal?* VoxEU.org eBook.

Constantinescu, C., A. Mattoo, and M. Ruta (2015), "The global trade slowdown: Cyclical or structural?" IMF Working Paper, No. 15/6.

Crozet, M., C. Emlinger, and S. Jean (2015), "On the gravity of world trade's slowdown," *The Global Trade Slowdown: A New Normal?* VoxEU.org eBook, pp. 179−196.

Escaith, H., N. Lindenberg, and S. Miroudot (2010), "International supply chains and trade elasticity in times of global crisis," World Trade Organization Staff Working Paper, No. ERSD-2010-08.

Hoekman, B. (2015), "Trade and Growth – end of an era?" *The Global Trade Slowdown: A New Normal?* VoxEU.org eBook, pp. 3−19.

IMF (2016a), *World Economic Outlook, April 2016*.

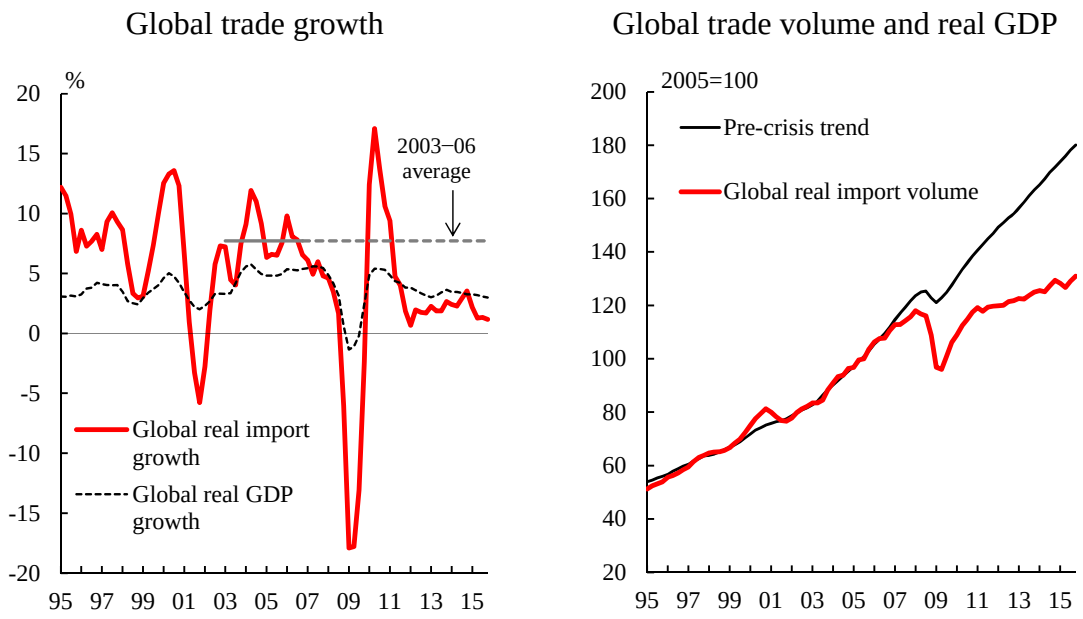
IMF (2016b), *World Economic Outlook, October 2016, Chapter 2:* "Global Trade: What's behind the Slowdown?"

Kalra, S. (2016), "6½ Decades of Global Trade and Income : "New Normal" or "Back to Normal" after GTC and GFC?" IMF Working Paper, No. 16/139.

Kurachi, Y, M. Ando, and K. Shoji (2015), "Changes in the environment surrounding Japan's exports: An approach focusing on global trade volume and export share," *Bank of Japan Review*, No. 2015-E-5.

Lagarde, C. (2015), "Reinvigorate trade to boost global economic growth," Address at the U.S. Ex-Im Bank Conference, Washington, DC, (April 23, 2015).

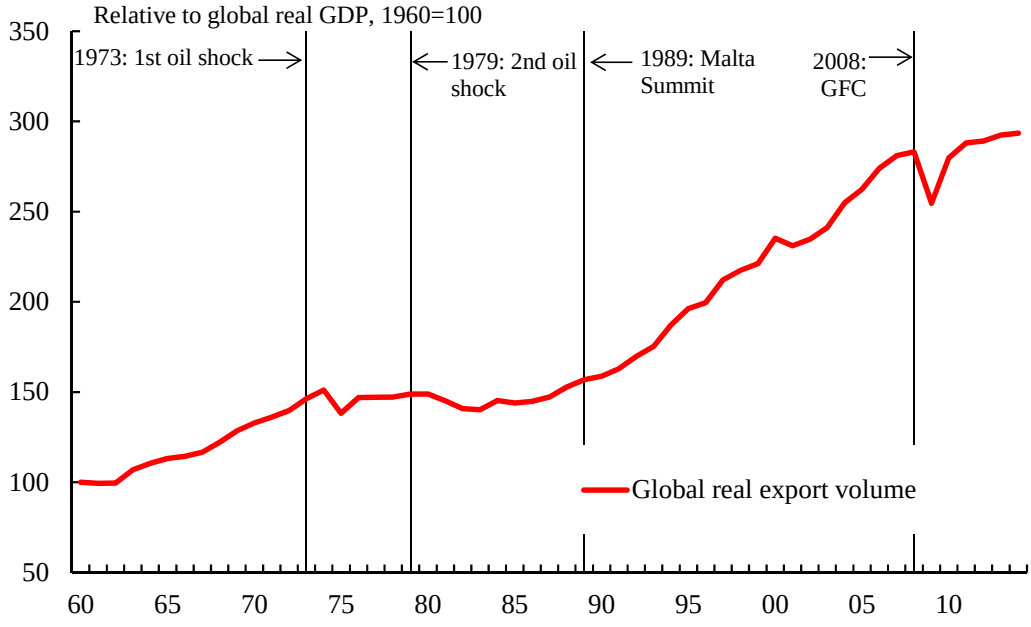
Figure 1. Global trade growth and GDP growth



Note: The left panel shows year-on-year rate of change. "Pre-crisis trend" in the right panel is the estimate of the global real import volume based on the regression of the real import volume on global GDP for the period of 1995−2007. The figures since 2008 are obtained by extrapolation.

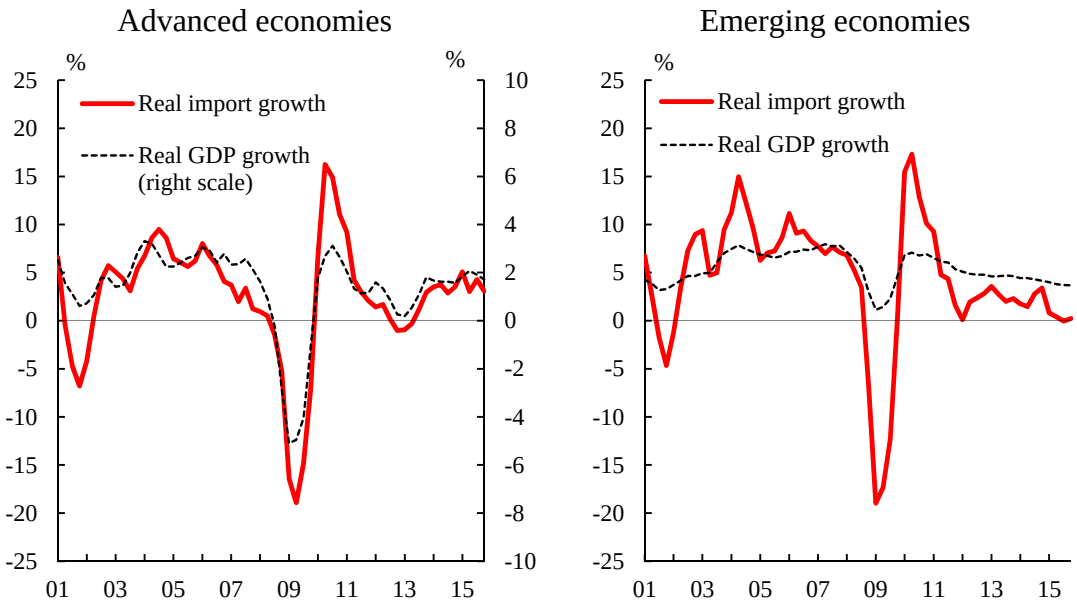
Sources: CPB, IMF, National Statistics, HAVER, Thomson Reuters Datastream, and CEIC.

Figure 2. Global trade volume



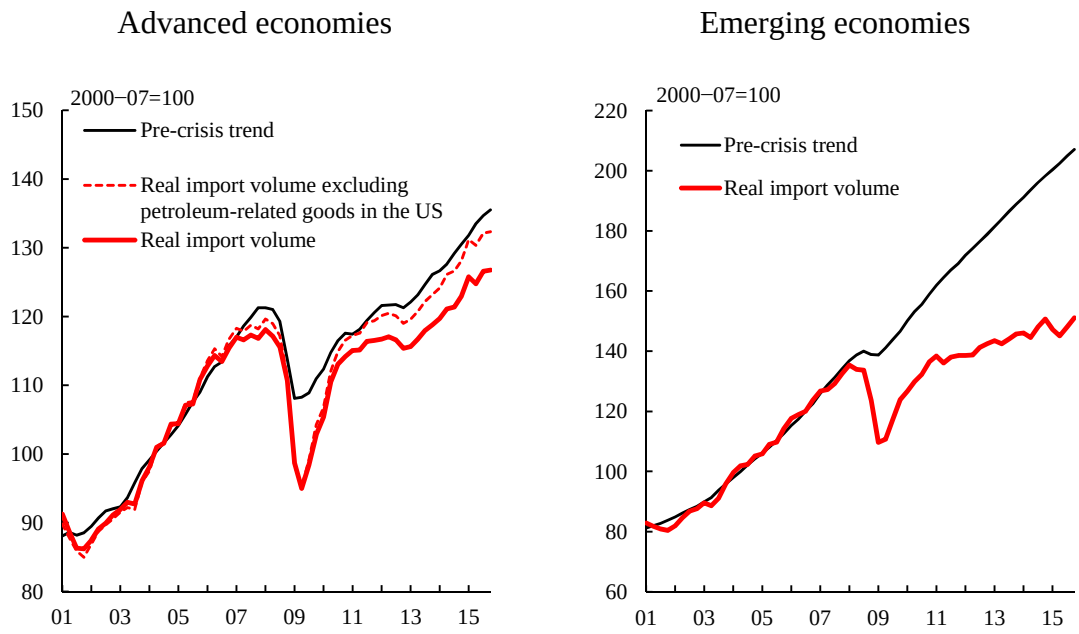
Source: WTO.

Figure 3. Trade growth in advanced and emerging economies



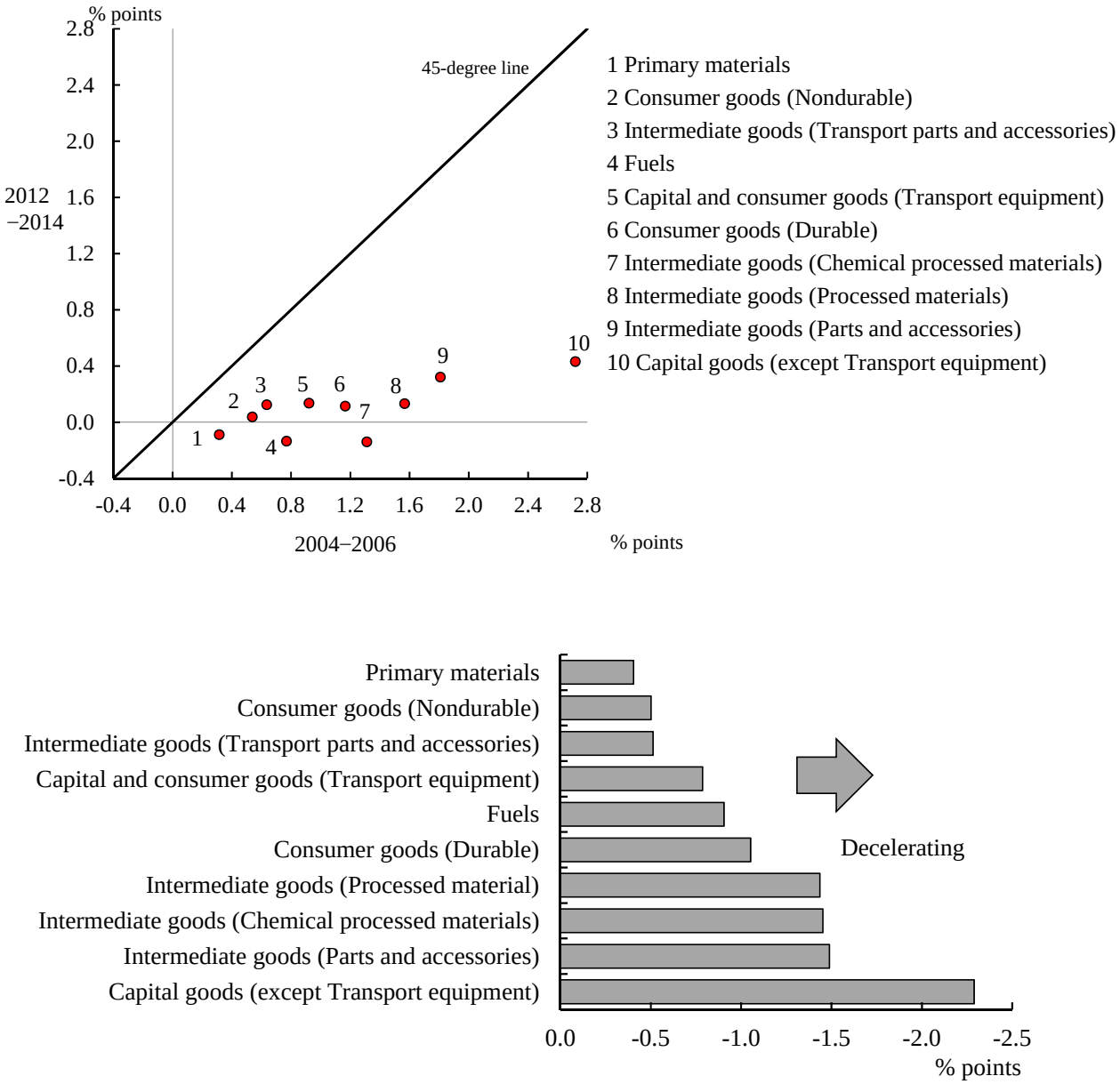
Note: The figures show year-on-year rate of change.
Sources: CPB, HAVER, and CEIC.

Figure 4. Trade volume and GDP in advanced and emerging economies



Note: The pre-crisis trend for advanced economies is computed from the regression of the real import volumes excluding petroleum-related goods in the United States.
Sources: CPB, HAVER, and CEIC.

Figure 5. Changes in real import growth for categories of goods



Note: The top panel shows the contributions of each category of goods to the global real import growth. The horizontal axis shows the growth rate during 2004−2006 and the vertical axis shows that during 2012−2014. The bottom panel shows differences of the contributions in 2012−2014 from those in 2004−2006.

Sources: UN Comtrade and HAVER.

Figure 6. Deviation from the pre-crisis trend

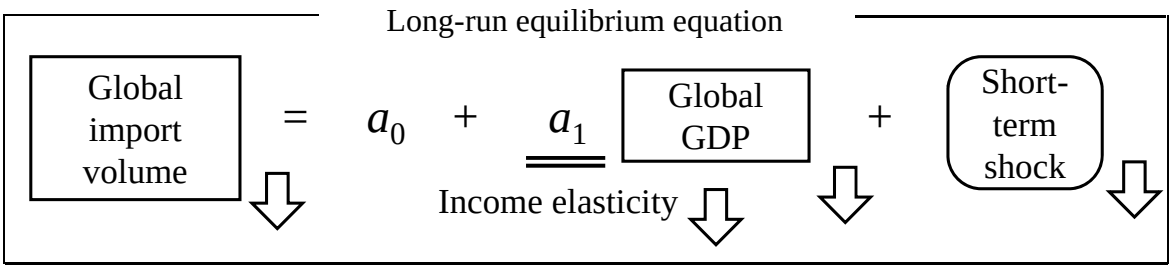
% points

	US	Euro area	UK	Japan	China	NIEs ASEAN	Latin America	Total
Fuels	-0.10	-0.10	-0.06	0.02	0.02	0.02	0.01	-0.2
Primary materials	0.00	-0.03	0.00	-0.02	-0.12	-0.02	-0.01	-0.3
Intermediate goods (Processed materials)	-0.01	-0.06	0.00	-0.03	0.04	-0.03	-0.01	-0.7
Intermediate goods (Chemical processed materials)	-0.05	-0.06	-0.02	-0.03	-0.07	-0.07	-0.02	-0.9
Intermediate goods (Parts and accessories)	-0.03	-0.07	-0.01	-0.01	-0.22	-0.27	-0.01	-0.9
Intermediate goods (Transport parts and accessories)	0.02	0.02	0.00	0.00	-0.02	-0.04	-0.01	-0.2
Capital goods (except Transport equipment)	-0.14	0.08	-0.07	-0.04	-0.18	-0.20	-0.07	-1.7
Capital and consumer goods (Transport equipment)	0.08	-0.04	0.04	0.01	0.02	-0.03	-0.06	-0.3
Consumer goods (Durable)	-0.08	0.02	-0.04	-0.04	-0.02	-0.05	-0.01	-0.6
Consumer goods (Nondurable)	0.01	0.00	-0.01	-0.02	0.01	-0.01	0.00	-0.2
Total	-0.2	-0.3	-0.2	-0.2	-0.5	-0.7	-0.2	-6.1

Note: Based on the elasticity of real import volume to GDP during the period of 2003−2006 for each region, we extrapolate the pre-crisis trend for the period of 2012−2014. The figures show the contributions of the deviation of the realized import growth from the pre-crisis trend. A darker shadow indicates a lager negative contribution to the total deviation

Sources: UN Comtrade and HAVER.

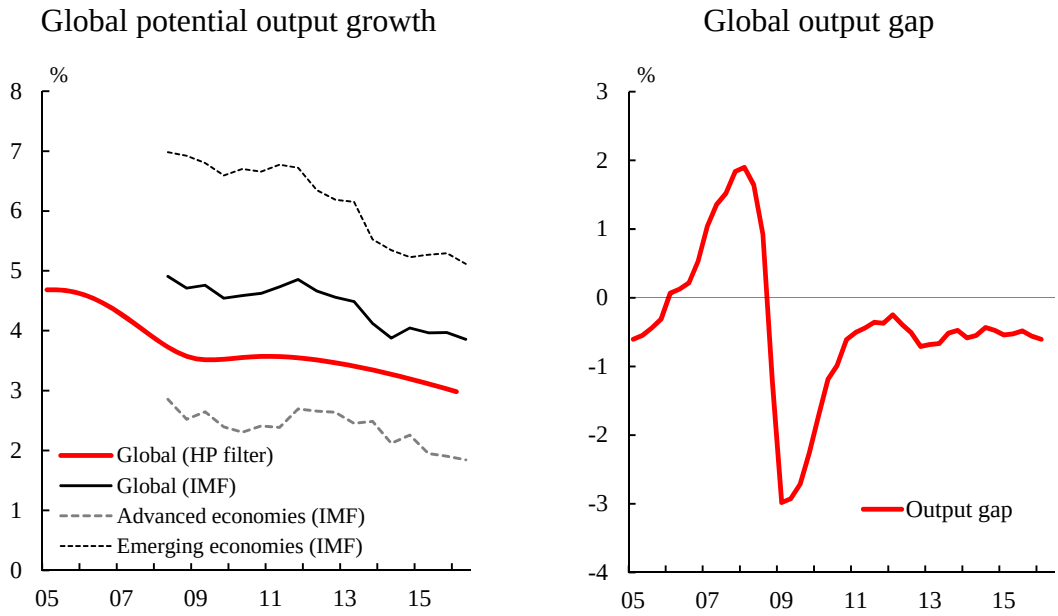
Figure 7. Background of global trade slowdown



Summary of background

	Structural factors	Cyclical factors
Slowdown of GDP	Decelerating potential output growth rate	Negative output gap
Decline in income elasticity of trade	1) Secular change in demand structure 2) Expansion of in-house production in emerging economies (especially China) 3) Deceleration in GVC expansion 4) Stagnation of trade liberalization	—
Short-term negative shocks	—	Temporary change in demand structure

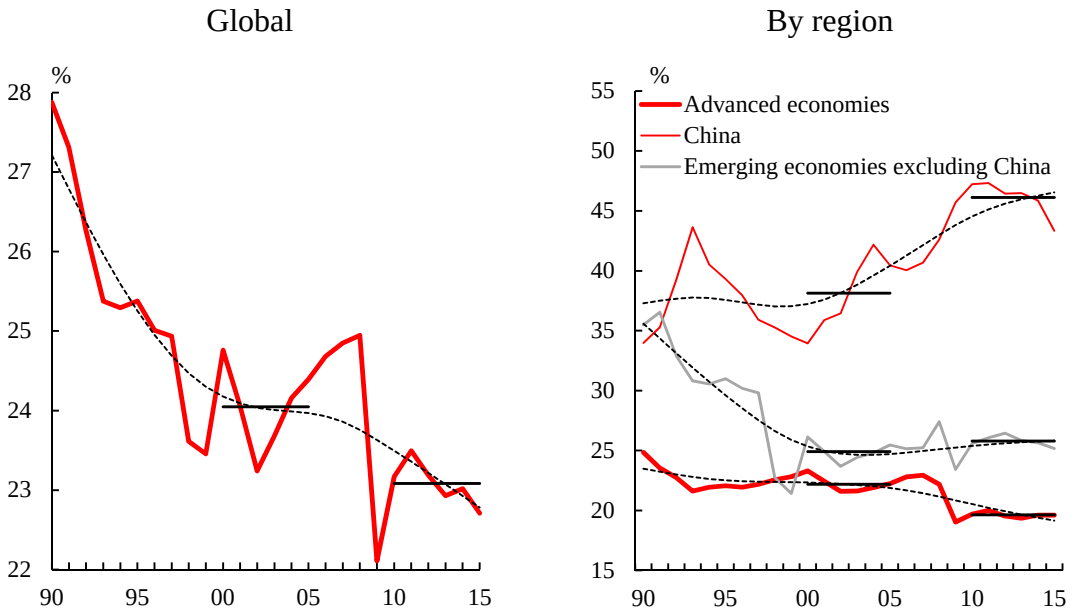
Figure 8. Global potential output growth and output gap



Note: The left panel shows year-on-year rate of change. The HP filter is based on $\lambda = 1{,}600$. The potential output growth from the IMF refers to the five-year-ahead forecast of real GDP in the IMF WEO. The global output gap is estimated using the global potential output growth based on the HP filter.

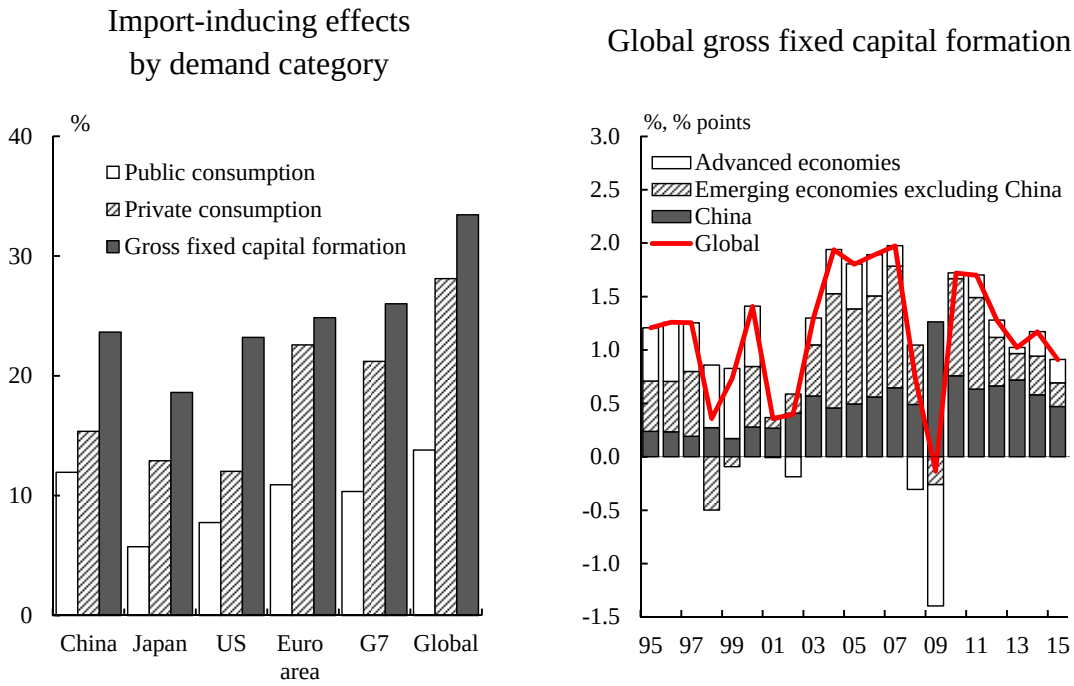
Sources: IMF, National Statistics, HAVER, Thomson Reuters Datastream, and CEIC.

Figure 9. Global I/Y ratio



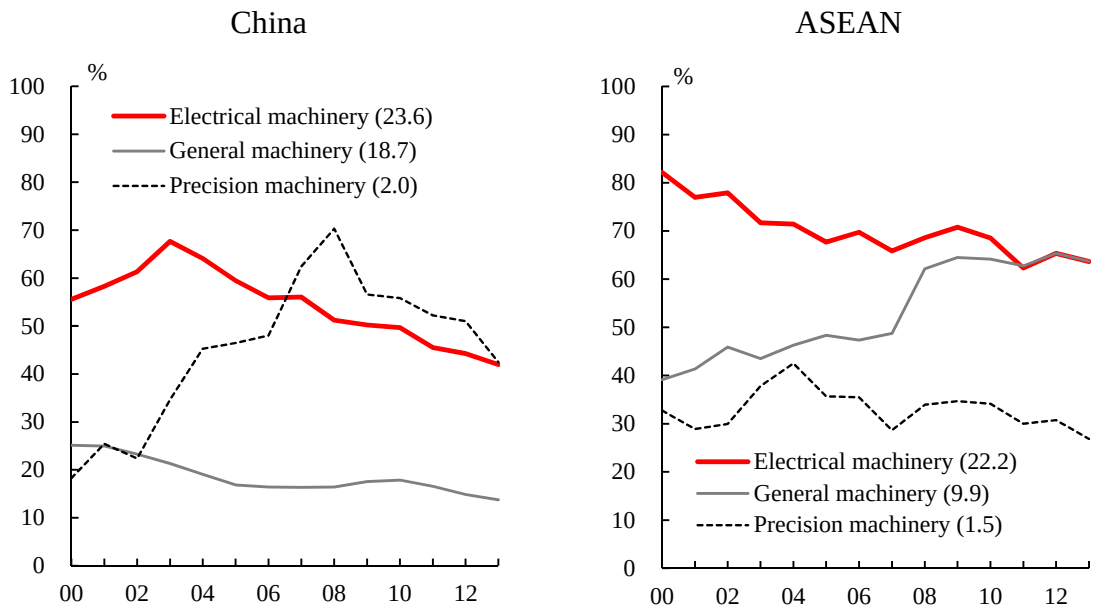
Note: The global and regional I/Y ratios are the weighted average of each country's I/Y ratio, where weights are import volumes in 2005. The dotted line refers to the HP-filter trend with $\lambda = 100$. The solid, horizontal lines refer to the average during 2000−2005 and 2010−2015.
Sources: IMF, UN Comtrade, and HAVER.

Figure 10. Import-inducing effects and global gross fixed capital formation



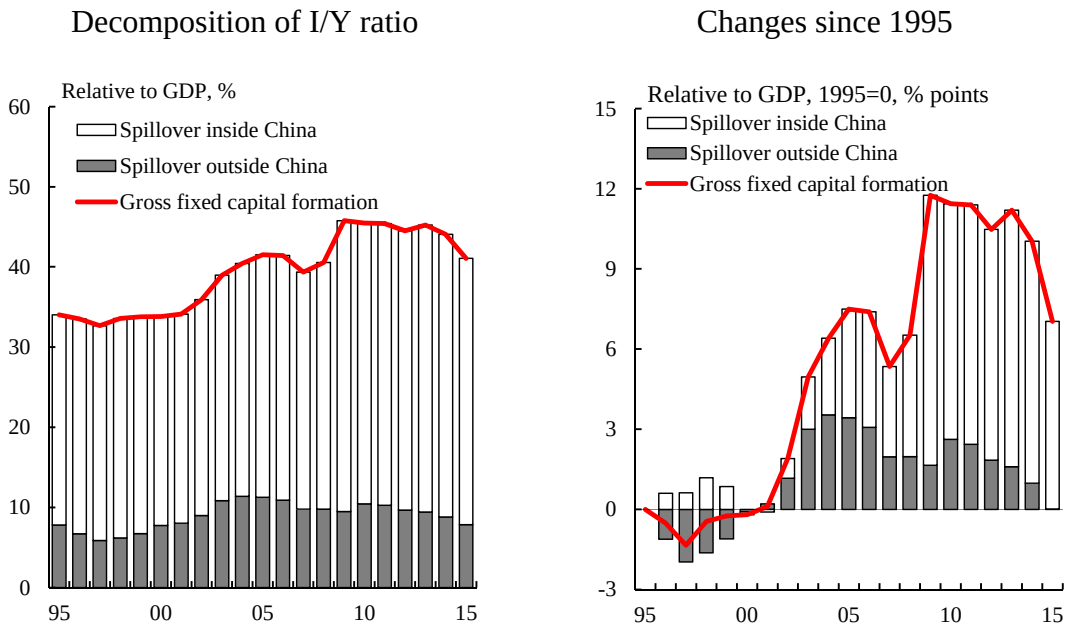
Note: The left panel shows the proportion of added-value spillover to foreign countries with a unit increase in each final demand category in 2011. The right panel includes the author's estimate.
Sources: HAVER, WDI, UN, IMF, and WIOD.

Figure 11. Relative ratio of imported intermediate goods to exported goods



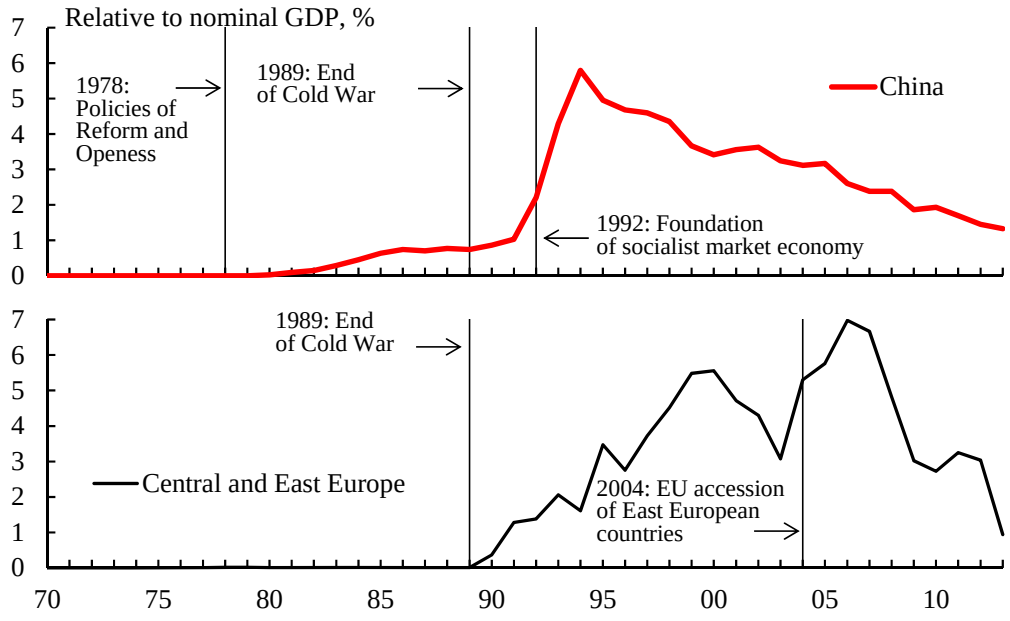
Note: The proportion to the total export volume in 2013 is in parentheses.
Sources: CEIC and RIETI-TID.

Figure 12. I/Y ratio in China



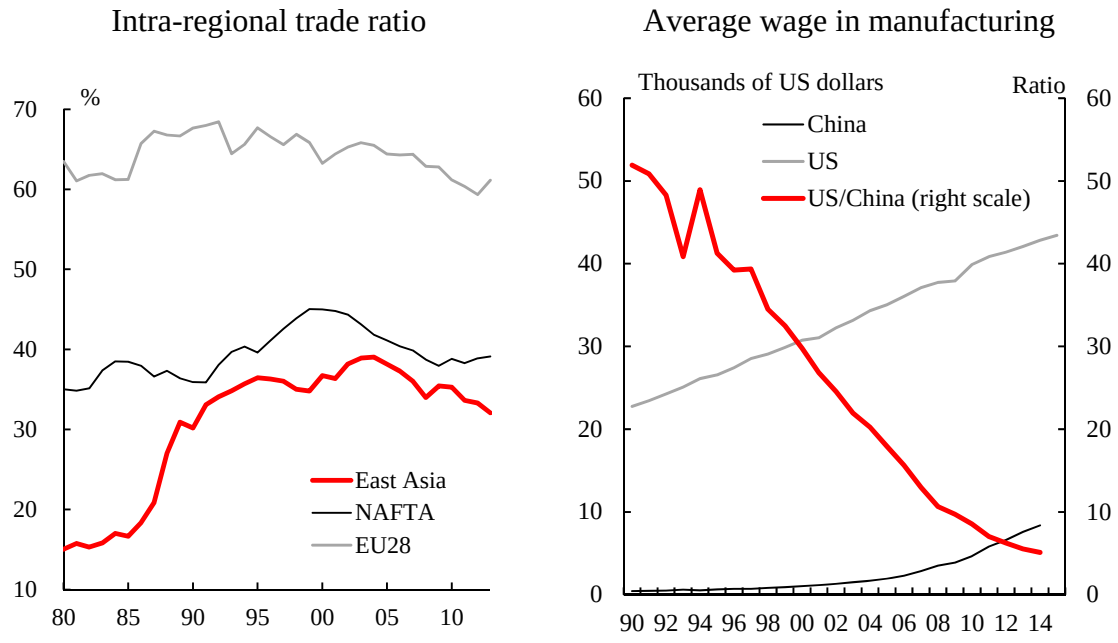
Note: The components show the total amount of prices which affects inside and outside China through intermediate trading out of the expenditure of gross fixed capital formation, estimated from the international industry input-output tables. The figures after 2012 are estimated using a trend of domestic-foreign spillover ratio of gross fixed capital formation in the period of 2005−2011.
Sources: WIOD, National Bureau of Statistics of China, and HAVER.

Figure 13. Inward direct investment in emerging countries



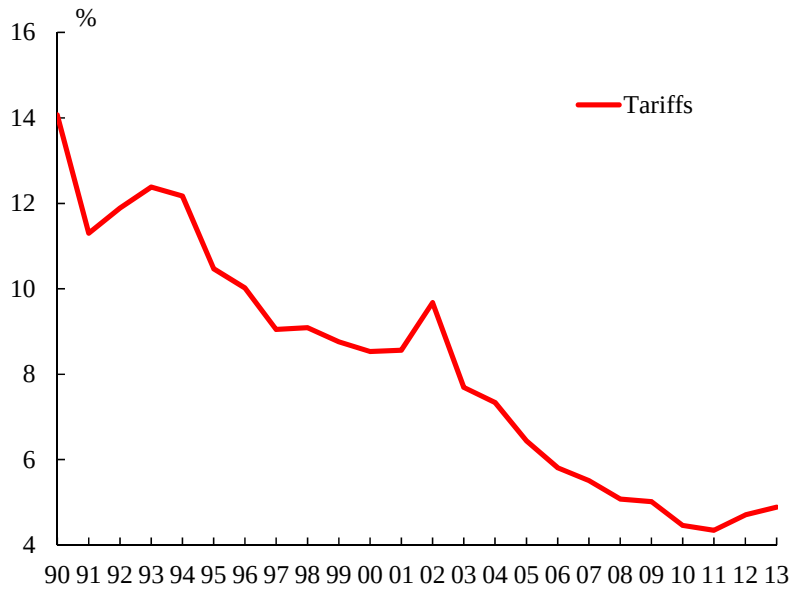
Source: UNCTAD.

Figure 14. Intra-regional trade ratio and wage gap



Note: The figure for the United States in the right panel is the average wage for nonsupervisory employees.
Sources: RIETI-TID and HAVER.

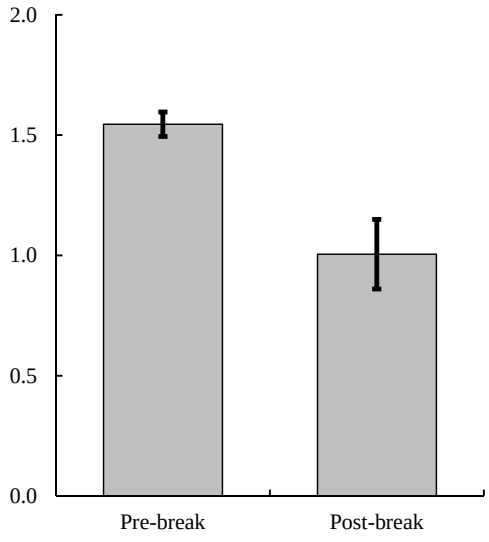
Figure 15. Global tariffs



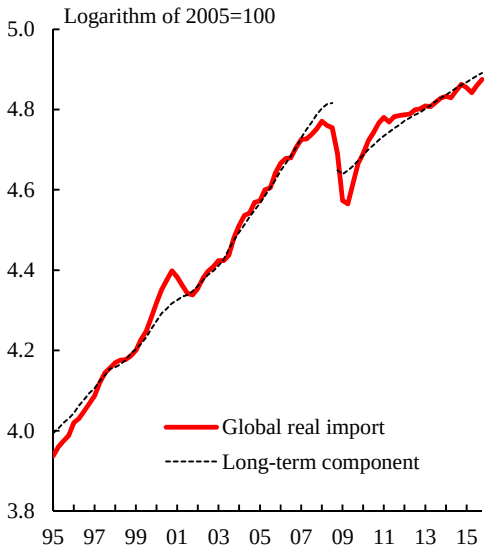
Source: WITS.

Figure 16. Long-run income elasticity of global trade volume and long-run equilibrium

Long-run income elasticity (a_1)

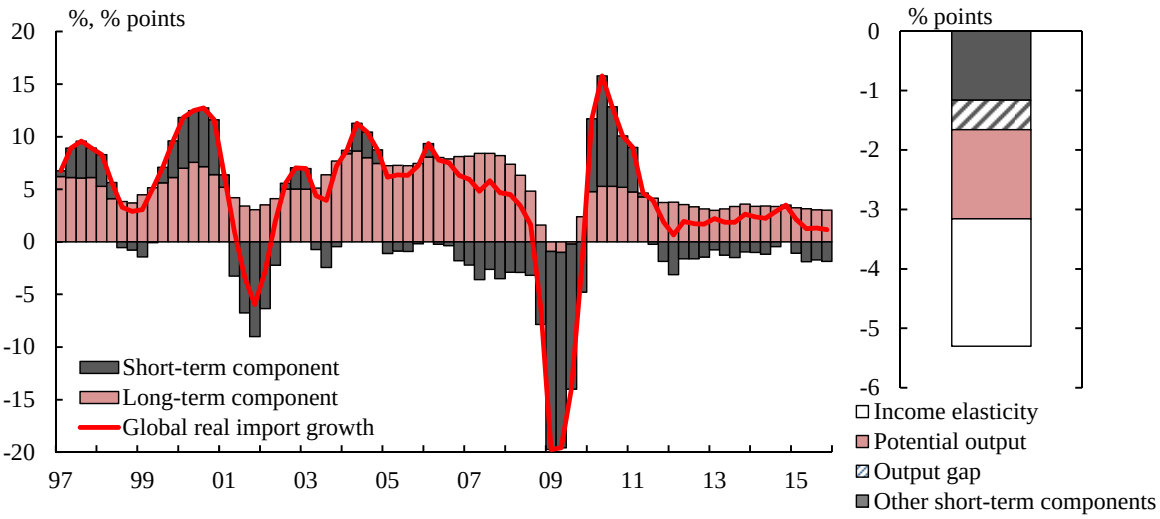


Global trade volume and long-run equilibrium



Note: Estimation period is from 1995/Q1 to 2015/Q4. The structural break point is 2008/Q4. The vertical band in the left panel refers to the 95 percent credible intervals.
Sources: CPB, IMF, National Statistics, HAVER, Thomson Reuters Datastream, and CEIC.

Figure 17. Long-term and short-term factors affecting global real import growth



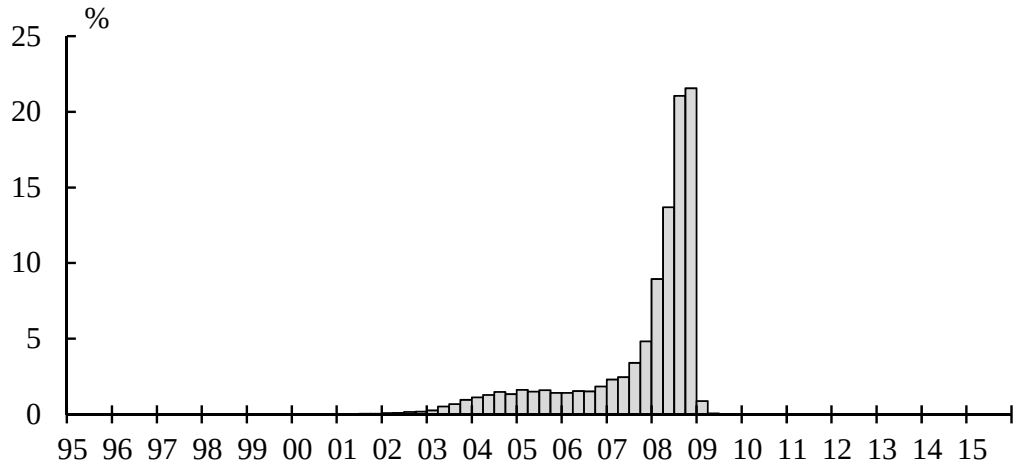
Note: The left panel shows year-on-year changes. The right panel shows contributions to the decline in global trade growth from 2003−2006 to 2013−2015.
Sources: CPB, IMF, National Statistics, HAVER, Thomson Reuters Datastream, and CEIC.

Table A1. Parameter estimates of the error correction model with structural break

	With structural break		Without structural break
	Pre-break	Post-break	
a_0	-2.13 (0.11)	0.14 (0.34)	-0.55 (0.14)
a_1	1.54 (0.03)	1.00 (0.07)	1.17 (0.03)
b_0	-0.01 (0.01)	-0.03 (0.01)	-0.02 (0.00)
b_1	2.25 (0.49)	4.13 (0.51)	3.20 (0.34)
b_2	-0.08 (0.06)	-0.20 (0.08)	-0.07 (0.02)

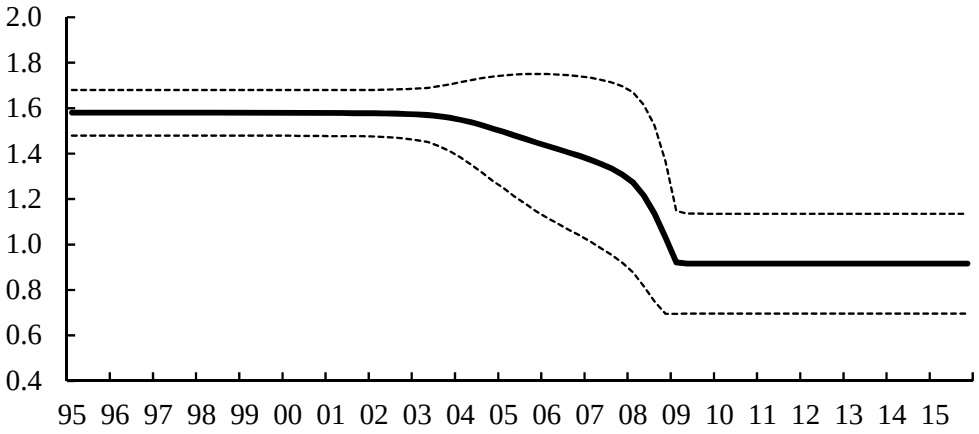
Note: Estimation period is from 1995/Q1 to 2015/Q4. The structural break point is 2008/Q4. Standard errors are in parentheses.

Figure A1. Estimated structural break point



Note: The figure shows the probability that the structural break occurs in each quarter.

Figure A2. Estimated long-run income elasticity with uncertainty in the structural break point



Note: Dotted lines show the one-standard-deviation bands.