Understanding the Role of China's Domestic Market in the (Unequal) Growth of World Economy*

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Abstract

This study investigates the role of China's domestic market expansion in the growth of world economy over the period of 2009–2011. Despite the worldwide economic collapse, China maintained high domestic final expenditure growth rates at 11.9% on average during the period. This strong growth was mainly driven by the demand for durable goods of which productions are widely fragmented across Asian countries. In the meantime, China's integration into the global economy had strengthened to an extent that more imported intermediate goods were embedded in goods for domestic sales. These two forces combine to magnify the impact of Chinese domestic market expansion on foreign economies, but disproportionately more on its neighboring countries and sectors related to durable good productions. Specifically, our estimates find that the expenditure growth in China over the 2009–2011 period had increased the annual GDP growths in Taiwan, Malaysia, and Korea by about 1%p, whereas the NAFTA and EU member countries had typically benefited by less than 0.1%p.

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1 Introduction

China's rapid growth for the last few decades and its impact on the world economy have been an interesting topic to academic researchers as well as policymakers. Since the implementation of its open-door policy in 1979, China had maintained an average GDP growth rate of more than 10% over the following years until 2011.[1] Moreover, this sustained high rate of growth was accompanied by the proliferating interconnections among countries through the fragmentation of production called global value chains (GVCs). Given these two facts, China is expected to have a substantial influence on the rest of the world, particularly in recent years.

A burgeoning literature in international and development economics has indeed investigated China's global impact. Arguably, the most popular approach in the literature is to view China as a "world factory" which reflects its massive production tightly linked to international trade and foreign direct investment. From this viewpoint, the main interest has been to assess the effect of market competition from China. Autor et al. (2013), for example, finds that the import surge from China can explain one quarter of the total decline in the U.S. manufacturing employment over the period 1990–2007. Bloom et al. (2016) investigate firm's strategic responses in 12 European countries to the massive imports from China and find that the import competing firms tend to innovate more to survive. Hanson (2010) provides some evidence that the global market competition from China is a crucial external factor that explains why Mexico is not rich despite all efforts. Similar studies have been conducted for many different countries/regions in the spirit of viewing China as a giant producer and competitor.[2]

This paper takes a different approach: we view China as a "world market" and examine its growing influence as a global consumer. Specifically, we quantitatively evaluate the role of Chinese domestic market in the growth of world economy from 2009 to 2011, the period of global financial crisis and subsequent recovery. This period is particularly appropriate to highlight the role of Chinese market, because China undertook a radical stimulus package at the end of 2008 to counter the negative global demand shock by boosting domestic demand. As a result, it maintained high market growth rates at 11.9% on average for the three years and became the second largest market since 2010. Clearly, it still has great potential for further expansion considering its endowment and recent performance. Given this increasing importance, however, few studies have investigated China from the world market view.[3]

To assess the question, we employ the input-output framework proposed by Bems et al. (2010, 2011), which originally is used to explain the great trade collapse during the global financial crisis in 2008 and 2009. The core underlying mechanism through which the world

[1] The annual growth rates are calculated in previous year's prices. Source: the CEIC China Premium.

[2] Related studies include Iacovone et al. (2013) and Utar and Ruiz (2013) for Mexico, Mion and Zhu (2013) for Belgium, Utar (2014) for Norway, Eichengreen et al. (2007) for Asian countries, Hanson and Robertson (2010) for developing countries. Also, see Acemoglu et al. (2016) and Pierce and Schott (2016) for the import competition from China on the US labor markets and Bernard et al. (2006) on goods market in the US.

[3] One notable study from the same viewpoint as ours is Costa et al. (2016) who examine the distributional effect of the increasing agricultural and mining product exports to China on Brazilian labor market.

trade can collapse in this framework is the strong vertical production linkages across countries, particularly for durable goods, which amplifies a final demand shock (hereafter, demand and expenditure mean final demand and final expenditure, respectively, unless specified otherwise). Since the demand for durables had reduced significantly during the crisis and this negative shock was transmitted through all production stages along the global supply chains, the trade among those chains plummeted sequentially.[4] Although the degree of effect can be different from that on trade, the transmission mechanism works for production and value-added exactly the same way. Thus, we apply the input-output framework to the change in China's domestic demand.

Armed with the analytical framework, we then examine two structural changes in Chinese economy over the period 1995–2011 that are key to understanding the role of its domestic market for the rest of the world. The first change is the unequal growth in Chinese final expenditure. By classifying the aggregate expenditure into four product groups (i.e., non-durables, durables, utilities & construction, and services), we show that the rapid expansion of Chinese domestic market over the sample period is largely attributed to the demand for durables. In particular, the growth of durable expenditure remained high even in the global crash of 2008–2009 when most countries suffered from considerably negative demand shocks for durables. The second change lies in the structure of Chinese imports. Whilst the share of final goods in the total imports declined from 31.6% in 1995 to 22.5% in 2010, we observe that all Chinese sectors for domestic sales used more imported intermediate inputs in the later years through the integration into the global economy.[5] These two structural changes reinforce each other to magnify the impact of Chinese domestic market on other countries. However, the size of impact is contingent on the degree of production integration with China: countries that are geographically proximate and have formed tighter input-output relationship with China–notably through durables–would tend to be highly affected by the uneven expenditure growths in China.

All our estimates consistently confirm the arguments described above. Using the Inter-Country Input-Output Tables from the OECD, we first calculate the elasticity of GDP with respect to final expenditure to show that a unit increase in Chinese domestic demand, regardless of product group, induces unilaterally higher GDP growths across all countries in 2010 than in 1995. However, the size of the impact on GDP varies substantially by each product group: the impact of durable demands has been much greater than others. These heterogeneous unit effects are combined with the unevenly high demand growth of durables to induce GDP growth in foreign countries, but disproportionately more in its neighboring countries and sectors related to durable productions. Specifically, the induced annual GDP growth rates are close to

[4]This explanation is also supported by Eaton et al. (2016) who explore the sources of the great trade collapse with a general equilibrium model framework. See Bems et al. (2013) for a comprehensive review on the related literature about the great trade collapse.

[5]The relative decline in the final good imports attenuates the first-order effect of Chinese demand on other economies, but the higher usage of imported input for domestic sales amplifies the second-order effect.

1%p in Taiwan, Malaysia, and Korea over the period 2009–2011, whereas the NAFTA and EU member countries have typically shown growth rates of less than 0.1%p. Moreover, the sustained market expansion in China absorbed significant portion of negative growth shocks in many countries (even outside Asia) in 2009 and helped their recoveries in subsequent years.

As mentioned earlier, this paper relates and contributes to the literature on China's global impact. A recent review article by Qiu and Zhan (2016) nicely classifies the relevant studies on this topic by the group of affected countries and type of markets. Notably, they summarize that China's "(i) rapid growth and development of the domestic economy, and (ii) gradual integration of the domestic economy into the global economy (p. 45)" are the fundamental sources of its significant and extensive influence on the world economy. We also deal with these two factors, but our main contribution is to examine China's demand (or expenditure) through which the two factors can have an influence on other countries rather than its supply (or production) on which prior studies focus.

Second, although one may easily expect that Chinese market would have a nontrivial influence on the rest of the economies, assessing the quantitative importance of Chinese market is still desirable. Indeed, there are claims by policymakers or media that China played as a significant bumper against the negative shocks during the 2008–2009 crisis to its major trading partners, but they lack empirical supporting evidences.[6] This paper is the first to provide a formal evidence for the claims and further demonstrates that China also served as a leading contributor to the post-crisis recovery of the world economy.

Third, our estimates for the implied GDP growth rates in each sample country provide clearer interpretation and policy implications than a model-driven measure of welfare. There are some studies that assess China's global impact on the worldwide welfare using multi-country, multi-sector general equilibrium models. Both di Giovanni et al. (2014) and Hsieh and Ossa (2016), for example, develop their own models to assess how China's productivity growth would increase the real income for the rest of the economies. Despite several advantages in their general equilibrium features, however, their model-driven measures of welfare do not provide completely accurate interpretation in the sense that they cannot be observed in the real world. We instead estimate directly the annual GDP growth rate, the most common measure for national welfare.

The rest of the paper is organized as follows. Section 2 introduces our analytical model to understand the role of Chinese domestic market and necessary data to implement the model empirically. Section 3 highlights the two aspects of structural change in China, i.e., the compositional changes in final expenditure and in imports. Our estimation results are reported and discussed in section 4 with some practical implications for the concerns about China's growth slowdown. Section 5 concludes.

[6] As an example of such claims, see King (2015) in *Financial Times*.

2 Analytical Framework and Data

2.1 Analytical Framework

Our baseline analysis employs the Input-Output framework suggested by Bems et al. (2010, 2011). Although readers can refer to the original papers for detailed explanations about the model environment and the estimation procedure, we concisely re-introduce the overall framework to clarify the key mechanism through which China's domestic market affects other countries' economic growth.

Consider an economy where there are N countries with each country having S sectors. Countries and sectors are indexed by $i, j \in N$ and $s, t \in S$, respectively. One sector produces only one product (i.e., good or service). Hence, the sector indices are used interchangeably to stand for the products of corresponding sectors. Product is differentiated across countries, so each variety of the product s faces a different demand. The output quantity or real output that sector s in country i produces, denoted by $q_i(s)$, must satisfy the following market clearing condition: $q_i(s) = \sum_j \sum_t q_{ij}^m(s,t) + \sum_j q_{ij}^f(s)$, which holds for all i, j, s, t. This equation implies that $q_i(s)$ is either used as an intermediate input, $q_{ij}^m(s,t)$, for another production in sector t in country j or consumed as a final product, $q_{ij}^f(s)$, in country j. Using the market clearing conditions, we can present the growth rate of $q_i(s)$ as a linear function of intermediate expenditure growths and final expenditure growths:

$$\hat{q}_i(s) = \sum_j \sum_t \left[\frac{q_{ij}^m(s,t)}{q_i(s)} \right] \hat{q}_{ij}^m(s,t) + \sum_j \left[\frac{q_{ij}^f(s)}{q_i(s)} \right] \hat{q}_{ij}^f(s), \quad \forall i, j \in N \text{ and } s, t \in S \tag{1}$$

where $\hat{x} \equiv (x_t - x_{t-1})/x_{t-1}$ represents the growth term. The terms inside the two brackets on the right-hand side of Eq. (1) are the shares of intermediate and final expenditures in each sector, respectively, and adds up to one. Thus, the overall growth of $q_i(s)$ equals the weighted average of the intermediate and final expenditure growths.

Eq. (1) can be reduced to an empirically estimable form with the following three assumptions: (i) shipment price of a product does not vary by destination country and sector, (ii) each sector has a Leontief production technology, and (iii) a representative final consumer in each country has a Leontief preference over the differentiated varieties of each product.

By assumption 1, the product price, $p_i(s)$, is set equal regardless of where it exports for what purposes. This allows the shares in the two brackets in Eq. (1) to be expressed in value terms, i.e., $\frac{q_{ij}^m(s,t)}{q_i(s)} = \frac{m_{ij}(s,t)}{y_i(s)}$ and $\frac{q_{ij}^f(s)}{q_i(s)} = \frac{f_{ij}(s)}{y_i(s)}$ where $y_i(s)$, $m_{ij}(s,t)$ and $f_{ij}(s)$ are the nominal values of output, intermediate and final expenditure, respectively. Assumption 2 tells us that each production requires a fixed amount of inputs with constant return to scale. This implies that the expenditure growth rate for intermediate inputs should be equal to its real output growth rate. Namely, we have $\hat{q}_{ij}^m(s,t) = \hat{q}_j(t)$ for all i, j, s, t. Likewise, assumption 3 means that consumer's expenditure for each variety of a product across all countries should grow at

an equal rate, i.e., $\hat{q}_{ij}^{f}(s) = \hat{q}_{j}^{f}(s)$ for all i, j, s.[7]

Combining all three assumptions above, we can re-write Eq. (1) as

$$\hat{q}_i(s) = \sum_j \sum_t \left[\frac{m_{ij}(s,t)}{y_i(s)}\right] \hat{q}_j(t) + \sum_j \left[\frac{f_{ij}(s)}{y_i(s)}\right] \hat{q}_j^f(s), \quad \forall i, j \in N \text{ and } s, t \in S. \tag{2}$$

For further calculations, it is convenient to express Eq. (2) in vector and matrix form. Let $(S \times 1)$ vector, y_i, be the output of country i and y $(SN \times 1)$ be the output of all countries. f_{ij} $(S \times 1)$ is the final expenditure in country j for the products in country i and A $(SN \times SN)$ is the input coefficient matrix with its element $a_{ij}(s,t) \equiv m_{ij}(s,t)/y_j(t)$. After some matrix algebra, Eq. (2) can be solved for the real output growth vector as follows:

$$\begin{pmatrix} \hat{q}_1 \\ \hat{q}_2 \\ \vdots \\ \hat{q}_N \end{pmatrix} = \underbrace{[diag(y)]^{-1}(I-A)^{-1} \underbrace{\begin{bmatrix} diag(f_{11}) & diag(f_{12}) & \cdots & diag(f_{1N}) \\ diag(f_{21}) & diag(f_{22}) & \cdots & \vdots \\ \vdots & \vdots & \ddots & \vdots \\ diag(f_{N1}) & \cdots & \cdots & diag(f_{NN}) \end{bmatrix}}_{\equiv F} \begin{pmatrix} \hat{q}_1^f \\ \hat{q}_2^f \\ \vdots \\ \hat{q}_N^f \end{pmatrix}}_{\equiv Z} \tag{3}$$

where $\hat{q}_i$ and $\hat{q}_i^f$ are $(S \times 1)$ vectors of output growths and final expenditure growths in country i, respectively. $diag(f_{ij})$ is the diagonalized matrix of vector f_{ij}.

Eq. (3) demonstrates that the output growths are proportional to the final expenditure growths. To see this relationship vividly, the matrix defined as Z needs to explained. First, $(I-A)^{-1}$ is the well-known Leontief inverse matrix and F is the rearranged form of final spending that captures equal growth of final demand for all product varieties due to the assumption 3. Hence, $(I-A)^{-1}F$ implies that how much products should be supplied both directly and indirectly to meet the final demand.[8] This term is then divided by the (diagonalized) output vector y to be expressed as percentage shares. Therefore, an element, $z_{ij}(s,t)$, of the matrix Z represents the output share of product s in country i required to meet a unit increase in the final expenditure for product t in country j. Mathematically speaking, $z_{ij}(s,t)$ is the elasticity of output of the product s in country i with respect to the final expenditure for product t in country j. By construction, each row of Z sums up to one, meaning that 1% increase in the final expenditure for all products induces 1% increase in the production in all sectors. The real output growth in each sector can be obtained when this Z is pre-multiplied by the actual final expenditure growths for all products.

[7] In fact, assumption 3 can be relaxed so long as we observe the actual expenditure growths for all varieties of all products in the data. More discussion on this assumption will come when we check the sensitivity of our estimation results.

[8] Specifically, $(I-A)^{-1}F = F + AF + A(AF) + \cdots$. Hence, sectors should supply (i) the final products by F, (ii) the intermediate inputs by AF that are necessary to produce the F, (iii) the intermediate inputs by $A(AF)$ that are necessary to produce the AF, and so on.

The real value-added growth in sector s in country i, $\hat{r}_i(s)$, is simply equal to the output growth $\hat{q}_i(s)$ as long as the value-added, $va_i(s)$, is defined as proportional to output, i.e., $r_i(s) \equiv va_i(s)/y_i(s)$. Hence, Z is also the elasticity of value-added or GDP to the final expenditure. When aggregated up to the country level, however, the output growth rate and the value-added growth rate can be different: the aggregate growth rates at the country level are calculated as the weighted averages of individual sector growth rates with the weights being the sizes of output and value-added in the base year, respectively. Since the value-added share of output is heterogeneous across sectors, the value-added weight of a sector is usually not equal to its output weight.

We add two comments on the features of our analytical model. First, our approach is purely demand-driven in the sense that production occurs only and always to meet a given expenditure, as Eq. (3) imply.[9] Despite some limitations compared to a general equilibrium approach (e.g., Eaton et al., 2016), this parsimonious model efficiently isolates the effect of expenditure changes from adjustment to price changes. Moreover, the model can embed the structure of processing trade in China (and Mexico) in a straightforward way, which eases the analysis considerably.

Another feature of this model is that it can additively decompose the GDP growth rate into the contribution by each country's expenditure growth. For example, if we feed the growth rates of final expenditure in China, $\hat{q}^f_{China}$, in Eq. (3), leaving all others zero, we obtain the induced GDP growth by $\hat{q}^f_{China}$ for each country. Since the expenditure growth in any country can be fed into the model, we can evaluate the relative contribution of Chinese domestic market to the aggregate GDP growth in each country. As Bems et al. (2010) note, this decomposition exercise may not be reliable if the induced aggregate GDP growth rates do not match the actual GDP growth rates. As we will show, however, our estimates fit reasonably well into the actual data.[10]

2.2 Data

Two data sources are used in our main analysis. One is the CEIC China Premium Database from which we draw national accounts and sector level price data. The other is the OECD Inter-Country Input-Output Table, 2016 edition (henceforth, ICIO Table) with which we construct the elasticity matrix, Z. The nominal expenditure growth rates in China are also calculated from the ICIO Table, which then are deflated using the sectoral prices to obtain the real growth rates, $\hat{q}^f_{China}$.

[9] See Bussière et al. (2013) for another recent application of this demand-driven approach to explain the great trade collapse in the 2008–2009 crisis.

[10] Eaton et al. (2016, p. 3402) conduct an accounting exercise in which they decompose output, GDP, and trade in each country into the contribution of six exogenous shocks: "(i) to the cost of trade in each manufacturing sector between each pair of trading partners; (ii) to productivity in each sector; (iii) to the efficiency of investment in each type of capital; (iv) to aggregate demand; (v) to the demand for nondurable manufactures; and (vi) to employment."

Although several institutions and projects provide international input-output (IO) tables recently, the ICIO Table has notable advantages.[11] First, it covers 63 trading countries (plus the rest of the world).[12] This coverage is fairly wide among other international IO tables. Importantly, the database includes most major Asian countries. Given the fact that GVCs are heavily concentrated within Asia and are not truly global (Los et al., 2015), having many Asian countries in the sample would help improve the accuracy of our estimation. Second, the table has 34 sectors classified according to the International Standard Industrial Classification (ISIC) revision 3, among which 16 are manufacturing sectors (See Table A1). In particular, the durable sectors are more disaggregated in the ICIO table than in others, which is also conducive to the accuracy of the estimation.

Perhaps, the most advantageous feature of the ICIO Table is that it explicitly accounts for the prevalence of processing trade in China and Mexico emphasized in Koopman et al. (2012, 2014). As for China, specifically, the ICIO Table differentiates the input structures of tradable sectors in three types: production for domestic sales, ordinary exports, and processing exports. Similarly, Mexican manufacturing sectors are distinguished into production for global manufacturing (known as Maquiladoras) and non-global manufacturing. We will explain further in the next sections about how input structures are different from each other as well as why the differences matter in our analysis.

That said, to incorporate such different input structures within the same sectors in China and Mexico in the estimation model, we technically assume that China consists of one consumption region and four production regions divided by the type of input structures: region 1 is assumed to produce services only, whereas regions 2, 3, and 4 to produce goods only for domestic sales, ordinary exports, and processing exports, respectively. These four regions exist only for production. Final consumption in China occurs only in region 5. We deal with Mexico in the same way so that it has three regions that are specialized to produce services, goods for processing exports (i.e., Maquiladoras), and all the other goods, respectively, and also has one region for final consumption. In the end, our sample is virtually equivalent to have 71 countries with seven countries specialized only in productions and two countries in final consumption.

We also need to mention about two caveats of the ICIO Tables. First, the ICIO Tables are published only up to 2011. This is another reason why we limit our analysis to the period of 2009–2011. Second, the ICIO Tables in themselves are estimated data using several national IO tables. Since most countries report their IO tables only once in a few years, the ICIO tables have to interpolate or extrapolate values to produce data for certain years, which may lead to

[11] Popular databases of international IO tables include the World Input Output Database (WIOD), Asian International Input-Output Tables by IDE-JETRO, and the Eora MRIO database.

[12] The country list is available from http://www.oecd.org/sti/ind/inter-country-input-output-tables.htm. Note that Hong Kong is included in the list as a separate country from China. The mainland China, Hong Kong, and Macao have their own statistical systems and legal provisions. China's national accounts data, thus, do not include Hong Kong and Macao, except for the area of the national territory and forest resources.

inaccurate estimation results. To minimize this issue, we directly obtain the real expenditure growth rates for some countries, including US, Japan, and Korea, of which national accounts provide both sector-level final expenditures and prices annually.

3 Structural Changes in Chinese Economy

3.1 Composition of Domestic Final Expenditure

China's domestic market had rapidly grown between 1995 and 2011. The share of its final expenditure in world's GDP was only 2.4% in 1995, but rose up to 10.1% in 2011. It also has become the second largest market in the world since 2010, followed by the US.[13] Figure 1 shows the annual growth rates of Chinese final expenditure over the period where the aggregate expenditure is decomposed into final consumption expenditure (or shortly consumption) and gross capital formulation (or shortly investment). Whereas the consumption growth is relatively stable ranging between 4% and 6% in most years of the period, the investment growth is more volatile and yet is mounting over time since 1997. Remarkably, despite the worldwide economic hardship, the investment growth rate in China hit the highest at 8.1% in 2009 which leads to the highest expenditure growth rate at 13.4% in the sample period.[14]

The significant increases in investment in 2009 and the following year is indeed attributable to a massive fiscal stimulus implemented from November 2008 through the end of 2010. The announced 4 trillion RMB (US $586 billion) of initial investment project is equivalent to 13.5% of domestic market size in 2008, recording the largest amount in the world's history. The cumulative total of new funds injected into the economy by the end of 2010 is, however, even far more than that: a conservative estimate in Wong (2011), for example, suggests 2.4 times as large as the original expenditure plan (See also Naughton, 2009). Clearly, this huge demand shock is driven by Chinese government intervention, meaning that a substantial portion of the final expenditure growth over the years of our interest, 2009–2011, is exogenous to the contemporaneous productivity or any supply-side shock. Though we do not completely rest on this feature to justify the reliability of our finding, it certainly helps to mitigate the concern about letting the final expenditure growth rates are given in our estimation.

We also compare the final expenditure growth with the GDP growth. By definition, the difference between the two growth rates is equal to the growth rate of net exports. The contribution of net exports to the aggregate GDP growth is positive only in mid-1990s and mid-2000s, although Chinese trade surpluses had been continuously escalated. The small or even negative contribution of net exports to GDP growths in China over the sample period (except

[13] The shares of the US domestic market in the world's GDP are 25.3% in 1995 and 22.2% in 2011, respectively. Source: CEIC China Premium Database and World Bank national accounts data.

[14] The annual worldwide GDP growth rate records -1.7% in 2009, which is the unique year of negative growth since 1951 (source: The Maddison-Project and World Bank national accounts data).

1997) reasserts that China is basically a large country where most of its growth are sourced from its domestic market. 2009 is the year in which the role of domestic market is highlighted.

Although the consumption vs. investment dichotomy helps us understanding the structure of Chinese domestic market, what is more relevant to our study is the expenditures on individual products constituting the domestic market and their growth patterns. To see those, specifically, the entire domestic market in China is first classified into four product groups: durables, nondurables, utilities and construction, and services, and then the four groups are further classified into the 17 products for later use. Let the former (product group) category be referred to as level 1 classification and the latter one be referred as level 2 classification. See Table A1 for the detail classifications.

Figure 2 shows the time trend of group-specific expenditures in China from 1995 to 2011. In order to compare the group expenditures over time, constant 1995 prices have been applied at the product level and then the product level real values are aggregated up to the group level. The growth is the fastest in durables, followed by utilities and construction, services, and nondurables. Interestingly, in 1995, the expenditure on nondurables was 2.1 trillion yuan and was twice that on durables (0.9 trillion yuan). More than eleven-fold upsurge in the durable spending over the sample period is in striking contrast to the two and a half fold increase in nondurable spending. Utilities and construction shows relatively faster growth pattern around the period of global financial crisis, while the expenditure on services rises quite constantly throughout the whole period.

The widening difference in the growth patterns between durables and nondurables particularly makes the structural change in China's domestic market apparent. Although it could be attributed partly to the strong deflation in durables over the long time, the structural change toward the higher demand for durables is a quite natural phenomenon in the process of Chinese industrialization. Indeed, a very similar pattern is observed even in the annual growth rates of final expenditure. Figure 3 decomposes the growth rates of aggregate final expenditure into the contributions of each product groups. To do so, the 17 product level growth rates are first weighted by the previous year's (nominal) expenditures and summed up to the group level.[15] We can only show the growth rates over the last three consecutive years due to the data limitation, but at least for that period, the expenditure growth for durables are the highest, utilities and construction the next, and services and nondurables are the lowest on average.

Thus far, we have confirmed that Chinese domestic market had a rapid expansion largely driven by the demand for durables over the 1995–2011 period, which made it possible to sus-

[15] In fact, the weighted sum of the product expenditure growth rates are greater by about 0.2% and 0.3% in 2010 and 2011, respectively, than the aggregate expenditure growth rates appeared in Figure 1. Perhaps, this is partly due to the mis-measurement of the final expenditure in the ICIO Tables or partly because the deflators at the product level vs. aggregate level are not exactly the same. In any case, we prefer the national accounts and adjust prices of 'other services' in China in order to match the aggregate growth rates of final expenditure. Although this adjustment is ad hoc, it barely affects other countries' production and trade.

tain the high economic growth in China even during the 2008–2009 crisis when its exports growth is hampered. Given that durables generally involves long production stages that have been gradually fragmented across borders and thereby amplifies the volume of international trade, the high, sustained growth in durables demand in China must have progressive influences on other countries.

3.2 Composition of Imports

Investigating the structures of both intermediate and final good imports in China is crucial in our study. Demand for a final good can be met by either producing the good domestically or importing it from a foreign country, and in both cases the demand can create productions in all countries through the international input-output networks, which is captured by Z in our analytical model. Hence, the bilateral trade relationship among all countries matter theoretically, but clearly more weights are on the direct trade relationship with China.

Let's first look at the structure of Chinese import by end use type and by trading partner including the world as in Figure 4. All products are classified in accordance with the Broad Economic Categories (BEC) by United Nation Statistics Division.[16] Among the five categories in the figure, raw materials, parts & components, and half-finished goods are regarded as intermediate inputs, whereas capital and consumer goods are final products in our context. Namely, the figure indicates that Chinese imports mainly consist of intermediate goods. Moreover, the share of intermediate goods in total imports (from the world) rises by 9.9%p from 68.6% in 1995 to 78.5% in 2010. Even for Korea and Malaysia in which the intermediate import shares fall, we still observe that the shares are way higher than the final import shares.[17]

The trend in Figure 4 implies that the final imports are not the main channel through which Chinese final expenditure creates the production and value-added in foreign countries, because if they were the main channel, a unit increase in Chinese expenditure would have weaker impact on other countries in 2010 than in 1995, but as we will see in the next section, our estimates for the magnitude of impact of the unit expenditure change show the opposite result. We can also guess from Figure 4 that more goods for domestic sales would be now produced within China rather than imported.

That said, we turn to the structure of intermediate imports used in productions within China. A central key to understanding China's production is the regime of processing trade. Backed by the strategical promotion as a core industrialization policy, processing trade is now prevalent in China. Typical processing exporters import parts and components from abroad with tariff exemptions, assemble or process, and then export them to third countries. Most inputs of a processed good are imported by the system's nature, even though domestic inputs

[16] Source: http://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=10

[17] The case for Taiwan is not directly available from the UN Comtrade Database. Instead, based on the OECD ICIO Tables, the intermediate import share in the total imports from Taiwan rises from 71.8% in 1995 to 78.5% in 2010.

are increasingly used in effort toward higher domestic value-added (Kee and Tang, 2016). Thus, the input structure of production for processing exports (PRO) is largely different from that for domestic sales (DOM) and ordinary exports (PRO).[18]

Figure 5 shows examples of the differences appearing in petrochemical sector and computers & electronic equipment sector, respectively. The figures inform that the input structures in PRO show the opposite time trend from those in DOM and NPR: Most inputs in PRO are imported–especially from Korea, Japan and Taiwan–through all the years, but the ratio of domestic inputs are increasing over time. On the other hand, inputs in DOM and NPR are mainly sourced domestically, but increasing portions of imported inputs are used arguably due to China's deeper globalization: firms in China have more access to global market to source inputs even for domestic sales. Though not shown to save spaces, these contrasting patterns are common in all manufacturing sectors in China. Thus, we expect that the impact of China's final expenditure on other countries would increase along with the increasing import shares in DOM, yet the impact might be over-estimated without distinguishing the input structures by its purpose.

One thing that makes our analysis complicated is that, even though some products are supposedly exported to foreign countries under their special tax treaties, such as value-added tax exemption, a substantial portion is indeed re-imported back to China for domestic sales. According to UN Comtrade database, the share of re-imports in the total Chinese imports is as large as 7.7% in 2010.[19] This is possible because of the unique customs system in China under which Hong Kong and Macao are treated as separate trading partner countries: the goods once exported to Hong Kong can be re-imported back to China as long as the import duties are paid when they re-enter.[20] Besides, the duties can be exempted if some values are added in Hong Kong, since the Closer Economic Partnership Arrangement (CEPA) between China and Hong Kong in 2003.

This fact implies that even the input structures in PRO and NPR are not irrelevant to China's final expenditure and the trade relationships between China and Hong Kong needs to be explicitly accounted for to obtain appropriate estimates for the impact of the expenditure growth. The ICIO Table does capture this relationship and we exploit the relationship in our estimation.

[18] Recent studies investigate the determinants of regime choice between ordinary exports vs. processing exports, such as credit constraints (Manova and Yu, 2016), tariffs and domestic market size (Brandt and Morrow, 2017).

[19] Although the re-imported products may be exported again to third countries, we suspect that many of them are sold in the domestic market.

[20] This round-trip pattern of trade is often referred to as "one-day trips" to Hong Kong. See, for example, Chang (2012) in *Forbes*.

4 Estimation Results

4.1 Impact of China's Domestic Market Expansion

We first present a unit impact of China's domestic market growths, which is represented by the elasticity Z. In our estimation, the original 34 sectors in the ICIO Tables are aggregated up to 17 sectors (or products) following level 2 classification. This aggregation simplifies the calculation without much loss of accuracy and allows us to concisely present the estimation results. It also eases our data collections especially for prices, since they are not usually as disaggregated as the 34 sector classification. After all, the actual estimation involves 71 countries or regions and 17 sectors, which generates the square matrix Z of dimension 1207 by 1207.

Table 1 reports the elasticity of GDP in each country with respect to (10 times) China's final expenditure by product group for years 1995 and 2010. Namely, the first two columns in the table show how much of GDP in the listed countries would have grown if Chinese final spending for nondurables had risen at equal rate by 10% for the two different years. From column (3) to column (8) are the corresponding elasticities to the 10% expenditure increases on durables, utilities & construction, and services in China, respectively. The last two columns are sums up all the values for the corresponding years, which are equal to the GDP growth rates in response to the uniform 10% Chinese expenditure growths for all products. As mentioned, the estimated elasticity of GDP in the responding countries is the weighted averages of the elasticities of value-added in all sectors with the weight being the sectoral value-added. We present 20 major countries out of 63 sample countries to save space. The listed countries are ranked by the magnitude of the elasticity in 2010 in the last column.[21]

The results present two major findings. Firstly, the impact from a 10% increase in China's final expenditure becomes unilaterally more severe across all countries in 2010 than in 1995, regardless of product group. Secondly, the size of impact varies significantly for each product group. In case of Malaysia, for instance, the 10% increase in China's spending for durable goods would hike up Malaysia's GDP by 0.31% in 2010, roughly 11 times higher than in 1995. This magnitude would be followed by the elasticities for services, utilities & construction, and nondurables, which is contrary to the pattern in 1995 when the largest impact was from the expenditure on nondurables. Similar patterns are observed in Korea and Taiwan, which are the top 3 countries in terms of the induced GDP growth rates. All of these countries are the newly developed economies by specializing in heavy and chemical productions including electronics and petrochemical goods.

As already emphasized, the root of the above two findings lies in the fact that GVCs involving China have become more active in recent years, but particularly in durable sectors. An expansion in a GVC amplifies the impact of one country's demand on others' production through tighter input-output relationships. Moreover, the durable sectors, among others,

[21] For the rest of the countries, the results are available upon request.

tend to create a larger spillover effect and brings about more stimuli to international trade than other sectors as they engage with a broader range of sectors and their production process is longer. Therefore, a 10% increase in China's durable expenditure have a larger impact on productions, exports, and GDPs in the world economy, compared to other product groups.

To confirm the idea above, Figure 6 illustrates the GDP growth rates driven by the 10% increase in Chinese final expenditure for all products in years between 1995 and 2010. Combined with the last two columns in Table 1, the figure indicates that the deeper integration of China into the world economy induces stronger impacts of its domestic market on other countries. This pattern is also in line with the finding in the literature that deeper vertical linkages cause higher business cycle co-movements across countries through intermediate trade (e.g., di Giovanni and Levchenko, 2010; Johnson, 2014). During the crisis in 2008–2009, however, the integration process was slightly deteriorated to weaken the impact of the same 10% increase on some countries like Japan and Vietnam.

As an interesting comparison, we document in Table 2 the elasticity of GDP with respect to a 10% increase in the final expenditure in the US. The list of countries in the table is the same, except that the US in Table 1 is replaced by China in Table 2. As we can expect, the biggest beneficiaries from the uniform growths in the US domestic demand are Canada and Mexico, arguably owing to the North American Free Trade Agreement (NAFTA) activated in 1994. However, the magnitudes in all five columns for the two countries had fallen in 2010 from those in 1995. Instead, some other countries like China and Vietnam received more influences from the same growth in expenditure. This implies that the global supply chains of the US is diversified from its closest neighbors to distant countries, whereas the overall degree of integration is largely unchanged. The finding for Mexico is particularly consistent with the studies on the competition between China and Mexico in the same position along the GVCs (Hanson, 2010; Utar and Ruiz, 2013, among others).

There are two more interesting differences between the elasticities in Tables 1 and 2. One is that the expenditure on services, rather than durables, in the US has the biggest influence among the four product groups. This result comes mainly from the fact that the spending on services takes almost two thirds of the total final expenditure (in nominal values), whereas the spending on durables takes only about 12% as of 2010 in the US. In contrast, the service expenditure in China are only 35%, whilst durable expenditure account for 21% of the total spending for the same year. Thus, the two countries exhibit quite different structures of domestic market, which are also reflected in the estimated elasticities.

Another difference is that the overall unit impact of the US final expenditure on the rest of the world is greater than that of China in most countries. This means that the US is still the most integrated through trade with the rest of the world even in 2010, despite the fast catch-up by China. Note, however, that this by itself does not mean that the final expenditure in the US is larger contributor to, say, Vietnam's GDP growth than that in China, because the expenditure growths in the US are much lower compared to those in China in any given year

during our sample period. For example, the aggregate US expenditure growth in 2011 is only 1.6% according to the US national accounts, but the expenditure growth in China is 10.3%, more than 6 times higher than that in the US.

4.2 Contribution to the Annual GDP Growth Rates

Here, we estimate the actual contribution of China's expenditure changes to the annual GDP growth rates in other countries. This is done by feeding the actual growth rates of Chinese final expenditure in Eq. (3), holding the expenditure growths in other countries at zero. All growth rates are measured in real terms at the previous year's prices. Therefore, the expenditure growth rates this year are pre-multiplied by the previous year's elasticity matrix Z to provide our estimates. Table 3 presents the estimated results for the same selected 20 countries. The first three columns in the table show the estimates for the induced annual GDP growth rates in years 2009 through 2011. The values in the very last column are the averages of estimates over the three years, which in turn are decomposed into the contributions by each product group and shown in column (4) through (7). The countries are listed in order of the size of estimates in the last column.

We find that the magnitudes of the impacts in Table 3 are ordered similar to Table 1, but there are substantial gaps between the estimated impacts and the elasticities, especially for the top 3 beneficiaries of Chinese final expenditure. To explain these gaps, note that the estimates for year 2011 in column (3) are comparable to the values in parentheses, which are the hypothetical estimates as if Chinese expenditure on each product rose uniformly by 10.3%, the actual aggregate growth rates in 2011. For example, Korea's GDP would increase approximately 0.63% (=0.61×1.03 where 0.61 comes from the last column in Table 1) if China's product expenditure rose equally by 10.3%. In the real world, however, the growth in final expenditure differs by product, and durables, which have the largest impact on Korea as shown in Table 1, showed the highest growth. Therefore, the durable-led expenditure growth in China increases Korea's GDP by 0.84%, 0.21%p higher than 0.63%. Both Taiwan and Malaysia show similar patterns to Korea in terms of impacts of the disproportionate expenditure growths in China. The last five columns from (4) to (8) simply confirm that the mechanism works for all three years: when the averages of the induced growth rates are decomposed, the contribution of the durable expenditure growths in China is much bigger than those of other product groups. That said, Table 3 suggests that the growth of Chinese final expenditure over the 2009–2011 period had increased the annual GDP growths in Korea, Malaysia, and Taiwan by close to 1%p, whereas the NAFTA and EU countries had typically benefited less than or equal to 0.1%p.

Table 4 highlights the contribution of Chinese final expenditure to the annual GDP growth in the 20 countries and China itself by comparing it to the contribution of the US. The results indicate that the roles of China and the US on GDPs in other countries are sharply contrasted in 2009. As already emphasized in Bems et al. (2013), the great trade collapse in 2009 is largely

attributable to the negative shock in the final demand, particularly for durables, in advanced countries. We consistently observe the same negative sign in the US demand-driven GDP growth rates. Moreover, the magnitudes of the impact are sizable to the NAFTA and even some Asian countries. Chinese final expenditure growth, meanwhile, played the role of absorbing the negative demand shocks especially for its neighbors. China's domestic market not only contributed to the recovery in adjacent countries in subsequent years, but it also induced higher growth rates than the US market even for the remote EU countries such as France, Germany, and Italy.

Table 4 also shows the estimates for the induced GDP growth rates by the final expenditure growths in all countries in the sample (see the column named as "World") so that we can measure the share of China's contribution. Note that all the values in the ICIO Table are reported in current US dollar terms, so we need to convert them into real values in local currencies when calculating the real growth rates of expenditure at the product level, $\hat{q}_j^f$ for all $j \in N$. This job requires the exchange rates against the dollar and product-level price data in each country, which are not easy to collect. We deal with this problem as follows. First, the growth rates of final expenditure in the US, Japan and Korea by product are obtained directly using the data from the national IO tables and output price indices. For the rest of the economies, rather than trying to obtain all the product-level price data, the aggregate price level data, with nominal exchange rates, drawn from the Penn World Table (PWT) 9.0 have been applied.[22]

Finally, the column named as "Actual" provides the actual GDP growth rates in the corresponding years to be compared to the estimates in the "World" column. Figure 7 visualizes the the estimated and the actual GDP growth rates for easier comparison. The comparison suggests that our estimates for the annual GDP growth rates in the listed countries fit the real data reasonably well, even though we use price data with less accuracy. Given the suggestion, we can roughly conclude that, for instance, about 40% of GDP growth in Taiwan and about 20% of GDP growths in Malaysia and Korea in 2011 can be attributed to China's domestic demand expansion.

4.3 Sensitivity Check

Our baseline analysis so far has relied heavily on a few assumptions about the empirical model. In particular, the assumption 3 on consumer's Leontief preference can be unrealistic if the consumer has a substantially heterogeneous demand for differentiated varieties of a product. We have at least two reasons for imposing the assumption. First, we do not observe import price of each variety that is spent as final product in China. Thus, we cannot calculate the final expenditure growth rate of each imported variety in real term. Second, by imposing the assumption, we can clearly show how the impact of the same unit increase in Chinese

[22]Specifically, we use *PL_DA* variable in PWT 9.0 which measures the real domestic absorption (i.e., real consumption plus investment) at current PPPs (in million 2011 US$) divided by nominal exchange rates against US$. See Feenstra et al. (2015) for more explanation about the variable.

final expenditure on GDP growth in other countries varies with product category as shown in Table 1.

As a sensitivity check of our finding, we relax the assumption on Leontief-type consumer preference and introduce an alternative (and perhaps less restrictive) assumption: prices of all domestic and imported varieties of a final product are equal to product price at the aggregate level which we only observe in the data. Since the import value of each variety for final consumption and investment is readily available in the ICIO Table, we can explicitly estimate the heterogeneous final expenditure growth rates of all imported product varieties in China.

Once the assumption 3 is relaxed, we should also modify Eq. (3) accordingly. Specifically, we re-define the elasticity of GDP with respect to the final expenditure in China, Z', as follows:

$$Z' \equiv [diag(y)]^{-1}(I-A)^{-1} \underbrace{\begin{bmatrix} diag(f_{1,China}) & 0 & \cdots & 0 \\ 0 & diag(f_{2,China}) & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & diag(f_{N,China}) \end{bmatrix}}_{\equiv F'} \tag{4}$$

where $diag(f_{i,China})$ is the diagonalized matrix of Chinese (nominal) final expenditure on country i's products. Notice that F' does not require to produce all varieties simultaneously to meet the final demand for a given product as F do in Eq. (3) by the assumption 3. The elasticity matrix Z' is then pre-multiplied by the demand vector for all product varieties in all countries to calculate the real value-added growth rates, i.e.,

$$\begin{pmatrix} \hat{q}'_1 \\ \hat{q}'_2 \\ \vdots \\ \hat{q}'_N \end{pmatrix} = Z' \begin{pmatrix} \hat{q}^f_{1,China} \\ \hat{q}^f_{2,China} \\ \vdots \\ \hat{q}^f_{N,China} \end{pmatrix} \tag{5}$$

where $\hat{q}'_i$ and $\hat{q}^f_{i,China}$ are $(S \times 1)$ vectors of country i's sectoral GDP growth rates and Chinese final expenditure for country i's products, respectively.

Table A2 reports the estimation result using Eq. (4) and Eq. (5). Once aggregated up to the country level, the induced GDP growth rates tend to be slightly greater than those in Table 3 for most countries, while Vietnam has exceptionally greater estimates. In general, however, we confirm that the estimates are not qualitatively different from our baseline result.

4.4 Further Discussion

During the period between 1995 and 2011, we only observe the sustained high growth of Chinese domestic market as well as the continuing integration of production across countries (with possible exception in 2008 and 2009 due to the global financial crisis), in which case

China's global impact could only be larger over time. The two forces, however, appear to have been gradually weakened more recently: the overall growth in China's domestic market has slowed down and concurrently the global trade has been stagnated since 2011. How would these changes in the recent years affect the impact of Chinese domestic market on other countries? Also, how long would these changes continue in the future?

A formal analysis on this question would be beyond the scope of this paper, but at least we would like to briefly touch this issue based on our findings so far, since it matters for policy implications. First of all, the stagnated global trade and production fragmentation across countries in recent years seems to be suggestive that the elasticity of GDP with respect to Chinese final expenditure would, at least, not increase significantly since 2011.[23] Given the little change in the elasticity, the overall growth slowdown in China's domestic market would unambiguously weaken the magnitude of the impact on the rest of the world. Besides, if the growth slowdown in Chinese domestic market is accompanied with a structural change, the degree to which the impact is weakened would not be proportional across countries and sectors.

To provide a clue to this conjecture, Figure 8 plots the relationship between real GDP per capita and the secondary sector's percentage share of GDP in 6 advanced countries and China. The figure suggests that, as long as China follows the same development trajectory as other advanced countries, the share of the secondary sector in China will fall gradually. As a matter of fact, according to the National Bureau of Statistics of China, the growth rate in the tertiary sector has outpaced the secondary sector's growth rate since 2014. This structural change in the production side indicates that China is also experiencing a concurrent compositional change in the domestic market, i.e., from durable-led growth to servitization.[24] In this case, the amplification mechanism would work to the opposite direction to significantly reduce China's role for the rest of the world.

5 Concluding Remarks

This paper has investigated on through what mechanism and to what extent China's domestic market had influenced the rest of the world from 2009 to 2011. China experienced two aspects of structural change over the period 1995–2011: (i) a rapid domestic market expansion mainly led by the disproportionate demand growth of durables, and (ii) increasing usage of imported intermediate inputs in the productions for domestic sales. These two changes in China interacts to make the impact of its domestic expenditure growths on the growth of

[23] China has also been trying to improve the domestic value-added shares in their outputs for recent years by replacing the imported intermediate inputs with domestic inputs. This would attenuate the elasticity of GDP to final expenditure in China.

[24] Since the services sector involves only a small amount of transactions across borders and most of its products are consumed in the domestic market, the GDP growth rates in tertiary sectors would not be significantly different from the growth rate of domestic demand for services.

other countries considerably bigger in the later years. As a consequence, over the 2009–2011 period, Chinese domestic market played a major role in mitigating negative demand shocks and helping subsequent recoveries in all countries, but more for its Asian neighbors. Thus, we highlight the role of China as a world market rather than as a world factory in which case China is typically considered as a disrupting competitor.

Continued research in the future is warranted. As mentioned in the previous section, Chinese current growth slowdown and structural changes are one of primary concerns to both researchers and policymakers, and we need better answers to the question of how such changes in China would affect other countries through which channels. In terms of methodology, our input-output framework by Bems et al. (2010, 2011) can provide a useful view at macro-level, but more micro-level studies, such as Costa et al. (2016), could supplement the findings in this paper with more detailed evidences.

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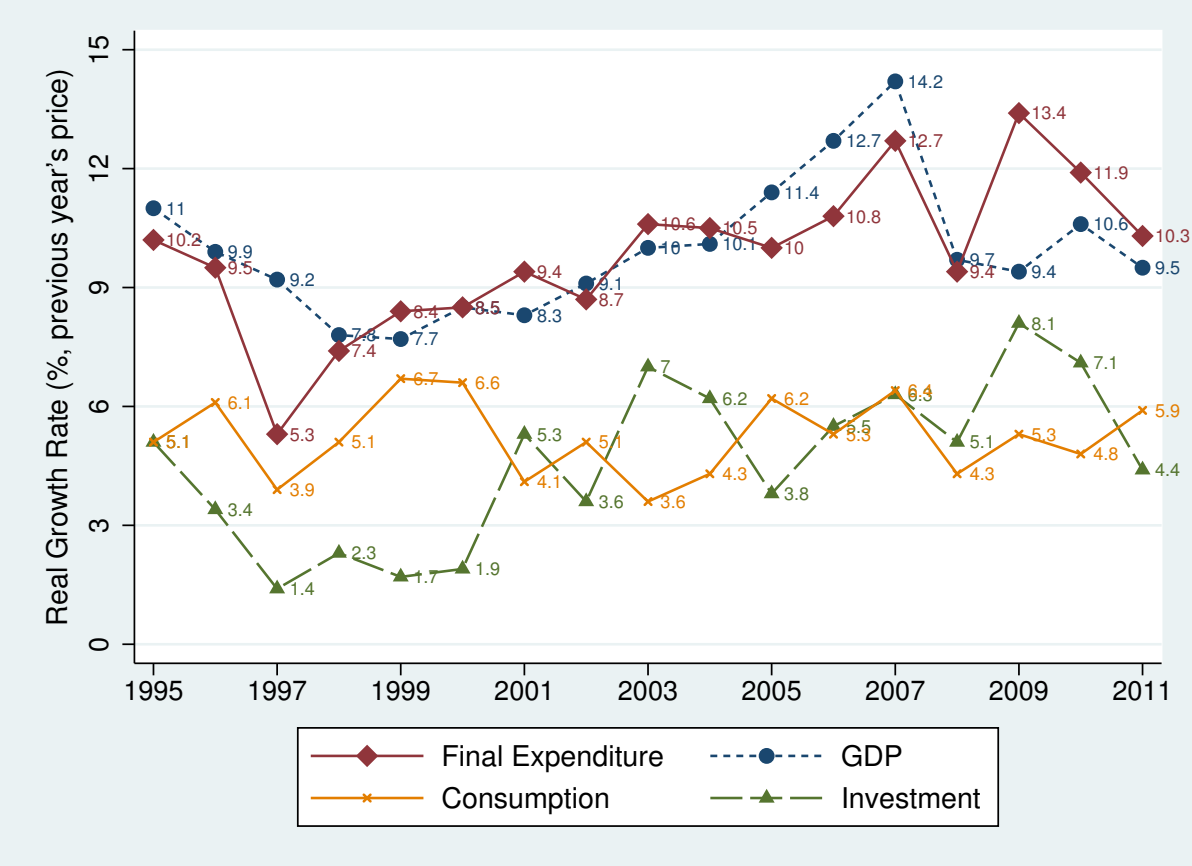
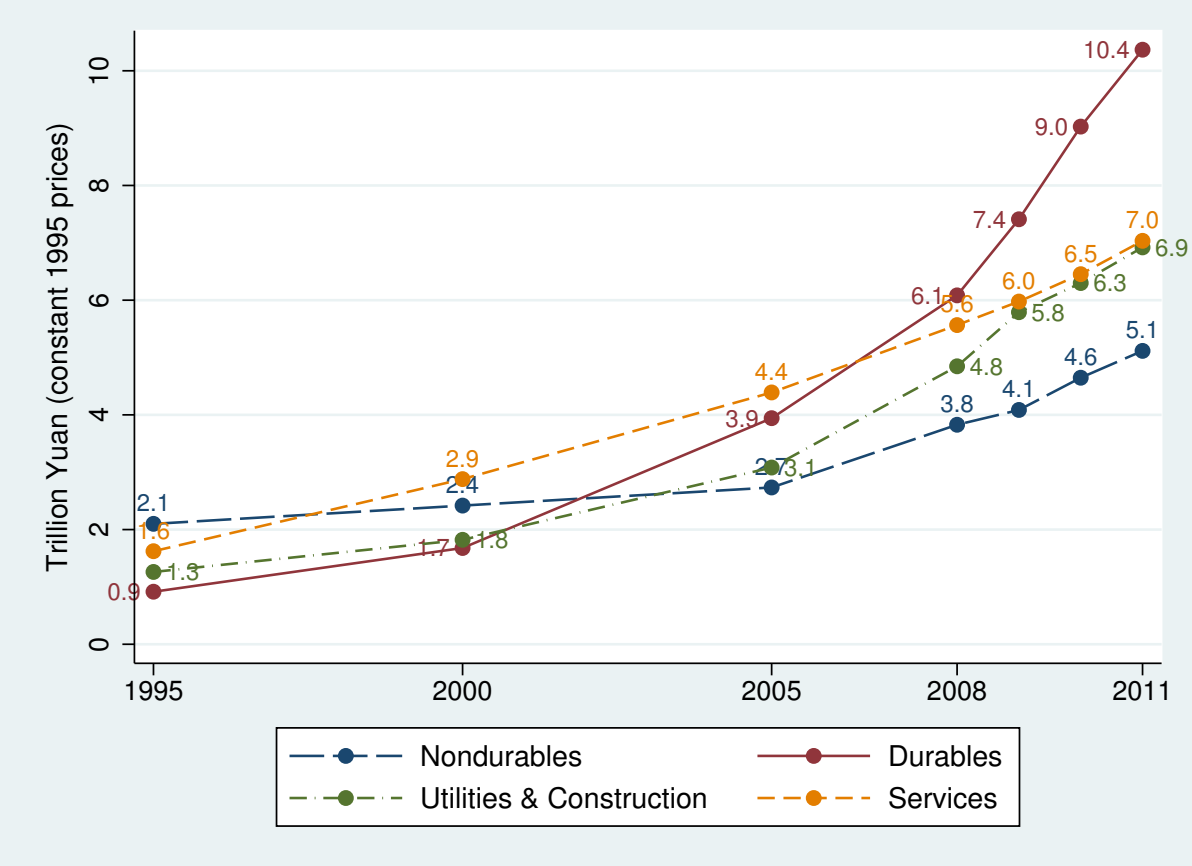
Figure 1: Growth Rates of Aggregate Final Expenditure vs. GDP in China



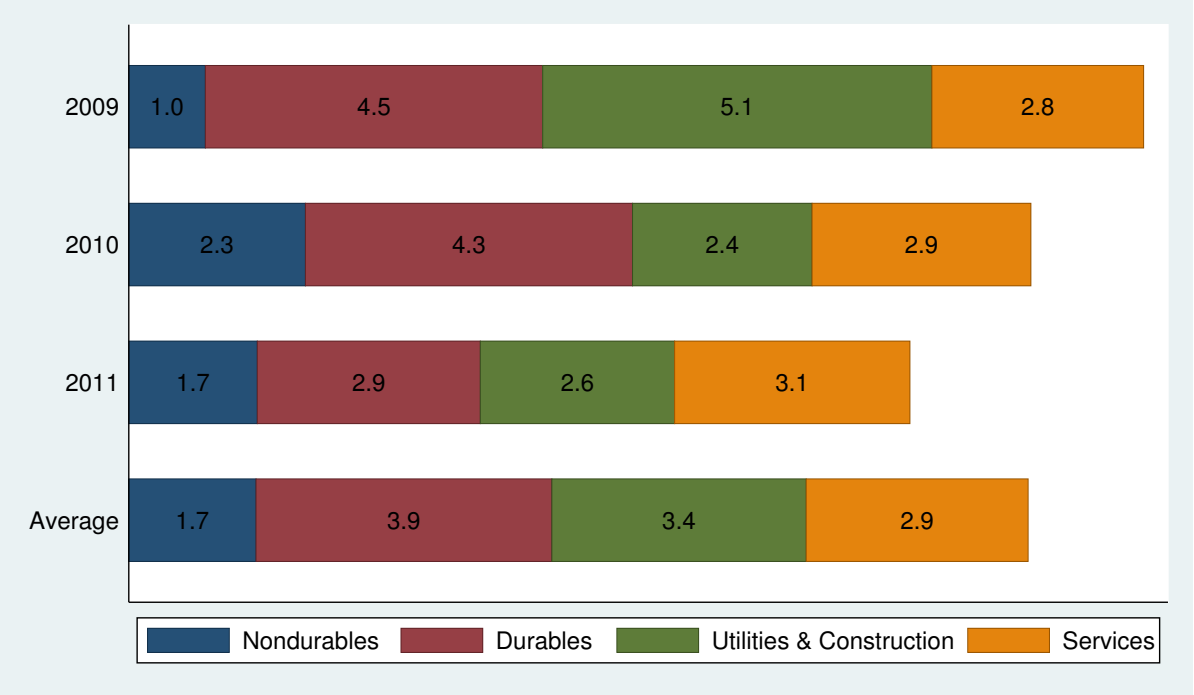
Source: The CEIC China Premium Database

Figure 2: Trends in Chinese Final Expenditure by Product Group (Constant 1995 Prices)



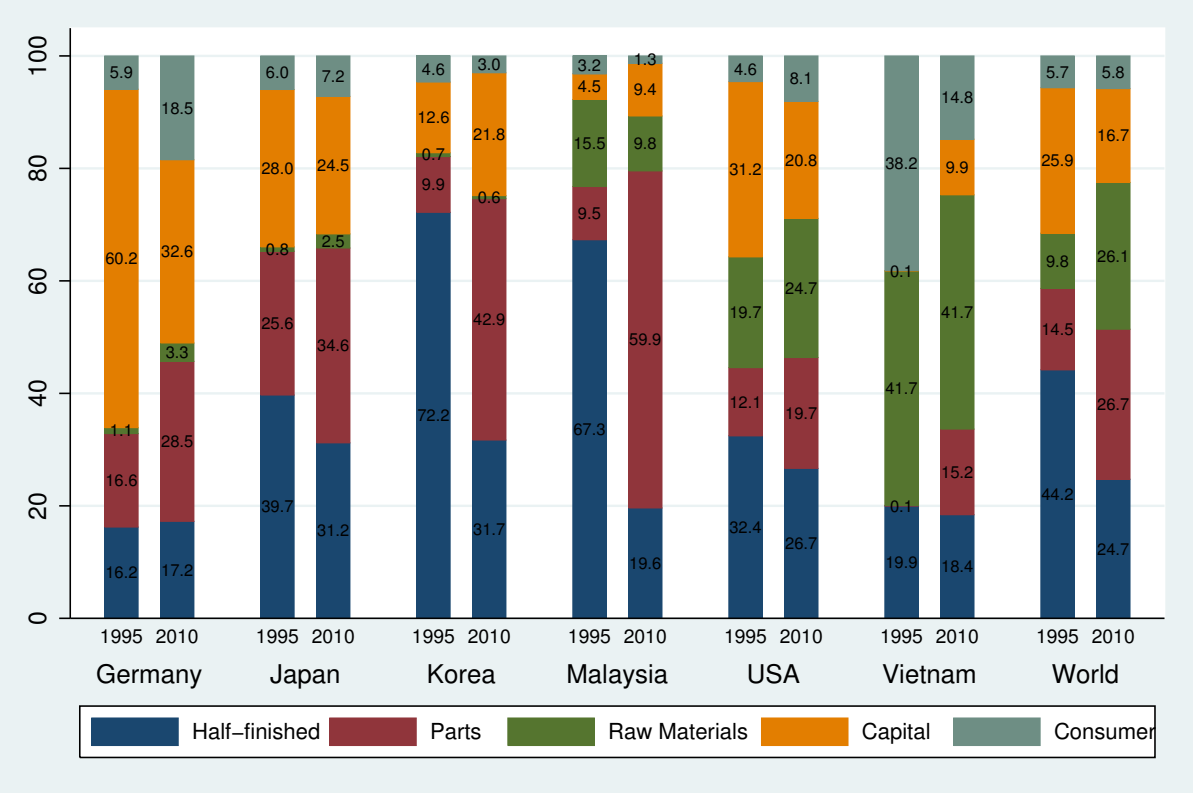
Note: Chinese domestic final expenditures are obtained from the ICIO Tables, which then converted to real values using exchange rate and price data from the CEIC China Premium Database.

Figure 3: Growth Rates of Chinese Final Expenditure by Product Group



Note: Chinese domestic final expenditures are obtained from the ICIO Tables, which then converted to real values using exchange rate and price data from the CEIC China Premium Database.

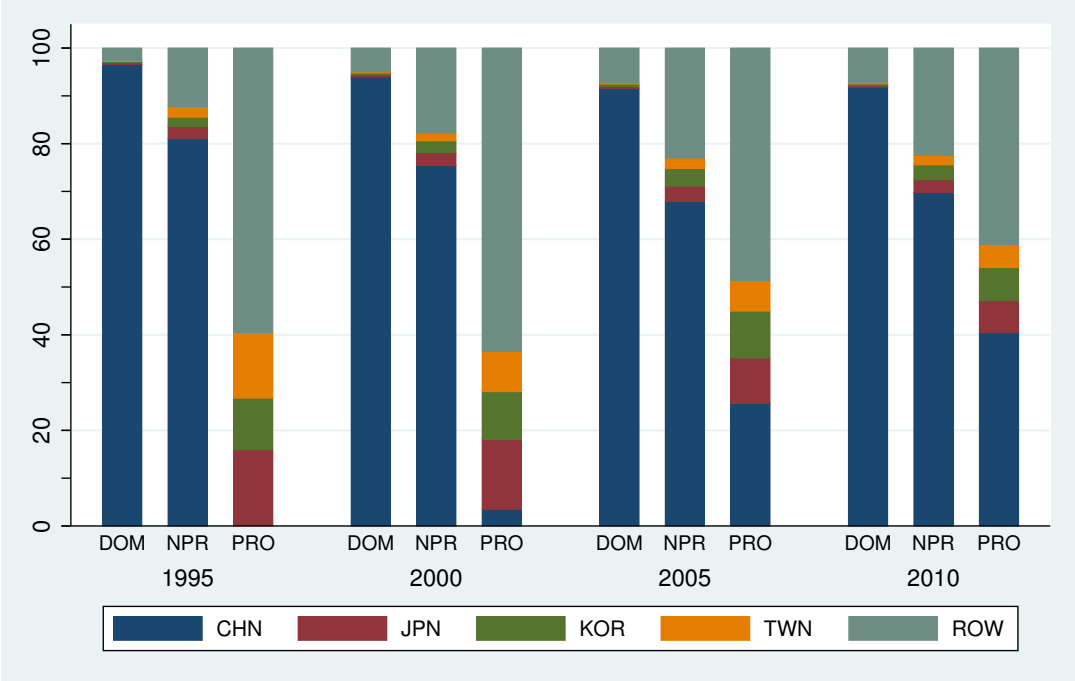
Figure 4: Composition of Chinese Imports by End Use Type



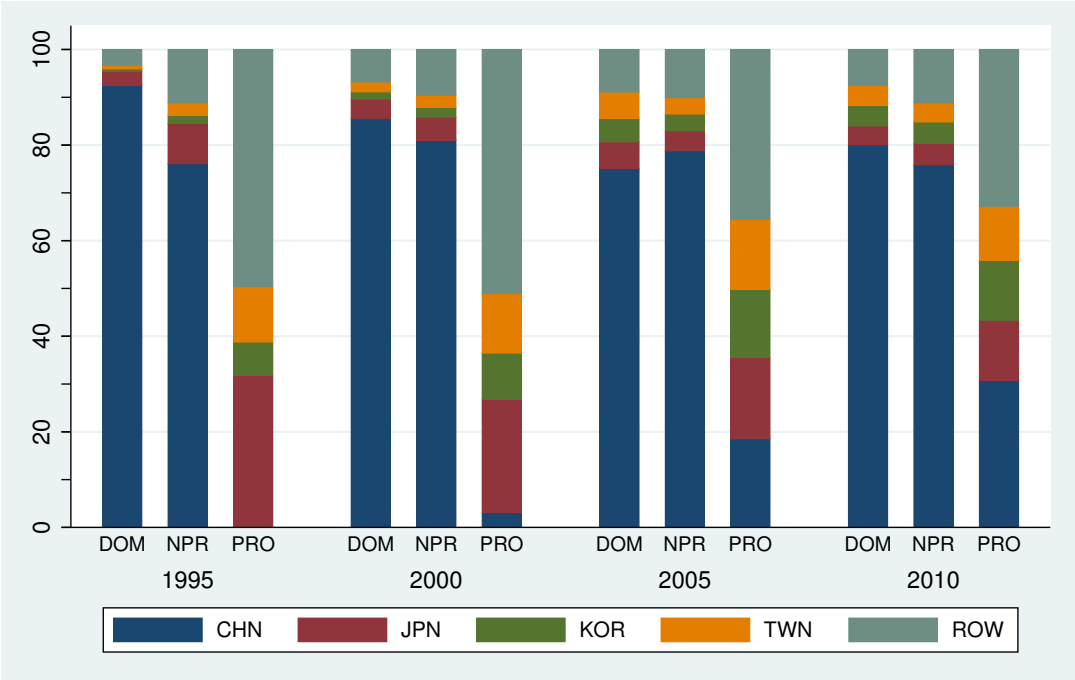
Source: UN Comtrade Database.

Figure 5: Input Structure of Production for Domestic Sales (DOM), Ordinary Exports (NPR), and Processing Exports (PRO)

(a) Petrochemical Products

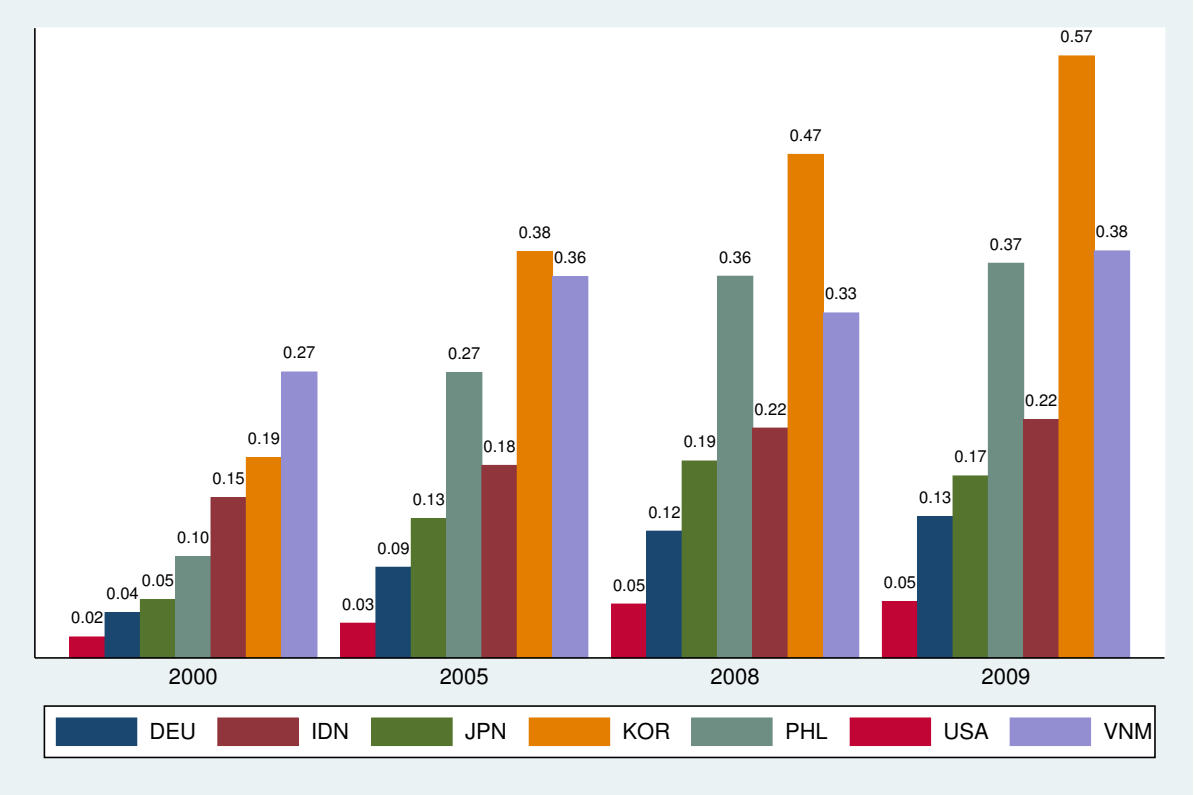


(b) Computers & Electronic equipment



Source: OECD Inter-Country Input-Output Tables

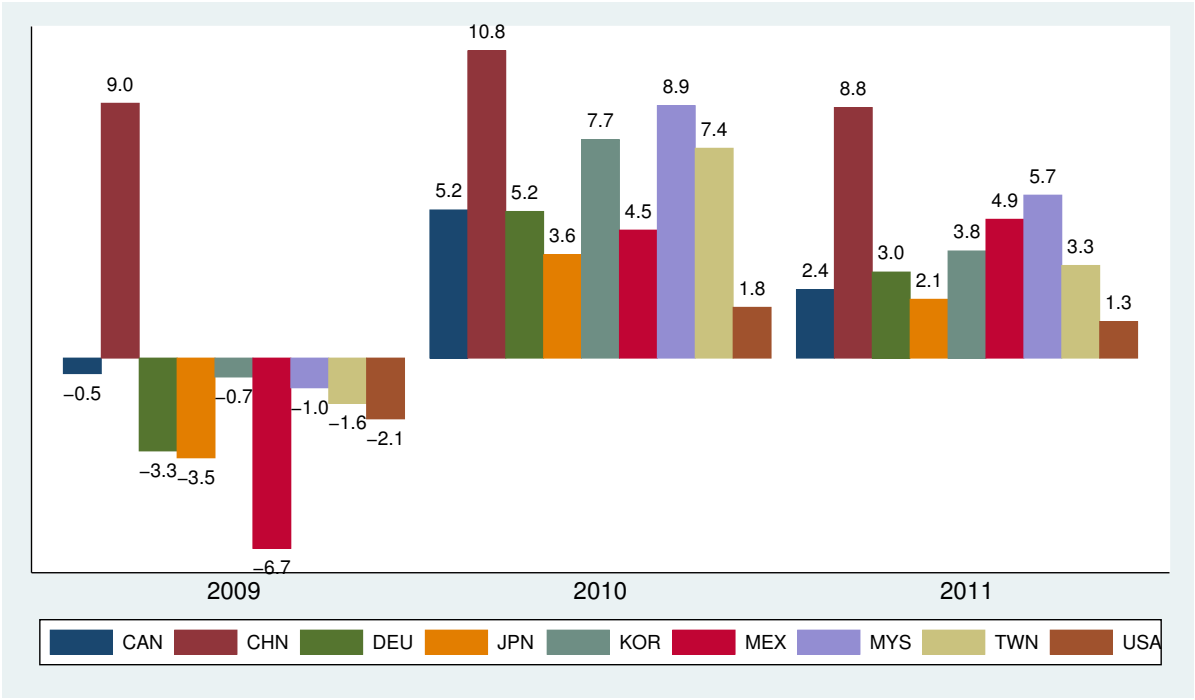
Figure 6: Elasticity of GDP to Chinese Final Expenditure on All Products



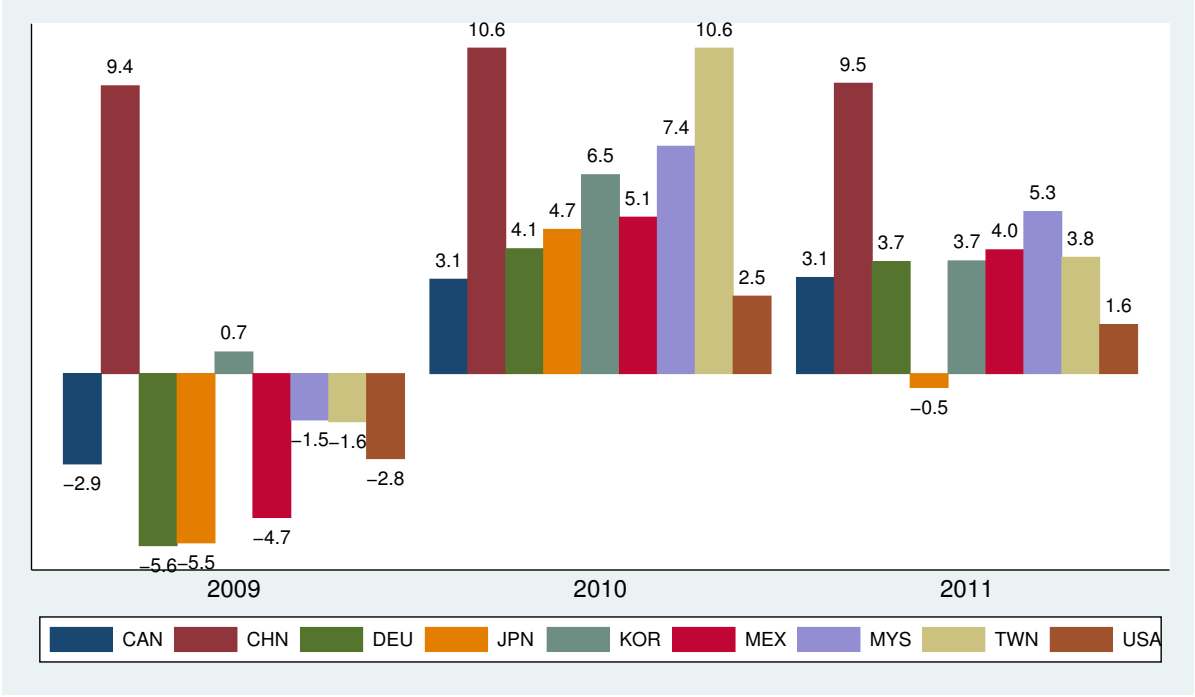
Notes: The values are the GDP growth rates induced by the 10% increases of Chinese final expenditure on all products.

Figure 7: Comparison between Estimated vs. Actual GDP Growth Rates

(a) Estimated GDP Growth Rates

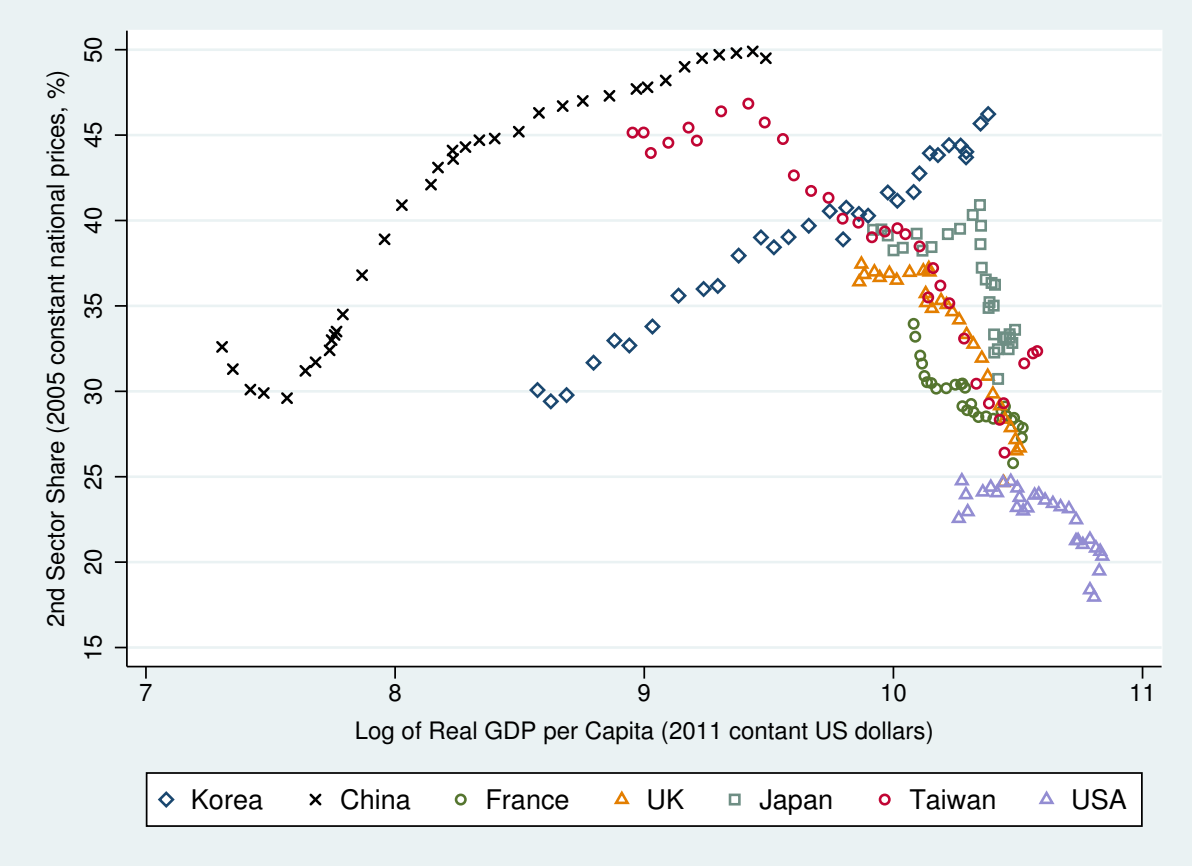


(b) Actual GDP Growth Rates



Sources: (a) author's calculation. (b) China: the CEIC China Premium, Taiwan: National Statistics, Republic of China, all other countries: World Development Indicator

Figure 8: Relationship between GDP per capita and the Secondary Industry Share in GDP



Sources: China: the CEIC China Premium, all other countries: The Madison Project database for GDP per capita and GGDC 10-Sector database for the 2nd industry shares.
Notes: The secondary sector includes manufacturing and utilities & construction. The sample period ranges from 1970 to 2015 for China. For all other countries, the different sample periods between 1970 and 2012 are applied.

Table 1: Elasticity of GDP to China's Final Expenditure by Product Group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Nondurables		Durables		Util & Cons.		Services		All Products	
Country	1995	2010	1995	2010	1995	2010	1995	2010	1995	2010
Taiwan	0.05	0.09	0.07	0.52	0.02	0.13	0.04	0.26	0.18	1.00
Malaysia	0.06	0.17	0.02	0.31	0.01	0.12	0.03	0.23	0.12	0.83
Korea	0.03	0.06	0.03	0.32	0.01	0.09	0.02	0.13	0.09	0.61
Chile	0.01	0.07	0.01	0.19	0.01	0.17	0.02	0.09	0.05	0.52
Vietnam	0.05	0.11	0.01	0.11	0.01	0.07	0.02	0.13	0.10	0.42
Australia	0.02	0.09	0.01	0.11	0.01	0.10	0.01	0.10	0.05	0.40
Philippines	0.01	0.04	0.01	0.20	0.01	0.06	0.01	0.09	0.04	0.38
Indonesia	0.02	0.07	0.01	0.08	0.01	0.05	0.01	0.06	0.05	0.26
Japan	0.00	0.02	0.01	0.12	0.00	0.03	0.01	0.05	0.03	0.21
Russia	0.02	0.04	0.02	0.05	0.01	0.04	0.01	0.04	0.06	0.17
Germany	0.00	0.01	0.01	0.10	0.00	0.03	0.00	0.03	0.02	0.17
Brazil	0.01	0.04	0.00	0.03	0.00	0.03	0.00	0.03	0.01	0.14
India	0.00	0.03	0.00	0.03	0.00	0.03	0.00	0.04	0.01	0.13
Canada	0.01	0.02	0.01	0.03	0.00	0.02	0.01	0.02	0.03	0.08
UK	0.00	0.01	0.01	0.03	0.00	0.01	0.00	0.02	0.02	0.07
France	0.00	0.01	0.01	0.03	0.00	0.01	0.00	0.01	0.01	0.07
US	0.00	0.01	0.00	0.03	0.00	0.01	0.00	0.02	0.01	0.07
Italy	0.00	0.01	0.01	0.03	0.00	0.01	0.00	0.01	0.02	0.07
Mexico	0.00	0.01	0.00	0.02	0.00	0.01	0.00	0.01	0.01	0.05
Spain	0.00	0.01	0.01	0.02	0.00	0.01	0.00	0.01	0.01	0.04

Table 2: Elasticity of GDP to the US Final Expenditure by Product Group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Nondurables		Durables		Util & Cons.		Services		All Products	
Country	1995	2010	1995	2010	1995	2010	1995	2010	1995	2010
Canada	0.37	0.35	0.51	0.26	0.17	0.11	0.67	0.61	1.73	1.34
Mexico	0.27	0.27	0.40	0.38	0.13	0.11	0.53	0.50	1.33	1.25
Vietnam	0.06	0.31	0.03	0.13	0.01	0.03	0.09	0.36	0.18	0.83
Taiwan	0.17	0.10	0.32	0.32	0.07	0.04	0.35	0.34	0.90	0.79
Malaysia	0.14	0.13	0.33	0.25	0.06	0.03	0.34	0.32	0.87	0.73
Korea	0.11	0.07	0.19	0.24	0.03	0.03	0.21	0.24	0.55	0.58
Chile	0.10	0.13	0.07	0.12	0.03	0.04	0.17	0.19	0.37	0.47
Philippines	0.16	0.10	0.18	0.14	0.03	0.02	0.34	0.20	0.71	0.46
UK	0.06	0.07	0.09	0.06	0.03	0.02	0.19	0.29	0.36	0.45
China	0.08	0.08	0.07	0.13	0.02	0.02	0.13	0.18	0.30	0.41
Germany	0.03	0.05	0.07	0.11	0.02	0.02	0.09	0.15	0.21	0.32
India	0.07	0.06	0.04	0.07	0.01	0.01	0.10	0.18	0.22	0.32
Indonesia	0.13	0.10	0.07	0.06	0.03	0.01	0.15	0.11	0.37	0.28
Russia	0.05	0.09	0.07	0.04	0.02	0.03	0.09	0.13	0.23	0.28
Japan	0.02	0.03	0.11	0.12	0.02	0.01	0.10	0.12	0.25	0.27
France	0.03	0.04	0.05	0.05	0.01	0.01	0.08	0.11	0.17	0.21
Italy	0.06	0.05	0.06	0.05	0.02	0.01	0.11	0.10	0.25	0.21
Australia	0.05	0.04	0.04	0.04	0.01	0.01	0.09	0.09	0.19	0.19
Brazil	0.04	0.05	0.03	0.03	0.01	0.01	0.07	0.08	0.15	0.17
Spain	0.03	0.03	0.03	0.03	0.01	0.01	0.06	0.10	0.12	0.17

Table 3: Induced GDP Growth Rates by China's Final Expenditure Growth

Country	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Estimated Growth Rates			3-Years Average				
	2009	2010	2011 (equal 10.3%)	NDR	DUR	U&C	SVC	All
Taiwan	0.87	1.33	1.42 (1.03)	0.08	0.80	0.15	0.18	1.21
Malaysia	0.66	1.09	1.04 (0.85)	0.17	0.47	0.12	0.17	0.93
Korea	0.60	0.87	0.84 (0.63)	0.06	0.51	0.11	0.10	0.77
Chile	0.45	0.62	0.58 (0.53)	0.07	0.27	0.16	0.06	0.55
Philippines	0.37	0.57	0.54 (0.44)	0.03	0.33	0.06	0.07	0.49
Vietnam	0.39	0.49	0.47 (0.41)	0.10	0.18	0.08	0.09	0.45
Australia	0.37	0.42	0.44 (0.39)	0.07	0.17	0.10	0.07	0.41
Indonesia	0.27	0.31	0.29 (0.27)	0.07	0.12	0.06	0.05	0.29
Japan	0.27	0.27	0.28 (0.22)	0.02	0.19	0.04	0.03	0.28
Germany	0.22	0.22	0.21 (0.18)	0.01	0.16	0.03	0.02	0.22
Russia	0.19	0.21	0.19 (0.17)	0.03	0.09	0.05	0.03	0.20
Brazil	0.14	0.16	0.14 (0.14)	0.04	0.05	0.03	0.02	0.15
India	0.13	0.14	0.14 (0.13)	0.02	0.06	0.03	0.03	0.14
Canada	0.09	0.11	0.10 (0.09)	0.02	0.05	0.02	0.01	0.10
France	0.09	0.08	0.08 (0.07)	0.01	0.05	0.01	0.01	0.09
UK	0.07	0.08	0.09 (0.07)	0.01	0.05	0.01	0.01	0.08
Italy	0.08	0.08	0.08 (0.07)	0.01	0.05	0.01	0.01	0.08
US	0.06	0.08	0.08 (0.07)	0.01	0.04	0.01	0.01	0.07
Mexico	0.04	0.06	0.06 (0.06)	0.01	0.03	0.01	0.01	0.05
Spain	0.05	0.04	0.05 (0.05)	0.01	0.03	0.01	0.01	0.05

Notes: NDR: Nondurables, DUR: Durables, U&C: Utilities & Construction, SVC: Services.

Table 4: Induced GDP Growth Rates by the Final Expenditure Growth in the World

	2009				2010				2011			
Country	China	US	World	Actual	China	US	World	Actual	China	US	World	Actual
Australia	0.37	-0.11	2.1	1.8	0.42	0.07	5.1	2.0	0.44	0.03	5.7	2.4
Brazil	0.14	-0.14	1.5	-0.1	0.16	0.07	8.0	7.5	0.14	0.02	3.7	3.9
Canada	0.09	-0.84	-0.6	-2.9	0.11	0.59	5.3	3.1	0.10	0.19	2.4	3.1
Chile	0.45	-0.29	-3.4	-1.0	0.62	0.20	11.2	5.8	0.58	0.07	8.4	5.8
China	10.4	-0.39	9.0	9.4	9.52	0.24	10.8	10.6	8.17	0.08	8.8	9.5
France	0.09	-0.12	-1.6	-2.9	0.08	0.08	3.6	2.0	0.08	0.03	1.7	2.1
Germany	0.22	-0.29	-3.3	-5.6	0.22	0.23	5.2	4.1	0.21	0.09	3.0	3.7
India	0.13	-0.16	7.0	8.5	0.14	0.13	9.6	10.3	0.14	0.05	6.8	6.6
Indonesia	0.27	-0.17	0.3	4.6	0.31	0.12	8.3	6.2	0.29	0.02	7.5	6.2
Italy	0.08	-0.16	-3.3	-5.5	0.08	0.10	1.6	1.7	0.08	0.04	-0.3	0.6
Japan	0.27	-0.35	-4.0	-5.5	0.27	0.24	3.6	4.7	0.28	0.10	1.1	-0.5
Korea	0.60	-0.52	-0.6	0.7	0.87	0.51	7.7	6.5	0.84	0.17	3.8	3.7
Malaysia	0.66	-0.51	-0.9	-1.5	1.09	0.46	8.9	7.4	1.04	0.13	5.7	5.3
Mexico	0.04	-0.88	-6.7	-4.7	0.06	0.82	4.6	5.1	0.06	0.29	4.9	4.0
Philippines	0.37	-0.32	1.4	1.1	0.57	0.27	7.3	7.6	0.54	0.07	4.6	3.7
Russia	0.19	-0.10	-6.1	-7.8	0.21	0.06	6.1	4.5	0.19	0.00	4.7	4.3
Spain	0.05	-0.08	-4.5	-3.6	0.04	0.06	-0.8	0.0	0.05	0.03	-2.0	-1.0
Taiwan	0.87	-0.61	-1.5	-1.6	1.33	0.54	7.5	10.6	1.42	0.18	3.3	3.8
UK	0.07	-0.19	-3.5	-4.2	0.08	0.16	5.0	1.5	0.09	0.07	-0.1	2.0
US	0.06	-2.70	-2.5	-2.8	0.08	1.96	2.4	2.5	0.08	1.69	1.6	1.6
Vietnam	0.39	-0.41	2.2	5.4	0.49	0.29	6.0	6.4	0.47	0.06	5.2	6.2

Notes: The column "World" shows the induced GDP growth rates by the final expenditure growth in the world, while "Actual" shows the actual GDP growth rates (source: World Development Indicator).

Table A1: Sector Classification in the ICIO Table and This Study

ICIO Table		Our Classification	
Sector Code	Sector Name	Level 2	Level 1
C01T05AGR	Agriculture, Forestry & Fishing	AGR.MIN	Nondurables
C10T14MIN	Mining		
C15T16FOD	Food	FOD	
C17T19TEX	Textiles	TEX	
C20WOD	Wood	WOD.PAP	
C21T22PAP	Paper & Publishing		
C23PET	Petroleum	PET.CHM	
C24CHM	Chemicals		
C25RBP	Rubber & Plastic		
C26NMM	Non-metallic Mineral	MET.MEQ	Durables
C27MET	Basic Metals		
C28FBM	Fabricated Metals		
C29MEQ	Machinery & Equipment, nec		
C30.32.33CEQ	Computer & Electronic Equipment	CEQ	
C31ELQ	Electrical Equipment	ELQ	
C34MTR	Automobile	MTR	
C35TRQ	Other Transport Equipment	OTM	
C36T37OTM	Manufacturing, nec		
C40T41EGW	Utilities	EGW.CON	Utilities & Construction
C45CON	Construction		
C50T52WRT	Wholesale & Retail Trade	WRT.HTR	Services
C55HTR	Hotels & Restaurants		
C60T63TRN	Transport Service	TRN.PTL	
C64PTL	Post & Telecommunication		
C65T67FIN	Finance & Insurance	FIN	
C70REA	Real Estate	REA	
C71RMQ	Renting	BZS	
C72ITS	Information Technology Service		
C73T74BZS	Business services		
C75GOV	Government Service	OTS	
C80EDU	Education		
C85HTH	Health and social work		
C90T93OTS	Community Service		
C95PVH	Private service		

Source: OECD Inter-Country Input-Output Table

Table A2: Induced GDP Growth Rates by China's Final Expenditure Growth (without Assumption 3)

Country	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Estimated Growth Rates			3-Years Average				
	2009	2010	2011	NDR	DUR	U&C	SVC	All
Taiwan	0.50	2.33	1.23	0.09	0.77	0.15	0.35	1.35
Malaysia	0.51	1.40	1.08	0.19	0.53	0.12	0.16	1.00
Korea	0.51	1.11	0.77	0.06	0.53	0.11	0.10	0.80
Vietnam	0.55	0.60	1.03	0.18	0.23	0.08	0.23	0.73
Chile	0.29	0.82	0.61	0.08	0.27	0.15	0.08	0.57
Australia	0.27	0.51	0.54	0.10	0.16	0.10	0.07	0.44
Indonesia	0.11	0.38	0.41	0.08	0.12	0.06	0.05	0.30
Philippines	0.09	0.54	0.26	0.05	0.13	0.06	0.06	0.30
Japan	0.09	0.40	0.23	0.01	0.16	0.04	0.03	0.24
Germany	0.08	0.25	0.28	0.01	0.14	0.03	0.02	0.20
Russia	0.16	0.20	0.24	0.04	0.09	0.05	0.03	0.20
India	0.15	0.21	0.18	0.03	0.07	0.03	0.05	0.18
Brazil	0.08	0.21	0.21	0.05	0.05	0.03	0.03	0.17
Canada	0.09	0.13	0.12	0.02	0.05	0.02	0.02	0.11
UK	0.03	0.11	0.11	0.01	0.05	0.01	0.01	0.08
Italy	0.03	0.10	0.11	0.01	0.05	0.01	0.01	0.08
France	0.01	0.11	0.10	0.01	0.04	0.01	0.01	0.07
Mexico	0.04	0.08	0.08	0.01	0.03	0.01	0.01	0.07
US	0.03	0.11	0.05	0.01	0.03	0.01	0.01	0.06
Spain	0.02	0.06	0.07	0.01	0.03	0.01	0.01	0.05

Notes: NDR: Nondurables, DUR: Durables, U&C: Utilities & Construction, SVC: Services.