Demand for Manufacturing Imports in China

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Fluctuations in Chinese imports are often viewed by analysts as containing information about domestic demand in China. However, identifying the extent to which imports of manufactured goods depend on domestic demand is difficult given the integration of Chinese trade in regional manufacturing supply networks. This article analyses Chinese imports of manufactured goods and assesses whether the determinants of manufactured goods imports have changed over the past few years. Over time, imports have declined as a share of Chinese sales of manufactured goods and appear to have become less affected by domestic demand and instead become more sensitive to exports.

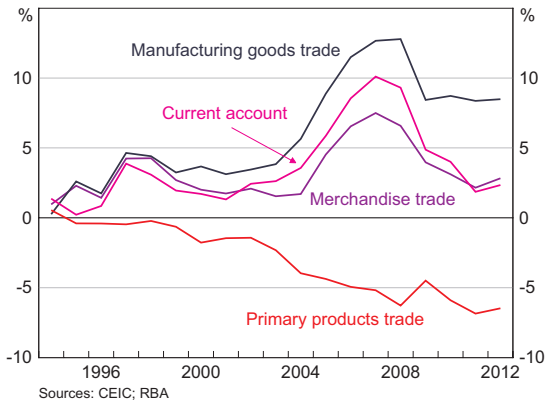
Introduction

China has emerged as a major global trading nation since its accession to the World Trade Organization (WTO) in 2001. The expansion of the traded goods sector has been important for China's industrialisation and growth, with net exports having made a significant contribution to the expansion in output in the Chinese economy since then. Analysts routinely examine Chinese export data as a means of gauging the strength of global demand. At the same time, Chinese imports are often considered to provide information on the strength of domestic demand in the Chinese economy. However, such an analysis misses the fact that some imports are also used as intermediate inputs for the production of exports. Thus, to some extent, imports will also reflect the strength of demand from China's export partners.

China imports a mix of primary products, manufactured goods and services, and predominately exports manufactured goods. Consequently, China has traditionally exported more manufactured goods than it imports, while it imports more primary products and services than it exports (Graph 1). Since reaching a peak around the time of the onset of the global financial crisis, China's trade surplus has declined as a share of GDP, from around 8 per cent in 2008 to around 4 per cent in 2012. Consistent with this, net exports have made little contribution to growth in recent years.

The decline in the trade surplus reflects, at least in part, the effect of subdued global demand on Chinese exports, while import growth has been supported by the relative strength of Chinese demand. In particular,

Graph 1
China – Trade Balance
Share of GDP



Sources: CEIC; RBA

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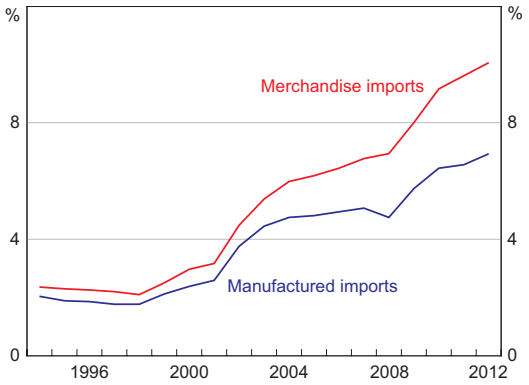
imports of primary resources, which tend to be driven by investment demand, have grown strongly in recent years. However, China's manufactured goods imports, which are affected by both domestic demand and export demand, have not kept pace with China's imports of goods more generally or the economy since the early 2000s (Graph 2). China's integration in global and regional manufacturing supply chains means that a proportion of manufactured goods imports are directly linked to export demand. But many manufactured goods destined for the domestic market also use imported manufactured inputs. Understanding the significance of these two sources of demand is useful for interpreting overall import demand.

Graph 2
China – Imports
Values, share of global imports



Sources: Thomson Reuters; United Nations COMTRADE database

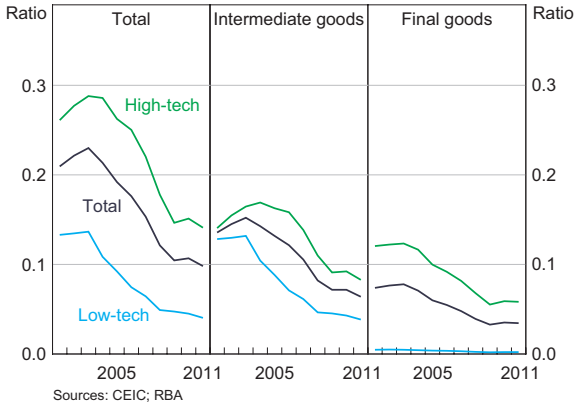
The development of international supply chains may have affected China's processing trade and its demand for imported manufactured goods in different ways. On the one hand, as domestic firms improve their product quality and production capacity over time, firms based in China may decide to source more of their intermediate inputs domestically. This would accord with the government's stated aim to increase the domestic value-added content in production. On the other hand, reductions in the country's trade barriers, and the existence of lower-cost labour in neighbouring economies, may have encouraged firms to use more imported inputs.

This article seeks to illustrate changes in imports of manufactured goods in China and assess whether the determinants of manufactured goods imports have changed recently. The article also evaluates whether any changes are uniform across production stages (intermediate and final goods), as well as the level of technological sophistication of an industry. Overall, Chinese manufacturing production appears to have become less dependent on imports of manufactured goods in recent years. Panel regressions indicate that China's manufactured goods imports have become more closely correlated with exports and less correlated with domestic demand over time, controlling for other factors.

Manufactured Goods Imports and Manufacturing Sales

To study the relationship between manufactured goods imports, exports and domestic demand, it is helpful to start by considering the size of manufactured imports relative to total Chinese sales of manufactured goods, which includes both export and domestic sales. Relative to total sales of manufactured goods, Chinese manufactured imports have declined significantly over the past decade (Graph 3). This decline in the import intensity of sales is largely explained by the decline in intermediate goods imports relative to sales, although imports

Graph 3
China – Manufacturing Goods Import Ratios
Ratio of imports to manufacturing sales



Sources: CEIC; RBA

of final goods have also declined relative to sales.[1] The decline in import intensity does not appear to be due to compositional change across industries, with the decline in import intensity broad based across most of the 16 key manufacturing industries, covering both 'high-tech' and 'low-tech' industries.[2] At face value, these data suggest that Chinese production has become less reliant on the use of imported intermediate goods and that the domestic economy has been able to supply more of the final goods sold domestically.

Intermediate goods imports would be expected to have a strong link to both exports and domestic demand since these inputs are typically transformed into other goods and sold both domestically and abroad. Final goods are more likely to be consumed domestically, but they can also have a link to exports. In some cases, goods classified as final goods may actually be used as components in other products, or alternatively, some imported final goods will be capital equipment that is used in production to satisfy export demand. The next section uses a panel regression framework to model the relationship between Chinese imports of manufactured goods and Chinese export and domestic demand.

Panel Regressions

To further explore the relationship between imports, exports and domestic demand, industry-specific panel regressions are estimated, covering the period 2001–2011 for the 16 manufacturing industries. While the sample period is relatively short, and only incorporates data after China's accession to the WTO, this may be an advantage as earlier studies have found a structural break around the WTO entry (Garcia-Herrero and Koivu 2007; Aziz and Li 2008).

A standard equation for imports of industry j (M_{jt}) is estimated, where the explanatory variables are exports (X_{jt}), domestic demand (DD_{jt}) and the real exchange rate (XR_{jt}):[3]

$$M_{jt} = c + \alpha X_{jt} + \beta DD_{jt} + \delta XR_{jt} + (\eta_j + T_t + \varepsilon_{jt}) \quad (1)$$

where t denotes time.[4] All variables are in natural logarithms (see Appendix A for data details); c is a constant term, the coefficients α, β, and δ capture the influence of exports, domestic demand and the exchange rate on imports. Both industry and time effects (η_j and T_t) are included, while ε_{jt} denotes a residual idiosyncratic error term.[5] This specification assumes that imports in one industry are primarily related to exports and domestic demand for the same industry, and are not related to the demand conditions in other industries. Although this is a relatively strong assumption, investigation of the World Input-Output database suggests that production processes are relatively confined within the broad industry categories used here and that inter-industry production spillovers are relatively small.

The first column of Table 1 shows the results of estimating regression (1) for total manufactured goods imports over the full sample. As expected, both exports and domestic demand have a positive effect on imports. Column 1 shows that a 1 per cent increase in the level of exports is associated with an increase in imports of 0.35 per cent, while a 1 per cent increase in the level of domestic demand is associated with an increase in the level of imports

1 This article follows Gaulier, Lemoine and Ünal (2011) in the categorisation of intermediate and final goods. Broad Economic Categories (BEC) 121, 22, 322, 42 and 53 are considered intermediate goods, while BEC 112, 122, 41, 51, 521, 522, 61, 62 and 63 are considered final goods.

2 The industry categories used in this article are textiles, wood, furniture, paper and paper products, pharmaceuticals, chemicals, non-metallic mineral products, ferrous metals, non-ferrous metals, general equipment, transport equipment, electrical machinery, computers and other electronics, metal products, rubber products and special equipment. This article follows the OECD categorisation by considering pharmaceuticals, chemical, electrical machinery, transport equipment, computers and electronic equipment, general equipment and special equipment as high-tech. The remaining industries are considered low-tech. See Hatzichronoglou (1997) and OECD (2005).

3 While data on imports and exports at the industry level are readily available, industry-specific domestic demand is more difficult to measure. For the analysis in this article, a proxy is constructed by using the National Bureau of Statistics of China industrial survey to subtract exports from total industrial sales.

4 The regressions also include one lead and lag of the first difference of the explanatory variables in order to ensure the coefficient standard errors are more efficient (Stock and Watson 1993). The regression results are qualitatively similar when we include the value of industrial inventories as an explanatory variable.

5 Statistical tests confirm the presence of unit roots and cointegration among the time series in the panel.

of 0.55 per cent. The exchange rate does not have a statistically significant effect on imports.

In order to assess whether the relationship has changed over the sample period, a dummy variable – $D_{Post\ 2005,t}$ – is included. The dummy is equal to 1 if the period is after 2005 and 0 otherwise. It interacts with the export and domestic demand variables. Equation (1) is transformed to:

$$M_{jt} = c + (\alpha_1 + \alpha_2 * D_{Post\ 2005,t})X_{jt} + (\beta_1 + \beta_2 * D_{Post\ 2005,t})DD_{jt} + \delta XR_{jt} + (\eta_j + T_t + \varepsilon_{jt}) \quad (2)$$

The results are presented in the second column of Table 1. The coefficient on the interaction term provides the marginal impact of a shock to export or domestic demand over the more recent period *compared with* the impact over the first period. Exports have a stronger impact on imports since 2005, with the interaction term being positive and statistically significant; a 1 per cent increase in the level of exports increases the level of imports by 0.49 per cent after 2005, compared with only 0.32 per cent for the period up to 2005. Conversely, domestic demand appears to have had a weaker effect on manufactured goods imports in more recent years.

The interaction term with domestic demand is negative and statistically significant, implying that a 1 per cent increase in domestic demand results in a 0.80 per cent increase in imports over the more recent period, compared with 0.96 per cent over the earlier period. When estimated with fixed effects, the main results are qualitatively similar (Table 1, Columns 3 and 4). The coefficients are estimated less precisely; however, the interaction terms are both significant at the 1 per cent level.[6]

The finding that imports have become more sensitive to changes in exports in recent years can be compared with the preceding analysis, which suggests that imports have fallen in magnitude relative to manufacturing sales. Together, these results suggest that while the value of manufactured goods imports has fallen as a share of manufacturing sales, imports have become more sensitive to changes in exports. It is worth noting that export growth slowed dramatically during the global financial crisis, whereas domestic demand growth remained relatively stable. In terms of contributions to demand for imports, the increase in the sensitivity of import demand to exports is offset by the fact that exports have grown less rapidly since the global financial crisis.

Table 1: Panel Regression Results
Total imports, 2001–2011

	Random effects		Fixed effects[(a)]	
	(1)	(2)	(3)	(4)
X_{jt}	0.35**	0.32**	0.20	0.05
$X_{jt} * D_{Post\ 2005,\ t}$		0.17***		0.18***
DD_{jt}	0.55**	0.96***	0.22	0.33*
$DD_{jt} * D_{Post\ 2005,\ t}$		–0.16*		–0.15***
XR_{jt}	–0.97	–1.21	–1.32	–1.35
Observations	128	128	128	128

Notes: *,**,*** represent statistical significance at the 10, 5 and 1 per cent levels, respectively
(a) Time fixed effects are dropped from the estimation as they were found to be jointly insignificant
Source: RBA

6 The Hausman test indicates that random effects estimators can be used. However, to allow for the fact that idiosyncratic industry effects may not be orthogonal to the explanatory variables, the models are also estimated using fixed effects. It is a standard result for the standard errors of the estimated coefficients to increase when using fixed effects estimators (Wooldridge 2002).

Some Extensions

Intermediate and final goods imports

Given that the drivers of imports might vary across production stages, the panel regression is also estimated separately for imports of intermediate goods and imports of final goods (consumption goods and capital goods). Since trade processing is widespread, with China assembling imported intermediate goods and exporting final goods, it might be expected that exports would have a larger impact on intermediate goods' imports compared with final goods. Table B1 in Appendix B suggests that exports are indeed more closely associated with imports in the case of intermediate goods when compared with final goods, but the estimates are imprecise. In line with the results for total imports, the results in Table B1 suggest that for the two types of goods, the impact of exports has increased over the recent period while the influence of domestic demand has declined.

Technological sophistication

Another extension is to consider whether imports of products by industries with different levels of technological sophistication have responded differently to changes in foreign and domestic demand. It is reasonable to expect that the more sophisticated a product is, the harder it is to find a comparable substitute domestically. This would result in both domestic demand and exports being associated with a higher level of imports for high-tech industries. Moreover, given the government's objective to increase domestic production of high-tech industries, it could be expected that the relationship of both export and domestic demand to imports would have diminished more for these industries compared with the others. Graph 3 supports this hypothesis, with the value of imports relative to manufacturing sales declining more for the high-tech than for the low-tech industries. To consider the question in the panel regression framework, an interaction term equal to 1 if the industry is designated 'high-tech' and 0 otherwise is added to the model. No significant interaction between either exports or domestic demand and the 'high-tech' dummy is found, and this result does not change in the post-2005 period. This suggests that the processes driving the decline in import intensity across industries has been relatively uniform across industries.

Conclusion

The imported content of Chinese manufactured goods sales has declined over the past decade. This suggests that as China has developed, Chinese firms have increasingly produced intermediate and final goods that previously would have been imported. Results from panel regressions indicate that while an increase in domestic demand now has a smaller impact on manufactured goods imports than in the past, an increase in exports has a larger effect on these imports. Over the period of interest, domestic demand growth was relatively stable, while export growth slowed dramatically during the global financial crisis. So, although manufactured goods imports have become less sensitive to changes in domestic demand, domestic demand has continued to have a significant and positive effect on imports of manufactured goods.

Appendix A

Total export and import data at the two-digit level based on Standard International Trade Classification revision 3 are drawn from the United Nations Comtrade Database. These trade data are converted into renminbi. Given that trade prices are only available from 2005 onwards, a price index is estimated for the period 2001–2004. The monthly change in export prices is correlated with the change in China's producer price index (PPI) and import prices are correlated with the unit value of Hong Kong's exports to China (correlation coefficients of 0.49 and 0.33, respectively, on average across industries). Therefore, for export prices, a monthly regression of export prices over the industry-specific PPI is estimated. Based on the estimated

coefficients, a proxy for export prices before 2005 is generated. For import prices, a similar method is used, regressing import prices on Hong Kong export unit values to China, as well as sector-specific total Hong Kong export unit values.[7]

A proxy for industry-specific domestic demand is created by subtracting export sales from total industrial sales using the National Bureau of Statistics of China industrial survey. However, this measure of domestic demand should not be interpreted as final demand given that an industry could be producing goods used as intermediate inputs in another industry. This should not be a problem for the analysis as long as inter-industry linkages have remained broadly constant over time. The World Input-Output Database suggests that for the period 2001–2009 this is indeed the case.[8]

Domestic demand is deflated using an industry-specific producer price index. An industry-specific real effective exchange rate is constructed using Chinese bilateral nominal exchange rates with its 12 largest trading partners.[9] These nominal bilateral exchange rates are transformed into real terms using relative PPI prices. The industry-specific real effective exchange rate is created as follows:

$$XR_{jt} = \sum_{i=1}^{12} a_{jt} * S_{it} * \left(\frac{PPI_{it}}{PPI_{China,t}}\right) \quad \text{(A1)}$$

where XR_j is the real effective exchange rate specific to industry j, a_{jt} is the share of partner i in imports by industry j, S_{it} is amount of RMB per unit of currency from country i, PPI_{it} is the level of producer prices in country i and $PPI_{China,t}$ is the level of Chinese producer prices.[10]

Appendix B

Table B1: Panel Regression Results
Intermediate and final goods imports, 2001–2011

	Intermediate				Final Goods	
	Random effects		Fixed effects[(a)]		Fixed effects[(a)]	
	(1)	(2)	(3)	(4)	(5)	(6)
X_{jt}	0.34*	0.37**	0.22	0.13	0.09	0.02
$X_{jt} * D_{Post\ 2005,\ t}$		0.13**		0.14**		0.07
DD_{jt}	0.54**	0.63***	0.29	0.29*	0.37***	0.43***
$DD_{jt} * D_{Post\ 2005,\ t}$		–0.13		–0.12***		–0.06
XR_{jt}	–1.52	–0.60	–1.45	–1.25	–0.57	–0.60
Observations	128	128	128	128	112	112

Notes: *,**,*** represent statistical significance at the 10, 5 and 1 per cent levels, respectively; final goods data cover only 14 industries as two industries do not include final goods; Hausman test results indicate random effects estimators should not be used for final goods

(a) Time fixed effects are dropped from the estimation as they were found to be jointly insignificant

Source: RBA

7 As a robustness check, only Chinese industry-specific PPI and Hong Kong export prices were used to proxy for export and import prices over the full period. The results were largely unchanged.

8 The main exception is the chemical industry, which has become more important for other industries over time. Excluding this industry, the conclusions were unchanged.

9 This includes Australia, Brazil, euro area, India, Japan, Malaysia, Russia, Singapore, South Korea, Thailand and the United States. Hong Kong is excluded from the data in order to avoid dealing with specific issues related to re-exporting.

10 The results are largely unchanged if trade shares are used instead of import shares and CPIs are used instead of PPIs.

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