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ABSTRACT

We find that Chinese trade flows respond to economic activity and relative prices – as represented by a trade weighted exchange rate – but the relationships are not always precisely or robustly estimated. Chinese exports are generally well-behaved, rising with foreign GDP and decreasing as the Chinese renminbi (RMB) appreciates. However, the estimated income elasticity is sensitive to the treatment of time trends. Estimates of aggregate imports are more problematic. In many cases, Chinese aggregate imports actually rise in response to a RMB depreciation and decline with Chinese GDP. This is true even after accounting for the fact a substantial share of imports are subsequently incorporated into Chinese exports. We find that some of these counter-intuitive results are mitigated when we disaggregate the trade flows by customs type, commodity type, and the type of firm undertaking the transactions. However, for imports, we only obtain more reasonable estimates of elasticities when we allow for different import intensities for different components of aggregate demand (specifically, consumption versus investment), or when we include a relative productivity variable.

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1. Introduction

China's growing role in the world economy has sparked both envy and enmity. Her exporting prowess and ballooning trade surplus over the past decade have elicited charges of unfair competition. In some interpretations, China's current account surplus has been identified as the cause of the global financial crisis of 2008 (e.g., CEA, 2009). An often heard proposed remedy is that China should adjust its exchange rate policy to alleviate global imbalances. Policymakers of several countries, including the US, openly urge China to allow the Chinese currency, the renminbi (RMB), to appreciate at a faster rate in order to reduce its large trade surplus.

China, on the other hand, has resisted that pressure and has asserted that the RMB undervaluation is not a (main) cause of the recent global finance crisis and furthermore accelerated currency appreciation would do little to reduce trade imbalances. Even though the RMB has been allowed to appreciate since 2005 and – after a hiatus – again since 2010, China has maintained a policy of relatively stable exchanges rates over the last few decades.

Would an appreciation of the Chinese currency have mitigated the effects of global imbalances and averted the crisis? The answer depends a lot on the behavior of China's trade flows and whether these flows conform to the usual prescription that a more valuable currency implies a lower trade balance. Even when unattended by such concerns, there is a natural interest in the determinants of Chinese trade flows. This interest was only heightened when trade surpluses expanded in the mid-2000s, and once again as they rose again in the wake of the Great Recession.

The Chinese trade phenomenon poses a number of distinct questions. The first is whether Chinese exports have behaved in a distinctly odd manner; have they risen in line with foreign economic activity as expected, or have they risen more rapidly than expected? How have exchange rate changes, which many policymakers in the West have pinned their hopes of expenditure switching on, affected Chinese exports in the past, and how are they expected to affect exports going forward? Even more challenging questions relate to Chinese imports. First, why don't Chinese imports rise with GDP, as they would in an advanced economy? Second, why is it so difficult to find evidence that currency appreciation increases imports in China. In other words, why don't the usual rules apply to China?

Several hypotheses have been suggested in the literature. First, the large amount of processing trade obscures the usual effects; when a large share of the imported goods is used in exports, the usual activity variables, like GDP, might not be appropriate. In addition, exchange rates might have a muted effect if the share of domestic value added in Chinese exports is small.

Second, with a rapidly changing economic structure and different import intensities, aggregate import elasticities might exhibit instability. A similar argument could be applied to a changing structure of trade; different types of trade might respond differently to exchange rates. Once again, stable aggregate elasticity estimates might be difficult to obtain in such instances.

While these conjectures are not new, we believe a new study is justified by the recent drop off and resumption in Chinese imports and exports. The additional variation gives us hope that one can obtain more precise estimates of the relevant trade elasticities. Armed with these estimates, policymakers will be able to better calibrate their policies.

Looking backwards, this study can inform the question of whether policy could have mitigated the size of capital flows from China that fueled, according to some observers (CEA, 2009), the excesses that led to the financial crisis of 2008. If Chinese trade flows don't respond to exchange rate changes as normal flows do, then even a substantially appreciated RMB might not have resulted in smaller current account surpluses.

Looking forward, these empirical challenges motivate our analysis of Chinese trade flows. We examine the aggregate trade flows that others have examined, but in addition to disaggregating along the lines other have, we check other means of classification, in order to identify divergent behaviors.

To anticipate our results, we obtain several interesting findings. We find that Chinese multilateral trade flows do respond to relative prices – as represented by a trade weighted exchange rate – but that that relationship is not always precisely estimated. In addition, the direction of effects is different than expected a priori. For instance, we find that Chinese ordinary imports rise in response to a RMB depreciation. However, Chinese exports do appear to respond to RMB depreciation in the expected manner, as long as a supply variable is included. So, in this sense, Chinese trade is not exceptional.

2. Descriptive Analysis

Before embarking upon the formal data analysis, it's useful to review some of the data. The trade balance, expressed in US dollars, is shown Figure 1. The Chinese RMB trade weighted real exchange rate is also included in the figure (An increase in the real rate implies a RMB appreciation). It is quite evidenced that the trade balance expands remarkably around 2003, and rises in absolute terms and as a share of GDP until the Great Recession. There is a remarkably steep drop off during the recession, and then a resumption of the trade surplus. Also, note that after 2003, the RMB real exchange rate moves together with China's trade surplus.

Note over this period, there are a number of other important events, including the unification of separate exchange rates at the end of 1993, sharp declines in the import tariff rates starting in 1995, the East Asian crisis in 1997, and finally WTO accession in 2002.

Figure 2 illustrates the evolution of the aggregate import and export flows. It's clear that while both trade flows start growing rapidly in the 2000's, exports start pulling away from imports in 2005.

Figure 3 shows the breakdown between exports for processing and for ordinary trade; figure 4 presents the corresponding data for imports. This breakdown has often been used to account for the potentially different determinants of trade used for differing purposes. For exports, it is difficult to detect any noticeable breaks in the shares. However, for imports, there is a clear jump in the processing share in mid-1998; and in mid 2005, the processing share begins to rise steadily. The latter is notable in that it coincides with the widening in the trade balance.

Figures 5 and 6 display exports and imports by commodity type – but only at a very coarse level, namely manufactured goods versus primary products. While the value of primary exports has inched up, the primary export share has experienced a long and gradual decline of the 15 year period. On the other hand, primary goods have accounted for an increasing share of imports, with a pronounced trend appearing in 2002. There is a temporary jump in 2008, likely due to rising oil prices.

Finally, Figures7 and 8 exhibit the trade activity breakdown by type of firm. For both exports and imports, as expected, the state owned enterprise share declines, albeit more markedly for exports. And as expected, private firms become more important over time, but more substantially so for exports. Finally Foreign invested enterprises, while accounting for similar

shares by 2010, experienced much more of an increase in importance for exports. In other words, foreign owned enterprises have been particularly important in export growth.

With these observable changes in the magnitude and nature of Chinese trade, it would be unsurprising to find changes in the behavior of aggregate Chinese trade. Hence, studies based on earlier data, from the 1980's and early 1990's, would likely have little relevance for assessing the current responsiveness of Chinese trade to external and internal factors.

3. Trade Elasticities – Total Trade Data

3.1 The Exchange Rate Effect

Conventional wisdom holds that a trade surplus could be curbed by raising the value of the associated currency. However, standard economic analyses suggest that the exchange rate effect is more complicated than that laid out in the conventional wisdom. For instance, consider the elasticity approach that illustrates real exchange rate effects on trade balance.

Typically, the elasticities approach takes the exchange rate as exogenous to the trade flows. Then there are two effects emanating from an exchange rate change. One is the volume effect that captures the effect of revaluation on export and import volumes. Under normal circumstances, a revaluation discourages exports and promotes imports, and, thus, reduces trade surplus. The second effect is the value (price) effect, which measures the decrease in the domestic value of the initial import volume due to revaluation. A revaluation could reduce trade balance if the volume effect dominates the value effect, which is the Marshall-Lerner condition. When the Marshall-Lerner condition is satisfied, a revaluation results a deterioration of the trade balance and devaluation improves it.

The anecdotal evidence given in Figure 1, for example, suggests that the appreciation of the RMB may not lead to a reduction in China's trade balance. That is, the Marshall-Lerner condition may not hold for the China case. To be fair, the Marshall-Lerner condition is typically derived under specific assumptions – including the implicit assumption that the output is constant, and import and export supply elasticities are constant are perfectly elastic (the latter equivalent to saying the resource allocation can adjust according to the change in the trade pattern). Several of these assumptions are unlikely to hold for the Chinese economy in transition.

In the case of the Chinese trade flows, there is some reason to believe that the conventional elasticities approach is insufficient. An oft cited characteristic of the Chinese economy is its position in the global production chain. Since China plays an important role at the final phrase of the international production process, its trade flows might not be responsive to exchange rate changes.[1] Given the high degree of production fragmentation, an appreciation raises the relative price of exports, but lowers the price of inputs. The appreciation thus only affects the value added component of Chinese exports, and the net effect of a RMB appreciation on global imbalances could be ambiguous. Devereux and Genberg (2007), for example, use an analytical model to illustrate that an RMB depreciation will have an immediate perverse effect and little short-run effect on the current account balance.

3.2 Selected Chinese Trade Elasticity Estimates

There is a paucity of formal statistical analyses analyzing Chinese trade.[2] Kwack *et al.* (2007) uses a gravity model augmented with a CPI deflated real exchange rate to estimate elasticities over the 1984 to 2003 period. Using a panel of 29 developed and developing countries, he obtains a Chinese multilateral import price elasticity of 0.50 and an income elasticity of 1.57.[3]

Thorbecke and Smith (2007) do not directly examine the implications for both imports and exports, but do focus on the impact of RMB appreciation on exports, taking into account the integration of the production chain in the region. Using a sample of 33 countries over the 1994-2005 period, and a trade-weighted exchange rate that measures the impact of how bilateral exchange rates affect imported input prices, they find that a 10% RMB appreciation in the absence of changes in other East Asian currencies would result in a 3% decline in processed

[1] For real exchange rate movements and intermediate product trade, see Parsley and Popper (2010). See Wang and Wei (2010) for relatively high Chinese value added shares in Chinese exports.

[2] We review only studies published in the past five years. A survey of earlier studies is in Cheung, Chinn and Fujii (2010).

[3] Wang and Ji (2006) adopt a related approach, and find essentially zero effect of nominal exchange rates on Chinese imports and exports.

exports and an 11% decline in ordinary exports. If other East Asian currencies appreciated in line with the RMB, then the resulting change in the processed exports would be 9%.

Marquez and Schindler (2007) argue that the absence of useful price indices for Chinese imports and exports requires the adoption of an alternative model specification. They treat the variable of interest as world (import or export) trade shares, broken down into "ordinary" and "parts and components". Using monthly Chinese imports data from 1997 to July 2006, they find ordinary trade-share income "elasticities" ranging from -0.021 to -0.001 (i.e., the coefficients are *in the wrong direction*), and price "elasticities" from 0.013 to 0.021.[4] The parts and components price elasticities are in the wrong direction, and statistically significantly so. Interestingly, the stock of FDI matters in almost all cases. Since the FDI stock is a smooth trend, it is not clear whether to attribute the effect explicitly to the effect of FDI, or to other variables that may be trending upward over time, including productive capacity.

For export shares (ordinary goods), they find income elasticities ranging from 0.08 to 0.09, and price elasticities ranging from 0.08 to 0.068. For parts and components export share, the income coefficient ranges from a 0.042 to 0.049. Their preferred specification implies that a ten-percent real appreciation of the Chinese RMB reduces the Chinese trade balance between $75 billion and $92 billion.

Garcia-Herrero and Koivu (2007) come close to our approach. They examine data over the 1995-2005 period, breaking the data into ordinary and processing/parts imports and exports. They relate Chinese exports to the world imports and the real effective exchange rate, augmented by a proxy measure for the value-added tax rebate on exports, and a capacity utilization variable. In both import and export equations, the stock of FDI is included. One notable result they obtain is that for Chinese imports, the real exchange rate coefficient has a sign opposite of anticipated in the full sample.

One particularly interesting result they obtain is that post-WTO entry, Chinese income and price elasticities for exports rise considerably. On the import side, no such change is obvious with respect to the pre- and post-WTO period.

[4] Marquez and Schindler (2007) conjecture that this counterintuitive result arises from the role of state owned enterprises. They also observe that this result can occur under certain configurations of substitutability between imported and domestic goods.

In the bilateral vein, Mann and Plück (2007) investigate China-US trade. Using an error correction model specification applied to disaggregate bilateral data over the 1980-2004 period, they find extremely high income elasticities for US imports from China: for capital and consumer goods the estimated long run income elasticities are 10 and 4, respectively. The consumer good price elasticity is not statistically significant, while the capital good elasticity is implausibly high, around 10.[5] On the other hand, US exports to China have a relatively low income elasticity of 0.74 and 2.25 for capital and consumer goods, respectively. The price elasticity estimates are not statistically significant. In general, they have difficulty obtaining sensible coefficient estimates.

Thorbecke (2006) examines aggregate bilateral US-China data over the 1988-2005 period. Using both the Johansen maximum likelihood method, as well as the Stock-Watson (1993) dynamic OLS methodology, he finds statistically significant evidence of cointegration between incomes, real exchange rates and CPI-deflated trade flows.

US imports from China have a real exchange rate elasticity ranging from 0.4 to 1.28 (depending upon the number of leads and lags in the DOLS specification). The income elasticity ranges between 0.26 to 4.98. In all instances, substitution with ASEAN trade flows is accounted for by the inclusion of an ASEAN/Dollar real exchange rate. Interestingly, the income elasticities are not statistically significant, even when quantitatively large. For US exports to China, he obtains exchange rate elasticities ranging from 0.42 to 2.04, and income elasticities ranging from 1.05 to 1.21.

Ahmed (2009) examines a more recent period of Chinese data, and finds that Chinese exports respond fairly strongly to real exchange rate appreciation, at least when the relationship is estimated in first differences. The long run elasticity (in growth rates) is in excess of unity. On the other hand, they are unable to obtain sensible price elasticities for Chinese imports.

Finally, Aziz and Li (2008) document the tremendous compositional changes in Chinese trade flows in order to rationalize the use of disaggregate data. They find aggregate trade elasticities are varying over time due to both compositional shifts in types of goods, and variation in individual category elasticities.

[5] Mann and Plück (2007) use disaggregate US trade flow and price index data from BEA. The reported income elasticities are for matched expenditure series, e.g., investment activity as the income variable in a regression involving capital goods.

Their specifications involve activity variables, and relative productivity variables, and use dynamic OLS. Unlike our study, they rely upon prices of exports and imports as their price variable; that is they do not incorporate exchange rate changes, but take the prices of exports and imports as exogenously given.[6]

3.3 Estimation

First, let us consider Chinese trade flows with respect to the rest-of-the-world. We estimate the following equations, where the designations import and export are from the Chinese perspective,

$$ex_t = \beta_0 + \beta_1 y_t^* + \beta_2 r_t + \beta_3 z_t + u_{1,t}, \quad (1)$$

and

$$im_t = \gamma_0 + \gamma_1 y_t + \gamma_2 r_t + \gamma_3 w_t + u_{2,t}, \quad (2)$$

where y is an activity variable, r is the real value of the RMB, and z is a supply side variable. The variable w is a shift variable accounting for other factors that might increase import demand. Seasonal dummies are included. The empirical counterparts to these variables are described in Appendix 1.

Most of the variables in these specifications appear to be integrated of order one (see Appendix 2). Hence, the equations are estimated using the Stock-Watson (1993) dynamic OLS (DOLS) regression method, which is a single equation approach that yields a consistent and efficient OLS estimator of the cointegration relationship.[7] An interpretation of the reported estimates is that they represent the empirical long-run interactions between these variables. Thus, theoretical reasoning, rather the regression specification, is used to infer the causal links between

[6] Aziz and Li (2008) also examine differential behavior along customs classification, as we do, but do not pursue the differentiation along firm types. They also allow for productivity trends and evolving product sophistication in some of their regression specifications.

[7] While there are a number of methods for estimating the cointegrating relationships, we use this DOLS approach because it has been shown to be outperform other approaches such as error correction models, particularly in small samples (e.g., Inder (1993), Mantalvo (1995), Phillips and Hansen (1990)). Given the small sample, we also eschew the Johansen maximum likelihood multivariate approach.

these variables. For instance, it is conventionally assumed that the real exchange rate variable causes the trade volume variables. Also, because of China's role in the global supply chain, it is assumed that a fraction of imports is intermediate goods and its demand is driven by export activity.

In general, the estimated residuals obtained from the specification that has one lead and lag of first differences of the right hand side variables are quite well behaved. Stock and Watson suggest the inclusion of time trends.

For the dependent variables, we have collected data on Chinese exports and imports from as early as 1993, to 2010, on a monthly basis, which are then aggregated to the quarterly frequency. Note that we examine both aggregate and disaggregate trade flows. Disaggregation mitigates potential biases due to inappropriate aggregation, as noted by Berman et al. (forthcoming), and Dekle et al. (2011), among others.

One particularly difficult issue involves price deflators to use to convert nominal magnitudes into real. Until 2005, the Chinese did not report price indices for imports and exports; this limits the sample to one far too short to use in the analysis. Hence, we rely upon a variety of proxy measures, each with some drawbacks. Since the trade flows are reported in US dollars, the price measures we consider include the US PPI for finished goods, price indices from the World Bank[8], and Hong Kong re-export unit value indices. We only report results based upon the last deflator; the remaining results are qualitatively similar to those reported, and are available upon request.

Hong Kong is the most important entrepot for China trade. Given the paucity of the Chinese trade indexes, the Hong Kong unit value indices have typically been used in empirical analyses as proxy measures for Chinese trade (Cheung, 2005). In Cheung et al. (2010), the Hong Kong to China re-export unit value indices are used to deflate Chinese imports and the Hong Kong to US re-export unit value indices to deflate Chinese exports.

Our measure of the real RMB exchange rate is the IMF's CPI deflated trade-weighted index of the RMB against a broad basket of currencies. The results do not differ if one uses the BIS trade weighted index.

[8] Since the World Bank price indices are only available at the annual frequency, we interpolate the data to obtain quarterly values.

As one can see in Figure 1, before 1994, the trade weighted real value of the RMB based on official exchange rates was highly appreciated, and experiences a large discrete downward move in 1994M01. Some observers have characterized this as a massive devaluation; however, as Fernald, Edison and Loungani (1999) observe, many transactions were taking at "swap" rates, so that the relevant exchange rate was probably much weaker than the official rate. In order to circumvent difficulties in identifying the "correct" exchange rate value, we truncate the sample so as avoid pre-1994 exchange rate data. This means the regressions usually incorporate trade data starting in 1994Q3, in order to account for lags.

The IMF and BIS trade weighted indices are CPI deflated; while the CPI deflated real rate is a commonly used indicator of currency strength, in some ways one would want something more closely linked to firm competitiveness in the macroeconomic context, such as the PPI deflated or unit labor cost deflated real value of the RMB (see Chinn, 2006). Unfortunately, we don't have access to such measures for China.

For y^*, we use export-weighted real GDP in the rest-of-the-world, while y is measured using real GDP expressed in real RMB. For z, we rely upon several proxy variables, including the stock of fixed asset investment, and relative productivity.

3.4 Results

Table 1 presents the results for aggregate exports; the real value of the Chinese RMB is expressed so that an increase represents an appreciation. Hence, our expectation is that GDP should enter in with positive coefficient and the exchange rate with negative. In column 1, we find that indeed the exchange rate enters with a strongly and significantly negative coefficient, thus confirming the sensitivity of Chinese exports to exchange rate changes.

In addition, rest-of-world economic activity registers strongly positive, with a coefficient of around 1.4. This is true even though we have augmented the specification with a linear time trend. Had we omitted the trend, the coefficient on foreign output would have been around 2.2. In some sense, when we think of the tremendous growth in Chinese exports, only a small amount is being driven by the measured correlation with the world's income, and the rest is a trend increase in the Chinese exports, perhaps due to China increasing share of world exports, as well as the increasing export intensity of the world economy. That trend works out to a secular 16% annual growth over the sample period.

Our basic result is not sensitive to the inclusion of some obvious stationary covariates, including for instance the growth rate of credit. Typically, one thinks of credit as driving domestic demand, but we consider the possibility that the access to credit decreases the cost of acquiring working capital (column 3). While the coefficient is positive, it is not statistically significant.

Finally, we consider the role of structural breaks in the export relationship. Although we have conducted a number of univariate structural break tests, the results are inconclusive, and often point to differing dates, although many of them are around China's accession to the WTO. On a priori grounds, as well as suggestive statistical test results, we augment the regression with a dummy variable for WTO accession, and allow for a differential trend in the post-WTO period.[9]

The results are reported in Column 3. These results are interesting in that they indicate that the overall time trend was proxying for a trend in the post-WTO period. The income coefficient is now substantially higher.[10]

We now turn to imports. We initially estimated the import relationship over the same sample that we used for exports. However, a consistent finding when using this sample was a statistically significant and negative sign on the real exchange rate, contrary to expectations. That is, over the entire sample it appears that a stronger RMB causes less, not more, imports. Hence, we take seriously the structural break identified in our univariate tests, and truncate the sample to begin in the post WTO accession period. We report the results for aggregate imports in Table 2. In the basic specification (column 1), increases in Chinese GDP are associated with an increase in imports, with a particularly high elasticity of 3.2. In addition, an appreciated Chinese RMB induces a decrease in imports.

There has been much discussion of how much of Chinese imports are used as inputs for export. That is, China is one link in the integrated supply chain. Assuming Chinese imports are driven solely by demand by domestic Chinese households and firms would then be a mistake.

[9] The WTO accession dummy is set to equal 1 at 2002Q1 and thereafter.

[10] We also estimated regressions where our proxy for supply – namely the stock of capital – is included; these were not particularly successful, so we do not report the results.

One way to account for this aspect of the Chinese economy is to include exports as an independent variable.[11]

The results of this specification are reported in column 2. Exports enter in with the expected sign (and a near unit elasticity). The perverse coefficient on income is statistically significant, and the time trend now becomes statistically significant. We suspect this finding is due to the multicollinearity between GDP and the trend. However, we do obtain a positive and statistically and economically significant coefficient on the real exchange rate.

To sum up, on the export side, we have results that are basically in accord with conventional theory. On the import side, we have some quite surprising and difficult to explain results, unless we restrict the analysis to the post-WTO accession period. In addition, even the results for this truncated sample are sensitive to the treatment of trends. There are two ways to proceed. We can search out for additional variables that might eliminate these surprising results. Alternatively, we can disaggregate the data, in the hopes that analyses of individual trade categories will overturn the perverse results on the import side. And, on the export side, disaggregation might yield new insights.

4. Processing versus ordinary exports and imports

The Chinese customs agency categories exports and imports into those goods that are to be used for processing purposes, and those to be used as ordinary exports or imports. For instance, processing imports are usually for manufacturing finished products in China for (re-)exporting and these imports are usually subjected to more favorable tariff rates. In contrast, processing exports are exports that are used by the imported country for processing and assembly.

We first examine the behavior of exports in Table 3. Ordinary export results are on the left hand side, while processing export results are on the right hand side. The common result is that for both types of exports, the value of the RMB enters in with the right sign and statistical significance. One large difference is the fact that ordinary exports do not exhibit a statistically significant sensitivity to rest-of-world GDP (unless a post-WTO trend is included, as in column 3). In contrast, processing exports always exhibit income elasticities in excess of unity.

[11] It could be argued that we should use processing exports instead of total exports. Substituting one for the other does not lead to any consequential changes in the results. We conjecture that this is the case because the two series share the same trajectory. See Figure 3.

Next, we investigate whether the corresponding disaggregation yields some more promising results for imports (see Table 4). The simple answer is mixed. For ordinary imports, the income elasticity is positive but not statistically significant, while the exchange rate has the wrong effect. If one includes exports (which is not well motivated for ordinary imports), the results are largely negative as well, since no economic variable enters with significance.

For processing imports, both income and the real exchange rate enter significantly, but the latter enters with the wrong sign. Including exports results in properly signed coefficients for the exchange rate and export variables. Income now enters with a negative, and significant, sign. This result signals the collinearity of many of the variables.

5. Manufactures versus Primary Products

The next disaggregation we examine is between primary and manufactured goods.[12] On the export side, primary products have slowly trended to a smaller share, now less than 10% of total exports. On the other hand, the primary share of imports has exhibited more substantial movements as China has become a much more substantial importer of commodities, particularly of oil. The latter has experienced large swings in price over the last few years, inducing an upward spike in the primary product share in 2008.

In interpreting Table 5, it is useful to recall that in the sample period almost all exports are manufactured. Primary products exhibit a negative income elasticity, unless a post-WTO accession trend is included. Then, China is exporting more commodities over time, with an income elasticity of about unity; the time trend implies about 5.6% secular increase per annum. Moreover, such exports respond to the exchange rate.

Manufactured goods exports behave pretty much in the same fashion as aggregate exports. That outcome makes sense since they account for most exports, and even at the beginning of the sample didn't account for less than 20% of total. If one takes column 6 estimates to be the most reliable, then the income elasticity of manufactured exports is 5.9, and they respond to price changes with an elasticity of about 0.9. Even with the high income

[12] The classification follows the one-digit level convention of the Standard International Trade Classification, Rev.3. Specifically, the "primary" includes the level 0 to level 4 and the "manufactures" level 5 to level 9.

elasticity, Chinese manufactured exports exhibit a secular trend growth of about 10% per annum (a bit less than double that for primary product exports).

On the import side (Table 6), we obtain mixed results. Under specifications (1) and (3), primary imports do not appear to respond to Chinese income in a statistically significant fashion while the manufacturing imports do. It appears to be important to include exports in the specification. Then, they appear to be important drivers of imports, and the exchange rate coefficient no longer exhibits a significant and incorrect sign.

6. The Changing Ownership Structure

To say the structure of the Chinese economy has changed drastically over the past twenty years is an understatement. One of the dimensions in which that change has taken place is in terms of ownership. At the beginning of the 1990's, state owned enterprises retained a commanding role in the economy. By the end of the sample, in 2010, private firms had taken on a much bigger role.

Figures 9 and 10 highlight the relative roles of state owned enterprises (SOEs), foreign invested enterprises (FIEs), and private firms in exports and imports. The rise of the role of foreign invested enterprises and even more so private firms in exports – all at the expense of SOEs – is remarkable.

The results of estimating separate equations for different types of exports depending on sourcing are reported in Table 7. When we disaggregate to this level, we note that all the coefficient estimates are correctly signed. With the exception of specification (9), SOE exports exhibit the lowest income elasticity, while FIEs the next highest, and private firms the very highest.

Another general pattern is that the price elasticities rise as one goes from SOEs to FIEs, to private firms. We find this pattern of interest since it accords with the view that SOEs are the least concerned with profit maximization, FIEs are likely to be somewhat insensitive to exchange rate and cost fluctuations as they are conducting long term intra firm transactions. Finally, in this perspective, private firms should be most concerned with relative prices – holding all else constant.[13]

[13] Of course, not all else is held constant. In particular, one would expect the industrial structure and distribution across product types to differ across ownership segments.

The results are otherwise somewhat sensitive to the inclusion of post-WTO accession trends. In particular, the price effect is smaller (in magnitude) and displays a lower level of significance in the presence of these WTO dummy variables. Interestingly, the exchange rate elasticity for private firms remains significant (and quite strong) in all cases. The robustness of the price elasticity is consistent with the argument that many private firms are operating with very thin margins, so that small exchange rate appreciations can induce relatively large losses.

The corresponding results for imports are less promising (Table 8). The estimated income elasticity is positive, unless the exports variable is included. The exchange rate coefficient has the wrong sign, and is correctly signed only for SOEs and FIEs when exports are included.

For both SOEs and FIEs, exports show up as particularly important. The elasticity of imports with respect to exports is least marked for private enterprises.

7. Other Factors

7.1 Sex Ratios, Nominal Exchange Rates and Regimes

Given the difficulty in modeling Chinese trade flows, we investigate the importance of including additional control variables. In this subsection, we discuss the marginal effect of the control variables including the sex-ratio, the nominal exchange rate, and the commodity price. To conserve space, we present these results in the Appendix.

One factor is suggested by the work of Du and Wei (2010). They employ an OLG model to illustrate the importance of the sex-ratio in determining the Chinese current account balance. In general, the inclusion of the sex-ratio variable does not qualitatively alter the sign and significance of the other variables. These results are reported in Tables 3A and A4 in the Appendix summarizes the sex-ratio effect on China's exports and imports.[14] Moreover, this variable has a significant positive effect on exports but negative – albeit insignificant -- impact on imports. The findings are in accord with the finding that the sex ratio imbalance is associated with trade surplus.

We also examine the proposition that the nominal exchange rate would be a better indicator of relative prices. One rationale for this is that the rigidity of the nominal exchange rate

[14] The annual data were interpolated using the quarterly saving rate data and a time trend to obtain the quarterly sex-ratio data from 1995Q1 – 2010Q4. We investigated whether the results were due to seasonality; the results were unchanged when we used de-seasonalized data.

conveys information not incorporated into the behavior of the real exchange rate. As reported in Appendix Tables A5 and A6, an RMB appreciation induces the expected effect only in the export specifications for FIEs and private firms, and an unexpected sign in the SOE export equation. The coefficient on the nominal rate is not significant in other export equations and the import equations.

Given the fact that the Chinese exchange rate is de facto fixed for much of the sample period, we attempt to capture this fixity by inclusion of a dummy variable, which takes a value of unity starting from the second quarter of 2005. The estimated price elasticity does not change with this new specification (see Appendix Tables A7 and A8). Hence, these results do not lend a strong support for this specific policy effect.

Finally, given that commodity imports become important toward the latter part of the period, we include a commodity terms of trade variable. Aside from the contrasting effects recorded for the SOE and FIE export equations, the commodity terms of trade variable does not have a statistically significant effect on other specifications in Appendix Tables A9 and A10. Hence, despite the apparent importance of commodities, the terms of trade do not appear to be a substantial factor affecting China's trade.

Summing up, the results in Tables A3 to A10 suggest that while the inclusion of these additional control variables might have implications for selected trade equations, there is no discernible evidence of a pattern of improved results. Nor does the inclusion of these variables improve the goodness of fit. The root-mean-squared-errors (RMSEs) in Tables A3 to A10 are no larger than the corresponding ones in Tables 1 to 8. Hence, we now move to examining an alternative strategy aimed at the import equations in the next subsection.

7.2 Differential Import-Intensities of Aggregate Demand

As we noted earlier, there are other ways in which to attempt to obtain more plausible estimates, particularly with respect to imports. In addition to disaggregation, one can see if different types of imports respond differently to different components of aggregate demand. This approach follows Chinn (2010) and more recently Bussiere et al. (2011). The idea is that consumption might be relatively intensive in one type of import, while investment might be intensive in manufactured goods. Aggregate imports' relationship to aggregate activity might appear to change as the composition of the economy varies.

The results are reported in Table 9, for regressions over the entire sample (not just the post-WTO accession sample). The same specification, incorporating consumption and fixed asset investment as activity variables is estimated, along with exports, the real exchange rate and dummies and trends.

In column 1, the regression results for aggregate imports are reported to establish a baseline. Interestingly, in this specification, both activity variables enter with the appropriate sign. At the same time, the post-WTO accession trend variable drops in significance.

When we decompose imports by type of product, we find that primary imports appear to respond strongly to fixed asset investment, but negatively to consumption. They also depend on exports. Manufactured goods, on the other hand, do not appear to depend on any activity variable.

For ordinary and processing goods, we find including fixed asset investment proves useful. Positive elasticities are recovered in both cases. In addition, processing imports depend positively on exports, while ordinary imports do not. This differential result makes a lot of sense.

Finally, when stratifying the imports by firm type, we find once again including fixed asset investment is useful. We obtain the correct sign in all three instances. Exports enter positively as well.

We obtain one particularly interesting result, relating to the exchange rate elasticity. In the aggregate, the estimated exchange rate coefficient is wrong-signed. It becomes correctly signed and statistically significant for primary imports and for imports of private firms. In the other instances, the coefficient is not statistically significant. One puzzle remains, however: manufactured imports continue to exhibit the wrong sign.

Finally, we include relative productivity as an additional regressor, following Aziz and Li (2008). The motivation is that the CPI deflated real exchange rate does not fully reflect the price of Chinese tradable output, as it includes a large nontradable components (Chinn, 2006). The proxy variable is Chinese GDP per capita relative to US output per man hour in the nonfarm business sector. We present the results of these augmented regressions over the post-WTO-accession sample in Table 10.

The inclusion of the relative productivity variable yields substantially improved results. The exchange rate now has the correct sign for all aggregates and components of imports, and is statistically significant in most cases but one. Higher Chinese relative productivity decreases

imports as well, which makes sense, as higher productivity is consistent with greater competitiveness. In some sense, the competitiveness variable explains even more of Chinese import behavior than the conventional variables, as the associated coefficient is significant in all cases but one.

8. Concluding remarks

We have found that for exports, while there is some diversity of responses to income and exchange rate variables, Chinese trade flow behavior largely accords with conventional wisdom: Higher rest of world income results in higher Chinese exports, while a stronger RMB results in lower exports. However, the income elasticity is imprecisely estimated, varying widely depending upon the inclusion or exclusion of a linear time trend. In addition, the price elasticity varies widely between goods exported from SOEs, foreign invested firms, and private firms. The latter appear to behave in a more price-sensitive fashion than the other firm types. As their share of exports continues to rise, one should expect the overall price elasticity to increase, holding all else constant.

On the import side, we obtain a more nuanced story, as we have replicated some of the puzzling results that other researchers have found, namely an apparently negative income elasticity. We are tempted to ascribe this result to import substitution taking place as the Chinese economy's structure alters drastically. However, that remains a conjecture.

On the other hand, the fact that disaggregation and the use of proxies for sectoral demands leads to positive coefficients on the activity variables is consistent with the view that rapid structural change has resulted in what appears to be unstable and perverse income and price elasticities at the aggregate level.

Disaggregation improves the overall results, but leaves some anomalies in place. In particular, we are unable obtain a specification without a large negative price coefficient for manufactured imports, which still constitute about 70% of Chinese imports, except when relative productivity is included. Indeed, inclusion of relative productivity makes the estimates much more plausible, and results in a correctly-signed exchange rate coefficient. To the extent that relative productivity is correlated with supply, this outcome is not entirely surprising.

Overall, Chinese trade flows do seem to respond to economic activity and price variables in the expected manner, at least when the data are sufficiently disaggregated or supply factors

incorporated. Does it mean that policymakers in principle had the means by which they could have affected the trade balance in the run-up to the crisis, had they wished? Given the empirical results presented here, the answer is in the eye of the beholder. Our results suggest that China's trade surplus could be reduced by appreciating the RMB, holding all else constant. To the extent real and financial imbalances – both within and without China – are exacerbated by these large Chinese surpluses and the consequent accumulation of reserves, this is an important finding.

There is a less optimistic interpretation, however. We have assumed the exchange rate is exogenous in identifying the parameters, including the price elasticities. It might be that when policy authorities change the exchange rate, other macro variables might be affected in a way that offsets the effects laid out in the traditional elasticities approach. And overarching these points is the practical observation that our estimates are often imprecise and – in the case of income elasticities – sensitive to the treatment of trends.

To further our understanding on the role of exchange rate policy in China's trade imbalance, future work should investigate whether further disaggregation can yield greater insights into Chinese trade behavior. In particular, we can examine commodity types more finely. In addition, alternative proxies for Chinese supply might yield more precise estimates of the price and income variables.

Appendix 1: Data – Definition and Source

Import	China's imports in US dollar normalized by the Hong Kong re-export to China unit value index. The data are in logarithm values. The types of import data considered are China's total imports, imports of ordinary trade, imports of processing trade, primary goods imports, manufactured goods imports, and imports by SOEs, FIEs, and private firms. (Data Source: CEIC)
Exports	China's exports in US dollar normalized by the Hong Kong re-export to the world unit value index. The data are in logarithm values. The types of export data considered are China's total exports, exports of ordinary trade, exports of processing trade, primary goods exports, manufactured goods exports, and exports by SOEs, FIEs, and private firms. (Data Source: CEIC)
GDP	The income is given by the real GDP index of the rest of the world in the exports equation (Data source: Shaghil Ahmed at the Federal Reserve Board) and by China's real GDP in RMB in the imports equation (Data source: CEIC). Both are in logarithm values.
REER	The real effective exchange rate of the Chinese currency, the renminbi. (Data source: IMF IFS)
CRgrw	China's domestic credit growth rate. (Data source: CEIC)
Consumption	China's private consumption to GDP ratio. (Data source: CEIC)
Fixed asset inv.	China's fixed asset investment to GDP ratio. (Data source: CEIC)
Prod	China's relative productivity, measured by the Chinese GDP per capita relative to the US output per man hour in the nonfarm business sector. (Data source: CEIC and St. Louis Fed FRED)
SexRatio	China's sex ratio - the birth ratio of boy and girl, lagged for 20 years; interpolated from Wei and Zhang (2011).
NER	The RMB nominal exchange rate, period average. (Data source: IMF IFS)
CTOT	China's commodity terms of trade, measured as the ratio of weighted real commodity export price to weighted real commodity import price. The data are compiled according to the methodology of Spatafora and Tytell (2009).
Reform	China's exchange rate reform in July, 2005 dummy variable[Reform = 1 (t>2005Q3)]
WTO	The China's accession to WTO dummy variable [WTO = 1 (t>2001Q4)]
gfc08	The 2008 Great Recession dummy variable [gf08 = 1 (t = 08Q4, 09Q1, 09Q2)]
Q1,Q2,Q3	The quarter dummy variables
Trend	The time trend variable

Appendix 2: Unit root and cointegration tests

Table A1: Unit root test results

	DF-GLS with a trend		ADF test with one structural break in both mean and trend	
	tau-statistics	lags	*t*-statistics	break point
Aggregated exports	-1.672	5	-2.053	2003q3
Primary goods exports	-3.230**	4	-2.422	2003q4
Manufacture goods exports	-1.612	5	-2.004	2003q3
Ordinary exports	-1.785	5	-2.183	2003q3
Processing exports	-1.304	5	-1.975	2002q3
SOE exports	-1.939	5	-2.268	2002q4
FIE exports	-0.94	5	-2.033	2002q3
Private firms exports	-1.908	4	-1.944	2004q1
Aggregated imports	-1.665	5	-1.891	2002q3
Primary goods imports	-3.102	1	-3.221	2003q2
Manufacture goods imports	-2.273	4	-1.871	2002q3
Ordinary imports	-2.782	4	-2.216	2001q3
Processing imports	-1.543	5	-2.531	2002q3
SOE imports	-1.683	6	-3.026	2001q3
FIE imports	-1.254	5	-2.031	2002q4
Private firms imports	-1.572	3	-1.844	2001q4
China's real GDP	-1.991	4	-1.767	2003q4
China's private consumption	-2.862	4	-2.45	2002q1
China's fixed asset investment	-0.783	4	-1.725	2004q3
The world real GDP	-1.908	2	-2.320	2004q1
REER IMF	-1.46	1	-2.74	2007q2
China's domestic credit growth rate	-5.764***	1	-6.599***	no break

Note: Export data are normalized by the Hong Kong re-export unit value index. Import data are normalized by the Hong Kong re-export to China unit value index. The normalized series in logarithms are used. The finite sample critical value at the 5% significant level for the DF-GLS test and the ADF test with one structural break are from Cheung and Lai (1995) and Perron and Vogelsang (1992), respectively. The break points are endogenously identified via grid search.

Table A2: Cointegration test results with one known break point (2001Q4)

Vector	H_0	Test Statistics	
		Max	Trace
Aggregated Export, GDP, REER	r = 0	44.36**	50.13**
	r <= 1	5.34	5.76
Primary Export, GDP, REER	r = 0	39.78**	44.91**
	r <= 1	4.62	5.12
Manufacture Export, GDP, REER	r = 0	44.09**	50.64**
	r <= 1	6.13	6.54
Ordinary Export, GDP, REER	r = 0	47.60**	52.28**
	r <= 1	4.06	4.68
Processing Export, GDP, REER	r = 0	37.52**	48.57**
	r <= 1	10.89	11.04
SOE Export, GDP, REER	r = 0	29.55**	39.62**
	r <= 1	9.35	10.07
FIE Export, GDP, REER	r = 0	31.17**	38.83**
	r <= 1	7.49	7.65
Private Export, GDP, REER	r = 0	49.53**	55.72**
	r <= 1	5.57	6.18
Aggregated Import, GDP, REER	r = 0	61.37**	86.88**
	r <= 1	22.99**	25.51**
	r <= 2	2.51	2.51
Primary Import, GDP, REER	r = 0	41.96**	68.55**
	r <= 1	24.26**	26.58**
	r <= 2	2.32	2.32
Manufacture Import, GDP, REER	r = 0	62.43**	87.22**
	r <= 1	21.52**	24.79
	r <= 2	3.26	3.26
Ordinary Import, GDP, REER	r = 0	40.02**	67.31**
	r <= 1	24.65**	27.28**
	r <= 2	2.63	2.63
Processing Import, GDP, REER	r = 0	36.54**	62.34**
	r <= 1	21.59**	25.80**
	r <= 2	4.21	4.21
SOE Import, GDP, REER	r = 0	28.02**	53.29**
	r <= 1	23.39**	25.27
	r <= 2	1.87	1.87
FIE Import, GDP, REER	r = 0	38.27**	59.34**
	r <= 1	18.97**	21.06

	r <= 2	2.09	2.09
Private Import, GDP, REER	r = 0	29.11**	50.85**
	r <= 1	19.86**	21.74
	r <= 2	1.87	1.87
Aggregated Import, Aggregated Export, GDP, REER	r = 0	68.58**	114.63**
	r <= 1	28.43**	46.05**
	r <= 2	17.29	17.61
Primary Import, Primary Import, GDP, REER	r = 0	50.98**	109.96**
	r <= 1	37.80**	58.97**
	r <= 2	20.38**	21.16
	r <= 3	0.78	0.78
Manufacture Import, Manufacture Export, GDP, REER	r = 0	77.10**	119.24**
	r <= 1	24.96**	42.13**
	r <= 2	16.78	17.16
Ordinary Import, Ordinary Export, GDP, REER	r = 0	55.22**	101.69**
	r <= 1	35.29**	46.47**
	r <= 2	9.77	11.18
Processing Import, Processing Export, GDP, REER	r = 0	91.55**	130.42**
	r <= 1	19.88*8	38.86**
	r <= 2	18.79	18.98
SOE Import, SOE Import, GDP, REER	r = 0	30.03**	66.07**
	r <= 1	24.01	40.03
FIE Import, FIE Export, GDP, REER	r = 0	72.21**	104.67**
	r <= 1	19.46	32.45
Private Import, Private Export, GDP, REER	r = 0	49.75**	81.54**
	r <= 1	27.79	31.79
Aggregated Import, Aggregated Export, Consumption, FAI, REER	r = 0	61.02**	125.66**
	r <= 1	40.33**	64.63**
	r <= 2	17.44	24.3
Primary Import, Primary Export, Consumption, FAI, REER	r = 0	55.04**	142.34**
	r <= 1	48.85**	87.29**
	r <= 2	30.95**	38.44
	r <= 3	6.92	7.48
Manufacture Import, Manufacture Export, Consumption, FAI, REER	r = 0	62.67**	121.87**
	r <= 1	34.54**	59.20**
	r <= 2	18.72	24.66
Ordinary Import, Ordinary Export, Consumption, FAI, REER	r = 0	75.08**	128.17**
	r <= 1	38.96**	53.09

	r <= 2	9.44	14.12
Processing Import, Processing Export, Consumption, FAI, REER	r = 0	93.83**	177.51**
	r <= 1	51.99**	83.67**
	r <= 2	24.61	31.68
SOE Import, SOE Export, Consumption, FAI, REER	r = 0	39.99**	90.51**
	r <= 1	31.18*	50.51
	r <= 2	11.8	19.33
FIE Import, FIE Export, Consumption, FAI, REER	r = 0	78.62**	135.86**
	r <= 1	38.55**	57.24**
	r <= 2	13.61	18.69
Private Import, Private Export, Consumption, FAI, REER	r = 0	71.64**	118.42**
	r <= 1	32.62**	46.78
	r <= 2	8.22	14.15

Note: Results of the Johansen cointegration rank test with one known structural break point are reported. Critical values are from Cheung and Lai (1993). "**" denotes 95% level of significance.

Appendix 3: Regression Results Discussed in Section 7.1

Table A3: China's exports, normalized by the Hong Kong re-export unit value index, controlling for China's sex ratio effect

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Aggregate	Ordinary	Proc.	Primary	Manuf.	SOE	FIE	Priv.
GDP	5.068***	4.912***	5.748***	1.075	5.336***	3.832***	6.318***	2.532
	(0.41)	(0.68)	(0.62)	(0.70)	(0.41)	(0.72)	(0.70)	(1.59)
REER	-0.954***	-1.273***	-0.787***	-0.758***	-0.967***	-0.541**	-0.660***	-5.771***
	(0.17)	(0.27)	(0.15)	(0.23)	(0.18)	(0.24)	(0.21)	(0.60)
CRgrw	-0.100	0.038	-0.175	0.088	-0.157	0.073	-0.119	-0.720
	(0.37)	(0.53)	(0.32)	(0.34)	(0.42)	(0.48)	(0.37)	(1.03)
SexRatio	0.131***	0.009	0.230***	0.122***	0.136***	-0.005	0.301***	-0.077
	(0.04)	(0.08)	(0.03)	(0.05)	(0.04)	(0.07)	(0.05)	(0.10)
WTO	-0.594***	-0.756***	-0.442***	-0.279**	-0.581***	-0.204*	-0.180**	1.671***
	(0.07)	(0.10)	(0.09)	(0.11)	(0.07)	(0.10)	(0.09)	(0.27)
WTO*Trend	0.022***	0.027***	0.016***	0.011***	0.021***	0.008**	0.009***	-0.028***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.01)
Trend	-0.008*	-0.001	-0.017***	0.004	-0.007	-0.010	-0.011*	0.139***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Q1	-0.152***	-0.167***	-0.134***	-0.172***	-0.147***	-0.180***	-0.102***	-0.122*
	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.06)
Q2	-0.042**	-0.016	-0.059**	-0.077***	-0.038*	-0.034	-0.039	-0.013
	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.06)
Q3	0.009	0.017	0.008	-0.094***	0.020	0.020	0.007	0.084
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.06)
Constant	0.633	14.128	-11.320***	-1.093	-0.071	12.866	-19.944***	37.655***
	(4.64)	(8.79)	(3.71)	(5.08)	(4.88)	(7.84)	(5.29)	(10.39)
RMSE	0.05	0.08	0.04	0.07	0.05	0.07	0.05	0.17
Obs.	62	62	62	62	62	62	62	62
Leads-lags	1, 1	1, 1	1, 2	1, 1	1, 1	1, 1	1, 1	1, 1

Note: The table reports the results of estimating equation (1) with the aggregate and disaggregated export data. The pair of numbers given in the row labeled "Leads-lags" are the number of leads and the number of lags of the first-differenced cointegrated variables used in the dynamic OLS regression. Robust errors are in parentheses underneath coefficient estimates. "***, **, *" indicate the 1%, 5%, and 10% level of significance, respectively.

Table A4: China's imports, normalized by the Hong Kong re-export to China unit value index, controlling for China's sex ratio effect

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Aggregate	Ordinary	Proc.	Primary	Manuf.	SOE	FIE	Priv.
GDP	-4.208	-1.010	-2.586*	-11.097***	-2.292	-5.259*	-3.917*	4.160
	(2.75)	(3.42)	(1.30)	(2.77)	(2.46)	(2.95)	(1.86)	(2.93)
REER	0.525	-1.916	1.659***	-0.654	-0.273	0.580	1.041	8.021***
	(1.11)	(1.32)	(0.52)	(0.71)	(0.94)	(0.74)	(0.76)	(2.15)
Export	0.774	-0.885	1.649***	-0.179	0.589	0.429	1.304***	2.418***
	(0.61)	(0.66)	(0.30)	(0.61)	(0.52)	(0.49)	(0.42)	(0.41)
SexRatio	-0.169	-0.445	0.021	-0.408	-0.152	-0.239	-0.231	0.161
	(0.25)	(0.29)	(0.11)	(0.26)	(0.22)	(0.22)	(0.17)	(0.34)
WTO	-0.664	-0.853	-0.425	-0.999	-0.618	-1.268	-0.919*	-4.065**
	(0.65)	(0.97)	(0.36)	(0.68)	(0.52)	(0.74)	(0.52)	(1.37)
WTO*Trend	0.017	0.013	0.016	0.013	0.018	0.032	0.031	0.156***
	(0.02)	(0.03)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.05)
Trend	0.122*	0.158*	0.019	0.382***	0.075	0.172**	0.086	-0.323**
	(0.07)	(0.08)	(0.03)	(0.09)	(0.06)	(0.08)	(0.05)	(0.12)
Q1	0.001	0.352	-0.284	0.913	-0.190	0.118	-0.021	-1.000
	(0.42)	(0.52)	(0.22)	(0.60)	(0.36)	(0.52)	(0.32)	(0.82)
Q2	-0.353	-0.176	-0.070	-0.048	-0.325	-0.120	-0.043	-1.215**
	(0.31)	(0.43)	(0.11)	(0.26)	(0.26)	(0.31)	(0.19)	(0.46)
Q3	0.168	1.248**	-0.164	1.471**	-0.056	0.820	0.085	-1.181
	(0.41)	(0.56)	(0.17)	(0.63)	(0.32)	(0.58)	(0.28)	(0.75)
Constant	51.265	84.233	3.224	144.390***	40.157	69.934	47.426	-98.296
	(44.11)	(49.65)	(18.93)	(47.15)	(39.19)	(40.23)	(30.21)	(60.69)
RMSE	0.04	0.06	0.02	0.07	0.04	0.05	0.03	0.07
Obs.	33	33	33	33	33	33	33	33
Leads-lags	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1

Note: The table reports the results of estimating equation (2) with the post-WTO aggregate and disaggregated import data. The pair of numbers given in the row labeled "Leads-lags" are the number of leads and the number of lags of the first-differenced cointegrated variables used in the dynamic OLS regression. Robust errors are in parentheses underneath coefficient estimates. "***, **, *" indicate the 1%, 5%, and 10% level of significance, respectively.

Table A5: China's exports, normalized by the Hong Kong re-export unit value index, controlling for RMB nominal exchange rate

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Aggregate	Ordinary	Proc.	Primary	Manuf.	SOE	FIE	Priv.
GDP	5.826***	4.034***	7.549***	1.291	6.148***	2.637**	9.291***	4.135*
	(0.88)	(1.13)	(0.95)	(1.04)	(0.88)	(1.01)	(1.28)	(2.37)
REER	-0.904***	-1.329***	-0.848***	-0.732***	-0.915***	-0.598**	-0.579*	-5.676***
	(0.23)	(0.26)	(0.22)	(0.24)	(0.25)	(0.23)	(0.32)	(0.60)
CRgrw	-0.176	0.016	-0.154	0.077	-0.234	0.178	-0.167	-0.924
	(0.39)	(0.51)	(0.44)	(0.40)	(0.43)	(0.46)	(0.55)	(0.96)
d.NER	-0.614	2.675	-2.368	0.993	-0.726	3.650*	-6.008**	-5.795*
	(1.58)	(2.35)	(1.64)	(1.92)	(1.62)	(1.93)	(2.25)	(3.24)
WTO	-0.662***	-0.681***	-0.663***	-0.290**	-0.653***	-0.085	-0.453***	1.504***
	(0.10)	(0.12)	(0.14)	(0.14)	(0.11)	(0.12)	(0.17)	(0.32)
WTO*Trend	0.025***	0.024***	0.025***	0.012***	0.025***	0.004	0.021***	-0.022*
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Trend	-0.007	0.006	-0.019**	0.009	-0.007	-0.001	-0.019*	0.121***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Q1	-0.211***	-0.188***	-0.216***	-0.227***	-0.207***	-0.184***	-0.204***	-0.084
	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.06)
Q2	-0.080***	-0.032	-0.112***	-0.111***	-0.077***	-0.033	-0.103***	0.004
	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.06)
Q3	-0.027	-0.009	-0.017	-0.127***	-0.017	0.016	-0.024	0.102*
	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.06)
Constant	14.269***	15.417***	13.391***	11.747***	14.144***	12.548***	11.572***	29.104***
	(1.07)	(1.20)	(1.00)	(1.10)	(1.12)	(1.09)	(1.50)	(2.73)
RMSE	0.06	0.08	0.06	0.07	0.06	0.07	0.07	0.17
Obs.	64	64	63	64	64	62	62	62
Leads-lags	1, 1	1, 1	1, 2	1, 1	1, 1	1, 1	1, 1	1, 1

Note: The table reports the results of estimating equation (1) with the aggregate and disaggregated export data. The pair of numbers given in the row labeled "Leads-lags" are the number of leads and the number of lags of the first-differenced cointegrated variables used in the dynamic OLS regression. Robust errors are in parentheses underneath coefficient estimates. "***, **, *" indicate the 1%, 5%, and 10% level of significance, respectively.

Table A6: China's imports, normalized by the Hong Kong re-export to China unit value index, controlling for RMB regime change

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Aggregate	Ordinary	Proc.	Primary	Manuf.	SOE	FIE	Priv.
GDP	-3.017*	1.320	-2.695***	-8.810***	-1.154	-4.087*	-2.033*	2.327
	(1.50)	(2.42)	(0.75)	(2.58)	(1.34)	(2.23)	(0.95)	(3.39)
REER	0.762	-1.041	2.001***	0.205	0.121	0.981*	1.520	7.439***
	(1.11)	(1.38)	(0.56)	(0.47)	(1.00)	(0.47)	(1.12)	(1.81)
Export	0.700	-1.023	1.788***	-0.329	0.596	0.273	1.281**	2.359***
	(0.62)	(0.77)	(0.26)	(0.84)	(0.51)	(0.54)	(0.49)	(0.41)
d.NER	0.120	1.608	-1.226	0.405	-0.886	2.561	-1.325	2.259
	(1.86)	(3.92)	(0.77)	(2.78)	(1.13)	(2.48)	(1.51)	(2.76)
WTO	-0.296	-0.003	-0.575**	-0.618	-0.361	-0.731	-0.521	-4.114***
	(0.41)	(0.73)	(0.26)	(0.74)	(0.36)	(0.64)	(0.42)	(1.35)
WTO*Trend	0.006	-0.015	0.021**	0.000	0.010	0.016	0.018	0.158***
	(0.01)	(0.03)	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.05)
Trend	0.085**	0.077	0.016	0.303***	0.037	0.129**	0.026	-0.261**
	(0.03)	(0.05)	(0.02)	(0.08)	(0.02)	(0.05)	(0.04)	(0.11)
Q1	-0.044	0.192	-0.212	0.792	-0.203	-0.134	-0.033	-0.940
	(0.46)	(0.49)	(0.21)	(0.72)	(0.41)	(0.54)	(0.35)	(0.82)
Q2	-0.416	-0.400	-0.070	-0.252	-0.409	-0.310	-0.121	-1.042**
	(0.29)	(0.39)	(0.10)	(0.26)	(0.25)	(0.24)	(0.15)	(0.42)
Q3	0.019	0.764	-0.113	1.183	-0.169	0.425	-0.055	-1.058
	(0.39)	(0.52)	(0.16)	(0.81)	(0.33)	(0.63)	(0.28)	(0.75)
Constant	23.468**	15.545	3.182	79.896***	13.039*	34.955**	5.812	-63.511**
	(9.08)	(15.48)	(5.84)	(25.71)	(7.10)	(12.09)	(10.97)	(28.85)
RMSE	0.04	0.07	0.02	0.07	0.04	0.05	0.04	0.07
Obs.	33	33	33	33	33	33	33	33
Leads-lags	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1

Note: The table reports the results of estimating equation (2) with the post-WTO aggregate and disaggregated import data. The pair of numbers given in the row labeled "Leads-lags" are the number of leads and the number of lags of the first-differenced cointegrated variables used in the dynamic OLS regression. Robust errors are in parentheses underneath coefficient estimates. "***, **, *" indicate the 1%, 5%, and 10% level of significance, respectively.

Table A7: China's exports, normalized by the Hong Kong re-export unit value index, controlling for RMB regime change using dummy variable

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Aggregate	Ordinary	Proc.	Primary	Manuf.	SOE	FIE	Priv.
GDP	5.981***	5.028***	7.386***	2.429**	6.250***	4.382***	7.981***	3.414*
	(0.78)	(0.88)	(0.98)	(0.97)	(0.78)	(0.81)	(1.19)	(1.96)
REER	-0.877***	-1.301***	-0.839***	-0.655***	-0.891***	-0.484*	-0.611*	-5.653***
	(0.23)	(0.26)	(0.22)	(0.23)	(0.25)	(0.25)	(0.36)	(0.59)
CRgrw	-0.129	-0.036	-0.043	0.128	-0.186	0.116	0.061	-0.660
	(0.38)	(0.54)	(0.46)	(0.37)	(0.43)	(0.48)	(0.62)	(1.01)
Reform	-0.043	-0.028	-0.064	-0.109**	-0.040	-0.070*	-0.077	-0.140
	(0.04)	(0.04)	(0.05)	(0.05)	(0.04)	(0.04)	(0.07)	(0.10)
WTO	-0.722***	-0.816***	-0.721***	-0.524***	-0.705***	-0.333***	-0.403*	1.429***
	(0.12)	(0.12)	(0.18)	(0.16)	(0.13)	(0.09)	(0.21)	(0.33)
WTO*Trend	0.027***	0.029***	0.026***	0.020***	0.026***	0.012***	0.018***	-0.021*
	(0.00)	(0.00)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Trend	-0.008	-0.002	-0.017**	0.000	-0.007	-0.015**	-0.007	0.128***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Q1	-0.213***	-0.186***	-0.221***	-0.230***	-0.210***	-0.181***	-0.217***	-0.099*
	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.06)
Q2	-0.082***	-0.034	-0.114***	-0.117***	-0.079***	-0.036	-0.107***	-0.004
	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.06)
Q3	-0.027	-0.006	-0.017	-0.123***	-0.017	0.023	-0.030	0.098*
	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.06)
Constant	14.135***	15.287***	13.328***	11.371***	14.022***	12.005***	11.697***	28.958***
	(1.07)	(1.23)	(1.00)	(1.05)	(1.12)	(1.19)	(1.68)	(2.69)
RMSE	0.06	0.08	0.06	0.07	0.06	0.07	0.08	0.17
Obs.	64	64	63	64	64	62	62	62
Leads-lags	1, 1	1, 1	1, 2	1, 1	1, 1	1, 1	1, 1	1, 1

Note: The table reports the results of estimating equation (1) with the aggregate and disaggregated export data. The pair of numbers given in the row labeled "Leads-lags" are the number of leads and the number of lags of the first-differenced cointegrated variables used in the dynamic OLS regression. Robust errors are in parentheses underneath coefficient estimates. "***, **, *" indicate the 1%, 5%, and 10% level of significance, respectively.

Table A8: China's imports, normalized by the Hong Kong re-export to China unit value index, controlling for RMB regime change using dummy variable

	[1] Aggregate	[2] Ordinary	[3] Proc.	[4] Primary	[5] Manuf.	[6] SOE	[7] FIE	[8] Priv.
GDP	-3.687**	1.392	-3.269***	-8.716***	-1.830	-2.266	-2.918***	3.054
	(1.48)	(2.08)	(0.81)	(2.44)	(1.37)	(2.32)	(0.84)	(2.77)
REER	1.275	-0.802	2.250***	0.228	0.423	0.863	2.220**	6.677***
	(1.02)	(0.93)	(0.56)	(0.48)	(0.99)	(0.50)	(0.95)	(2.15)
Export	0.932	-0.950*	1.906***	-0.300	0.739	-0.124	1.572***	2.207***
	(0.58)	(0.49)	(0.26)	(0.80)	(0.51)	(0.55)	(0.43)	(0.50)
Reform	-0.069**	-0.152***	-0.037*	0.003	-0.046*	-0.092**	-0.072**	-0.026
	(0.03)	(0.05)	(0.02)	(0.06)	(0.02)	(0.04)	(0.03)	(0.05)
WTO	0.092***	0.080**	0.026	0.300***	0.047**	0.099*	0.034	-0.257*
	(0.02)	(0.04)	(0.02)	(0.08)	(0.02)	(0.05)	(0.03)	(0.12)
WTO*Trend	-0.308	0.179	-0.576**	-0.617	-0.301	-0.836	-0.604	-3.816**
	(0.31)	(0.51)	(0.25)	(0.73)	(0.28)	(0.55)	(0.38)	(1.50)
Trend	0.006	-0.023	0.021**	0.000	0.008	0.014	0.022	0.146**
	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.02)	(0.01)	(0.05)
Q1	-0.122	0.075	-0.321	0.805	-0.294	0.128	-0.188	-0.907
	(0.44)	(0.42)	(0.21)	(0.72)	(0.41)	(0.49)	(0.35)	(0.85)
Q2	-0.465*	-0.505*	-0.090	-0.256	-0.425*	-0.203	-0.152	-1.080**
	(0.24)	(0.26)	(0.10)	(0.27)	(0.22)	(0.22)	(0.12)	(0.41)
Q3	-0.117	0.605	-0.229	1.189	-0.295	0.701	-0.250	-0.937
	(0.39)	(0.42)	(0.17)	(0.80)	(0.34)	(0.48)	(0.29)	(0.73)
Constant	23.714***	13.122	5.302	78.795***	15.351**	25.195*	6.425	-64.419*
	(6.17)	(10.14)	(5.87)	(23.97)	(5.82)	(12.07)	(8.32)	(30.22)
RMSE	0.04	0.05	0.02	0.07	0.03	0.05	0.03	0.08
Obs.	33	33	33	33	33	33	33	33
Leads-lags	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1

Note: The table reports the results of estimating equation (2) with the post-WTO aggregate and disaggregated import data. The pair of numbers given in the row labeled "Leads-lags" are the number of leads and the number of lags of the first-differenced cointegrated variables used in the dynamic OLS regression. Robust errors are in parentheses underneath coefficient estimates. "***, **, *" indicate the 1%, 5%, and 10% level of significance, respectively.

Table A9: China's exports, normalized by the Hong Kong re-export unit value index, controling for the commodity term of trade

	[1] Aggregate	[2] Ordinary	[3] Proc.	[4] Primary	[5] Manuf.	[6] SOE	[7] FIE	[8] Priv.
GDP	5.759***	4.333***	7.012***	1.681*	6.049***	3.630***	8.339***	2.095
	(0.84)	(1.08)	(0.89)	(1.00)	(0.84)	(0.86)	(1.21)	(1.97)
REER	-0.913***	-1.305***	-0.865***	-0.743***	-0.924***	-0.599***	-0.634**	-5.662***
	(0.23)	(0.25)	(0.21)	(0.25)	(0.24)	(0.22)	(0.31)	(0.59)
CRgrw	-0.164	-0.050	-0.096	0.046	-0.220	0.076	-0.018	-0.761
	(0.38)	(0.48)	(0.43)	(0.39)	(0.43)	(0.46)	(0.55)	(0.96)
CTOT	0.161	-4.844	3.039	-2.192	0.316	-4.890*	7.217**	6.451
	(2.22)	(2.90)	(2.04)	(2.52)	(2.32)	(2.49)	(2.99)	(3.98)
WTO	-0.654***	-0.559***	-0.717***	-0.244	-0.649***	-0.012	-0.577***	1.458***
	(0.14)	(0.18)	(0.14)	(0.16)	(0.15)	(0.15)	(0.19)	(0.35)
WTO*Trend	0.025***	0.021***	0.026***	0.011**	0.024***	0.003	0.023***	-0.023**
	(0.00)	(0.01)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)	(0.01)
Trend	-0.006	0.004	-0.015*	0.006	-0.006	-0.008	-0.011	0.137***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Q1	-0.213***	-0.194***	-0.214***	-0.233***	-0.210***	-0.193***	-0.202***	-0.075
	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.06)
Q2	-0.079***	-0.039	-0.104***	-0.116***	-0.076***	-0.044	-0.090***	0.024
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.07)
Q3	-0.028	-0.015	-0.014	-0.130***	-0.017	0.011	-0.019	0.107*
	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.06)
Constant	14.149***	20.176***	10.407***	14.010***	13.868***	17.482***	4.569	22.523***
	(2.63)	(3.50)	(2.38)	(2.84)	(2.72)	(3.01)	(3.59)	(4.65)
RMSE	0.06	0.08	0.06	0.07	0.06	0.07	0.07	0.17
Obs.	62	62	61	62	62	60	60	60
Leads-lags	1, 1	1, 1	1, 2	1, 1	1, 1	1, 1	1, 1	1, 1

Note: The table reports the results of estimating equation (1) with the aggregate and disaggregated export data. The pair of numbers given in the row labeled "Leads-lags" are the number of leads and the number of lags of the first-differenced cointegrated variables used in the dynamic OLS regression. Robust errors are in parentheses underneath coefficient estimates. "***, **, *" indicate the 1%, 5%, and 10% level of significance, respectively.

Table A10: China's imports, normalized by the Hong Kong re-export to China unit value index, controlling for the commodity term of trade

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Aggregate	Ordinary	Proc.	Primary	Manuf.	SOE	FIE	Priv.
GDP	-6.977	0.484	-2.656*	-8.341***	-5.114	-4.628*	-2.233	4.620**
	(4.05)	(6.28)	(1.27)	(1.50)	(2.97)	(2.50)	(2.07)	(1.73)
REER	4.274	-0.219	2.228**	0.452	3.280	1.295**	2.274	6.298***
	(2.99)	(3.33)	(0.93)	(0.46)	(2.24)	(0.55)	(2.08)	(1.52)
Export	2.461	-0.365	1.986***	-0.243	2.043*	1.225**	1.680*	2.066***
	(1.49)	(2.08)	(0.36)	(0.55)	(1.08)	(0.40)	(0.81)	(0.35)
CTOT	8.247	0.211	1.413	-1.262	8.560	-1.316	2.442	4.973
	(7.31)	(10.58)	(2.13)	(4.08)	(5.26)	(6.36)	(4.44)	(5.56)
WTO	-6.302	-3.768	-1.435	-6.695***	-4.515	-7.301***	-2.392	-8.896***
	(4.36)	(6.07)	(1.48)	(1.20)	(3.64)	(1.95)	(2.75)	(2.47)
WTO*Trend	0.207	0.111	0.051	0.199***	0.149	0.234***	0.082	0.306***
	(0.15)	(0.21)	(0.05)	(0.04)	(0.12)	(0.06)	(0.09)	(0.08)
Trend	0.088*	0.058	0.004	0.283***	0.057	0.119*	0.006	-0.286***
	(0.04)	(0.07)	(0.03)	(0.05)	(0.03)	(0.06)	(0.05)	(0.08)
Q1	0.441	0.573	-0.352	1.764**	0.128	0.673	-0.109	-0.572
	(0.62)	(0.78)	(0.37)	(0.61)	(0.46)	(0.69)	(0.56)	(0.82)
Q2	-0.489	-0.388	-0.090	-0.139	-0.468*	0.020	-0.142	-1.103**
	(0.30)	(0.48)	(0.11)	(0.25)	(0.25)	(0.28)	(0.16)	(0.48)
Q3	0.691	1.278	-0.136	2.257***	0.313	1.263*	-0.001	0.202
	(0.71)	(0.87)	(0.32)	(0.49)	(0.56)	(0.67)	(0.52)	(0.78)
Constant	9.666	11.066	-1.637	75.216***	4.286	28.751**	-2.780	-78.689***
	(11.64)	(12.97)	(6.97)	(17.47)	(9.84)	(11.42)	(15.24)	(20.38)
RMSE	0.05	0.08	0.02	0.05	0.04	0.05	0.04	0.06
Obs.	30	30	30	30	30	30	30	30
Leads-lags	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1

Note: The table reports the results of estimating equation (2) with the post-WTO aggregate and disaggregated import data. The pair of numbers given in the row labeled "Leads-lags" are the number of leads and the number of lags of the first-differenced cointegrated variables used in the dynamic OLS regression. Robust errors are in parentheses underneath coefficient estimates. "***, **, *" indicate the 1%, 5%, and 10% level of significance, respectively.

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Table 1: Aggregate exports, normalized by the Hong Kong re-export unit value index

	[1]	[2]	[3]
GDP	1.433***	1.502***	5.648***
	(0.51)	(0.52)	(0.61)
REER	-1.575***	-1.584***	-0.906***
	(0.17)	(0.17)	(0.23)
CRgrw		0.300	-0.159
		(0.51)	(0.38)
WTO			-0.642***
			(0.08)
WTO*Trend			0.024***
			(0.00)
Trend	0.040***	0.040***	-0.005
	(0.00)	(0.00)	(0.01)
Q1	-0.213***	-0.212***	-0.211***
	(0.03)	(0.03)	(0.02)
Q2	-0.081***	-0.075**	-0.080***
	(0.03)	(0.03)	(0.02)
Q3	-0.021	-0.017	-0.028
	(0.03)	(0.03)	(0.02)
Constant	17.153***	17.175***	14.277***
	(0.77)	(0.80)	(1.06)
RSME	0.08	0.08	0.06
Obs.	63	63	64
Leads-lags	1, 2	1, 2	1, 1

Note: The table reports the results of estimating equation (1) with the aggregate export data. The pair of numbers given in the row labeled "Leads-lags" are the number of leads and the number of lags of the first-differenced cointegrated variables used in the dynamic OLS regression. Robust errors are in parentheses underneath coefficient estimates. "***, **, *" indicate the 1%, 5%, and 10% level of significance, respectively.

Table 2: Aggregate imports, normalized by the Hong Kong re-export to China unit value index

	[1]	[2]
GDP	3.184**	-3.005**
	(1.51)	(1.14)
REER	-2.034***	1.111**
	(0.29)	(0.48)
Export		0.980***
		(0.17)
Trend	-0.033	0.068***
	(0.04)	(0.02)
Q1	-0.129	-0.132
	(0.50)	(0.42)
Q2	0.144	-0.415*
	(0.18)	(0.23)
Q3	0.371	-0.095
	(0.39)	(0.34)
Constant	-4.163	18.640**
	(11.45)	(6.51)
RMSE	0.06	0.04
Obs.	33	33
Leads-lags	1, 1	1, 1, 1

Note: The table reports the results of estimating equation (2) with the post-WTO aggregate import data. The pair of numbers given in the row labeled "Leads-lags" are the number of leads and the number of lags of the first-differenced cointegrated variables used in the dynamic OLS regression. Robust errors are in parentheses underneath coefficient estimates. "***, **, *" indicate the 1%, 5%, and 10% level of significance, respectively.

Table 3: Exports of ordinary and processing trade, normalized by by the Hong Kong re-export unit value index

	[1]	[2]	[3]	[4]	[5]	[6]
	Ordinary	Ordinary	Ordinary	Processing	Processing	Processing
GDP	0.422	0.478	4.809***	3.592***	3.640***	6.878***
	(0.78)	(0.81)	(0.73)	(0.61)	(0.61)	(0.77)
REER	-1.864***	-1.869***	-1.319***	-1.199***	-1.203***	-0.875***
	(0.25)	(0.25)	(0.25)	(0.22)	(0.23)	(0.23)
CRgrw		0.226	-0.055		0.195	-0.084
		(0.62)	(0.53)		(0.55)	(0.44)
WTO			-0.764***			-0.598***
			(0.10)			(0.13)
WTO*Trend			0.027***			0.022***
			(0.00)			(0.00)
Trend	0.047***	0.047***	0.000	0.024***	0.024***	-0.014*
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.01)
Q1	-0.176***	-0.175***	-0.185***	-0.226***	-0.225***	-0.218***
	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.02)
Q2	-0.036	-0.031	-0.033	-0.117***	-0.113***	-0.111***
	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.02)
Q3	0.003	0.006	-0.006	-0.041	-0.038	-0.018
	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)	(0.02)
Constant	17.660***	17.671***	15.380***	14.786***	14.795***	13.510***
	(1.17)	(1.19)	(1.17)	(1.03)	(1.05)	(1.03)
RMSE	0.11	0.11	0.08	0.08	0.08	0.06
Obs.	64	64	64	64	64	63
Leads-lags	1, 1	1, 1	1, 1	1, 1	1, 1	1, 2

Note: The table reports the results of estimating equation (1) with the ordinary and processing export data. The pair of numbers given in the row labeled "Leads-lags" are the number of leads and the number of lags of the first-differenced cointegrated variables used in the dynamic OLS regression. Robust errors are in parentheses underneath coefficient estimates. "***, **, *" indicate the 1%, 5%, and 10% level of significance, respectively.

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Table 4: Imports of ordinary and processing trade, normalized by the Hong Kong re-export to China unit value index

	[1] Ordinary	[2] Ordinary	[3] Processing	[4] Processing
GDP	2.960	-0.101	3.591***	-2.259**
	(2.02)	(2.37)	(1.13)	(0.80)
REER	-0.962**	0.376	-3.101***	0.787*
	(0.41)	(0.89)	(0.26)	(0.45)
Export		0.255		1.264***
		(0.33)		(0.14)
Trend	-0.026	0.033	-0.051*	0.033**
	(0.05)	(0.05)	(0.03)	(0.02)
Q1	0.040	-0.318	-0.447	-0.222
	(0.68)	(0.61)	(0.41)	(0.19)
Q2	0.173	-0.661*	0.060	0.013
	(0.27)	(0.36)	(0.16)	(0.11)
Q3	0.603	0.206	0.055	-0.064
	(0.54)	(0.69)	(0.37)	(0.14)
Constant	-8.300	7.128	-2.950	10.998**
	(15.31)	(13.20)	(8.58)	(3.88)
RMSE	0.09	0.07	0.06	0.02
Obs.	33	33	33	33
Leads-lags	1, 1	1, 1, 1	1, 1	1, 1, 1

Note: The table reports the results of estimating equation (2) with the post-WTO ordinary and processing import data. The pair of numbers given in the row labeled "Leads-lags" are the number of leads and the number of lags of the first-differenced cointegrated variables used in the dynamic OLS regression. Robust errors are in parentheses underneath coefficient estimates. "***, **, *" indicate the 1%, 5%, and 10% level of significance, respectively.

Table 5: Primary and manufactured products exports, normalized by the Hong Kong re-export unit value index

	[1]	[2]	[3]	[4]	[5]	[6]
	Primary	Primary	Primary	Manuf.	Manuf.	Manuf.
GDP	-0.603	-0.518	1.579*	2.151***	2.183***	5.938***
	(0.44)	(0.47)	(0.80)	(0.63)	(0.64)	(0.61)
REER	-1.143***	-1.152***	-0.728***	-1.492***	-1.496***	-0.918***
	(0.18)	(0.18)	(0.23)	(0.21)	(0.22)	(0.24)
CRgrw		0.343	0.050		0.130	-0.214
		(0.44)	(0.38)		(0.55)	(0.42)
WTO			-0.321***			-0.631***
			(0.12)			(0.09)
WTO*Trend			0.014***			0.024***
			(0.00)			(0.00)
Trend	0.032***	0.032***	0.007	0.038***	0.037***	-0.005
	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.01)
Q1	-0.224***	-0.222***	-0.226***	-0.201***	-0.200***	-0.208***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)
Q2	-0.116***	-0.110***	-0.112***	-0.077**	-0.075**	-0.077***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.02)
Q3	-0.126***	-0.122***	-0.126***	-0.010	-0.008	-0.018
	(0.03)	(0.03)	(0.02)	(0.03)	(0.04)	(0.02)
Constant	13.535***	13.551***	11.733***	16.589***	16.596***	14.155***
	(0.83)	(0.85)	(1.07)	(0.99)	(1.02)	(1.11)
RMSE	0.08	0.08	0.07	0.09	0.09	0.06
Obs.	64	64	64	64	64	64
Leads-lags	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1

Note: The table reports the results of estimating equation (1) with export data on primary and manufactured goods. The pair of numbers given in the row labeled "Leads-lags" are the number of leads and the number of lags of the first-differenced cointegrated variables used in the dynamic OLS regression. Robust errors are in parentheses underneath coefficient estimates. "***, **, *" indicate the 1%, 5%, and 10% level of significance, respectively.

Table 6: Primary and manufactured products imports, normalized by the Hong Kong re-export to China unit value index

	[1]	[2]	[3]	[4]
	Primary	Primary	Manuf.	Manuf.
GDP	3.933	-0.746	2.889**	-1.057
	(2.74)	(1.69)	(1.08)	(0.99)
REER	-2.210***	-0.349	-2.102***	-0.001
	(0.44)	(0.57)	(0.24)	(0.44)
Export		1.431*		0.600***
		(0.71)		(0.15)
Trend	-0.032	0.041	-0.031	0.033
	(0.07)	(0.04)	(0.03)	(0.02)
Q1	0.042	-0.322	-0.273	-0.262
	(0.84)	(0.77)	(0.42)	(0.37)
Q2	0.227	-0.302	0.054	-0.367*
	(0.35)	(0.30)	(0.14)	(0.20)
Q3	0.896	0.090	0.085	-0.227
	(0.74)	(0.74)	(0.32)	(0.28)
Constant	-11.119	4.361	-1.615	12.830**
	(20.83)	(13.35)	(8.24)	(5.45)
RMSE	0.11	0.09	0.05	0.03
Obs.	33	33	33	33
Leads-lags	1, 1	1, 1, 1	1, 1	1, 1, 1

Note: The table reports the results of estimating equation (2) with the post-WTO import data on primary and manufactured goods. The pair of numbers given in the row labeled "Leads-lags" are the number of leads and the number of lags of the first-differenced cointegrated variables used in the dynamic OLS regression. Robust errors are in parentheses underneath coefficient estimates. "***, **, *" indicate the 1%, 5%, and 10% level of significance, respectively.

Table 7: Exports of SOE, FIE, and Private firms, normalized by the Hong Kong re-export unit value index

	[1] SOE	[2] SOE	[3] SOE	[4] FIE	[5] FIE	[6] FIE	[7] Priv.	[8] Priv.	[9] Priv.
GDP	2.384***	2.444***	3.813***	5.060***	5.176***	7.355***	7.155***	7.465***	2.268
	(0.57)	(0.60)	(0.74)	(0.72)	(0.75)	(0.84)	(1.26)	(1.28)	(1.66)
REER	-0.815***	-0.822***	-0.541**	-1.304***	-1.317***	-0.673*	-7.518***	-7.555***	-5.768***
	(0.20)	(0.21)	(0.23)	(0.28)	(0.28)	(0.37)	(0.55)	(0.56)	(0.58)
CRgrw		0.252	0.071		0.486	0.010		1.295	-0.753
		(0.47)	(0.48)		(0.64)	(0.61)		(1.84)	(0.99)
WTO			-0.203**			-0.260*			1.691***
			(0.10)			(0.13)			(0.27)
WTO*Trend			0.008***			0.014***			-0.029***
			(0.00)			(0.00)			(0.01)
Trend	0.005	0.005	-0.010*	0.025***	0.024***	-0.002	0.107***	0.105***	0.136***
	(0.00)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)
Q1	-0.178***	-0.177***	-0.178***	-0.215***	-0.213***	-0.214***	-0.129	-0.123	-0.094
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.09)	(0.09)	(0.06)
Q2	-0.037	-0.032	-0.033	-0.111***	-0.102***	-0.103***	-0.009	0.017	0.003
	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.10)	(0.10)	(0.06)
Q3	0.020	0.024	0.021	-0.035	-0.028	-0.032	0.030	0.049	0.094
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.09)	(0.10)	(0.06)
Constant	13.488***	13.505***	12.284***	14.803***	14.836***	12.005***	37.754***	37.841***	29.521***
	(0.95)	(0.98)	(1.10)	(1.34)	(1.32)	(1.70)	(2.56)	(2.60)	(2.64)
RMSE	0.07	0.07	0.07	0.09	0.09	0.08	0.26	0.26	0.17
Obs.	62	62	62	62	62	62	62	62	62
Leads-lags	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1	1, 1

Note: The table reports the results of estimating equation (1) with the post-WTO data on exports via SOEs, FIEs, and private firms. The pair of numbers given in the row labeled "Leads-lags" are the number of leads and the number of lags of the first-differenced cointegrated variables used in the dynamic OLS regression. Robust errors are in parentheses underneath coefficient estimates. "***, **, *" indicate the 1%, 5%, and 10% level of significance, respectively.

Table 8: Imports of SOE, FIE, and Private firms, normalized by the Hong Kong re-export to China unit value index

	[1] SOE	[2] SOE	[3] FIE	[4] FIE	[5] Priv.	[6] Priv.
GDP	4.032*	-4.032*	3.412**	-1.760*	0.403	-2.779
	(2.19)	(1.95)	(1.31)	(0.96)	(1.66)	(2.51)
REER	-0.947**	0.976**	-2.730***	0.640	-3.096***	-0.056
	(0.38)	(0.42)	(0.25)	(0.55)	(0.49)	(1.25)
Export		0.969**		0.952**		0.589**
		(0.36)		(0.15)		(0.24)
Trend	-0.067	0.111**	-0.037	0.039*	0.079*	0.099*
	(0.05)	(0.04)	(0.03)	(0.02)	(0.04)	(0.05)
Q1	-0.093	-0.486	-0.266	-0.069	0.461	-0.206
	(0.66)	(0.53)	(0.42)	(0.28)	(0.82)	(1.20)
Q2	0.211	-0.444*	0.091	-0.044	0.024	-0.889
	(0.26)	(0.22)	(0.16)	(0.13)	(0.33)	(0.56)
Q3	0.591	0.114	0.189	-0.030	0.735	-0.046
	(0.51)	(0.56)	(0.35)	(0.21)	(0.75)	(0.90)
Constant	-16.858	27.559**	-3.221	11.255*	19.164	25.239
	(16.46)	(11.04)	(10.00)	(5.36)	(13.20)	(15.53)
RMSE	0.08	0.05	0.06	0.03	0.11	0.10
Obs.	33	33	33	33	33	33
Leads-lags	1, 1	1, 1, 1	1, 1	1, 1, 1	1, 1	1, 1, 1

Note: The table reports the results of estimating equation (2) with the post-WTO data on imports via SOEs, FIEs, and private firms. The pair of numbers given in the row labeled "Leads-lags" are the number of leads and the number of lags of the first-differenced cointegrated variables used in the dynamic OLS regression. Robust errors are in parentheses underneath coefficient estimates. "***, **, *" indicate the 1%, 5%, and 10% level of significance, respectively.

Table 9: Disaggregated imports, with private consumption and fixed asset investments activity variables

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Aggregate	Ordinary	Proc.	Primary	Manuf.	SOE	FIE	Priv.
Consumption	0.847**	1.304	0.436	-0.925*	-0.109	0.275	1.333*	-1.298
	(0.40)	(0.79)	(0.32)	(0.45)	(0.16)	(0.61)	(0.72)	(0.90)
Fixed asset inv.	0.836*	1.663**	1.186***	1.054**	-0.214	1.438*	1.488**	2.149**
	(0.47)	(0.74)	(0.41)	(0.40)	(0.20)	(0.78)	(0.67)	(1.00)
REER	-1.561***	-0.647	0.665	1.814*	-1.501***	1.177	-0.660	7.155***
	(0.52)	(1.54)	(0.56)	(1.01)	(0.34)	(0.78)	(0.52)	(1.33)
Export	0.348**	-0.360	1.077***	0.898*	0.174	0.312	0.823***	1.676***
	(0.16)	(0.31)	(0.11)	(0.50)	(0.11)	(0.24)	(0.13)	(0.18)
WTO	0.366	1.857**	0.525**	0.330	0.215	1.548***	0.450	-3.363***
	(0.31)	(0.69)	(0.22)	(0.36)	(0.17)	(0.51)	(0.31)	(1.05)
WTO*Trend	-0.012	-0.053***	-0.016**	-0.012	-0.003	-0.043***	-0.017	0.093***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.01)	(0.03)
Trend	0.026***	0.077***	-0.024***	0.014	0.039***	0.026**	-0.006	-0.240***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)
Q1	0.042	-0.001	0.105	0.271	0.036	-0.030	0.220*	-0.008
	(0.21)	(0.26)	(0.11)	(0.18)	(0.11)	(0.19)	(0.13)	(0.27)
Q2	-0.081	0.212	0.090	0.213	0.055	0.043	0.140	0.099
	(0.15)	(0.23)	(0.14)	(0.18)	(0.08)	(0.17)	(0.15)	(0.24)
Q3	0.031	0.198	0.098	0.460***	0.138*	0.148	0.268*	0.474
	(0.11)	(0.21)	(0.09)	(0.14)	(0.08)	(0.16)	(0.14)	(0.33)
Constant	15.245***	17.576**	-1.831	-6.828	14.377***	2.781	7.559***	-29.946***
	(3.30)	(7.24)	(2.90)	(7.71)	(2.19)	(4.08)	(2.55)	(7.29)
RMSE	0.05	0.08	0.05	0.11	0.04	0.04	0.05	0.08
Obs.	59	59	59	59	65	59	57	59
Leads-lags	1, 4, 1, 1	1, 2, 4, 1	1, 4, 1, 3	1, 1, 2, 4	1, 1, 1, 1	1, 2, 3, 1	2, 4, 1, 2	1, 1, 1, 2

Note: The table reports the results of estimating equation (2) with GDP replaced by its two components – consumption and fixed asset investment.

Table 10: Disaggregated imports, with China's relative productivity variable.

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Aggregate	Ordinary	Proc.	Primary	Manuf.	SOE	FIE	Priv.
GDP	4.099	1.563	4.648	6.723	1.701	-0.504	3.834	11.581**
	(2.39)	(8.31)	(2.62)	(3.98)	(1.45)	(2.84)	(2.21)	(4.47)
REER	2.785**	0.586	0.884	4.973**	1.320**	2.530***	1.518	5.535***
	(1.13)	(1.07)	(1.21)	(1.86)	(0.58)	(0.64)	(1.01)	(1.24)
Export	1.472***	1.820**	0.857**	1.822**	1.323***	1.760***	1.137***	1.262***
	(0.36)	(0.65)	(0.37)	(0.59)	(0.18)	(0.37)	(0.26)	(0.17)
Prod	-6.744**	-2.091	-4.812*	-12.606***	-3.021**	-5.637***	-4.472**	-12.651***
	(2.28)	(5.05)	(2.42)	(3.53)	(1.09)	(1.58)	(1.99)	(2.57)
Trend	-0.009	0.010	-0.032	0.012	-0.013	0.113**	-0.027	-0.106
	(0.03)	(0.12)	(0.04)	(0.07)	(0.02)	(0.05)	(0.03)	(0.07)
gfc08	-0.849	34.195	-1.195	1.446	8.153	7.133	8.584	67.008*
	(28.70)	(50.23)	(28.94)	(45.72)	(12.87)	(16.85)	(19.45)	(31.10)
gfc08*REER	-0.008	-8.217	0.221	-0.929	-2.101	-3.168	-1.635	-12.582*
	(5.45)	(9.38)	(5.38)	(9.47)	(2.44)	(3.53)	(3.66)	(5.98)
gfc08*Export	0.083	0.416	0.026	0.246	0.156	0.639**	-0.050	-0.519
	(0.43)	(0.62)	(0.48)	(0.45)	(0.24)	(0.25)	(0.39)	(0.52)
Q1	0.091	-0.372	0.133	-0.175	0.038	-0.122	0.111	-0.468
	(0.39)	(0.65)	(0.43)	(0.63)	(0.21)	(0.41)	(0.36)	(0.74)
Q2	-0.308	-0.166	-0.261	-0.329	-0.025	-0.152	0.049	-0.463
	(0.31)	(0.36)	(0.29)	(0.70)	(0.09)	(0.25)	(0.16)	(0.77)
Q3	0.063	-0.103	0.098	0.149	0.077	0.284	0.094	-0.725
	(0.36)	(0.75)	(0.41)	(0.57)	(0.20)	(0.41)	(0.32)	(0.92)
Constant	-76.17**	-29.88	-56.59	-133.24**	-34.37*	-41.10	-55.02*	-163.95***
	(29.96)	(83.65)	(32.39)	(43.30)	(16.14)	(25.30)	(28.69)	(43.07)
RMSE	0.04	0.09	0.04	0.07	0.02	0.04	0.04	0.07
Obs.	35	35	35	35	35	35	35	35
Leads-lags	1, 1, 1, 1	1, 1, 1, 1	1, 1, 1, 1	1, 1, 1, 1	1, 1, 1, 1	1, 1, 1, 1	1, 1, 1, 1	1, 1, 1, 1

Note: The table reports the results of estimating equation (2) with a relative productivity variable and the Great Recession dummy and its interactions. The one lead and one lag DOLS specification.

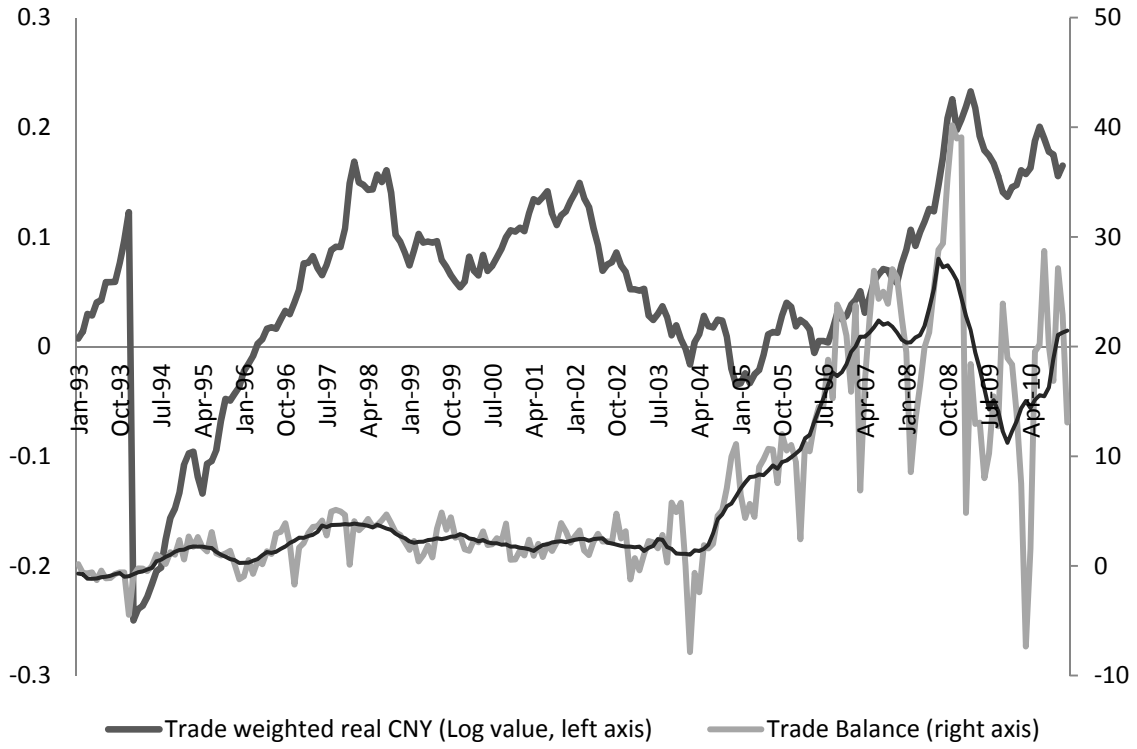

Figure 1: The Log real value of RMB (left scale) and Chinese trade balance, in billions USD per month (right scale)

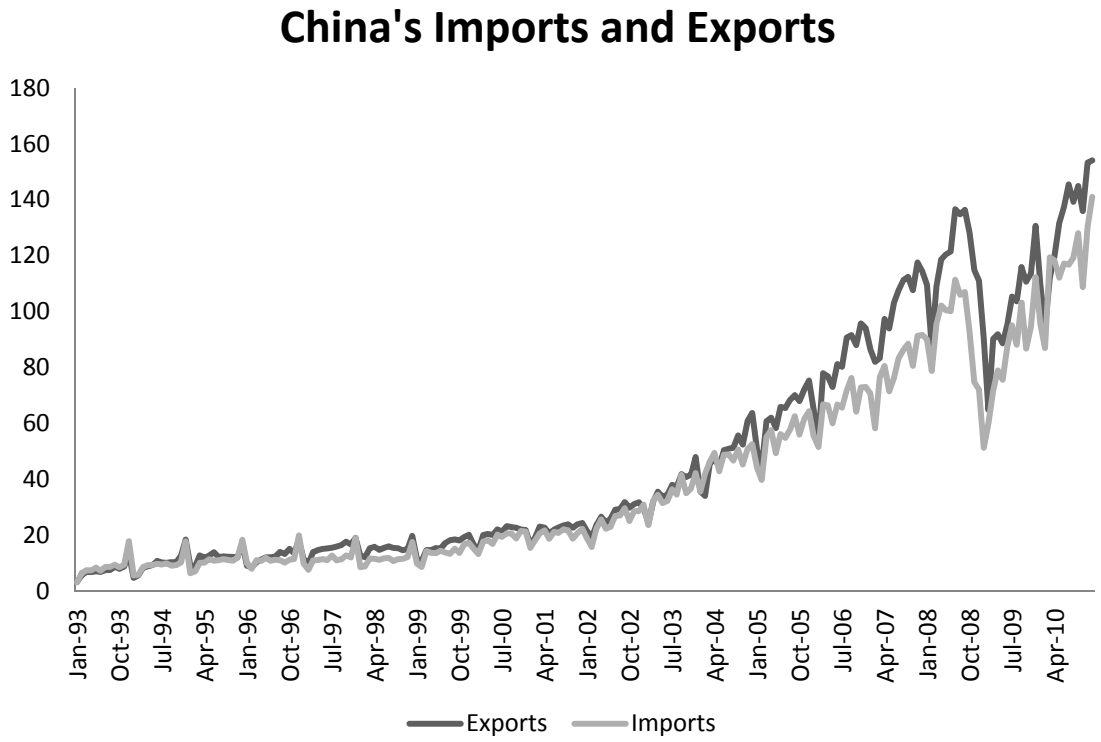

Figure 2: Aggregate Imports and Exports (Billion USD)

Figure 3: Exports by customs classification (Billion USD)

Figure 4: Imports by customs classification (Billion USD)

Figure 5: Exports by product type (Billion USD)

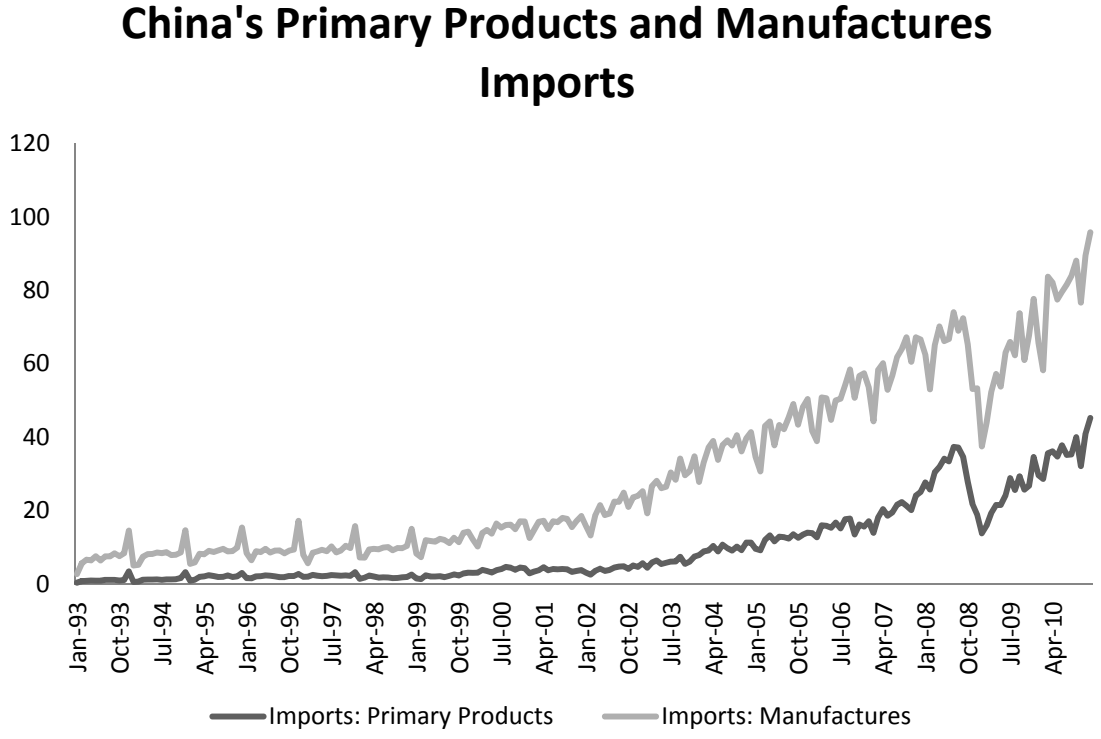

Figure 6: Imports by product type (Billion USD)

Figure 7: Exports by firm type (Billion USD)

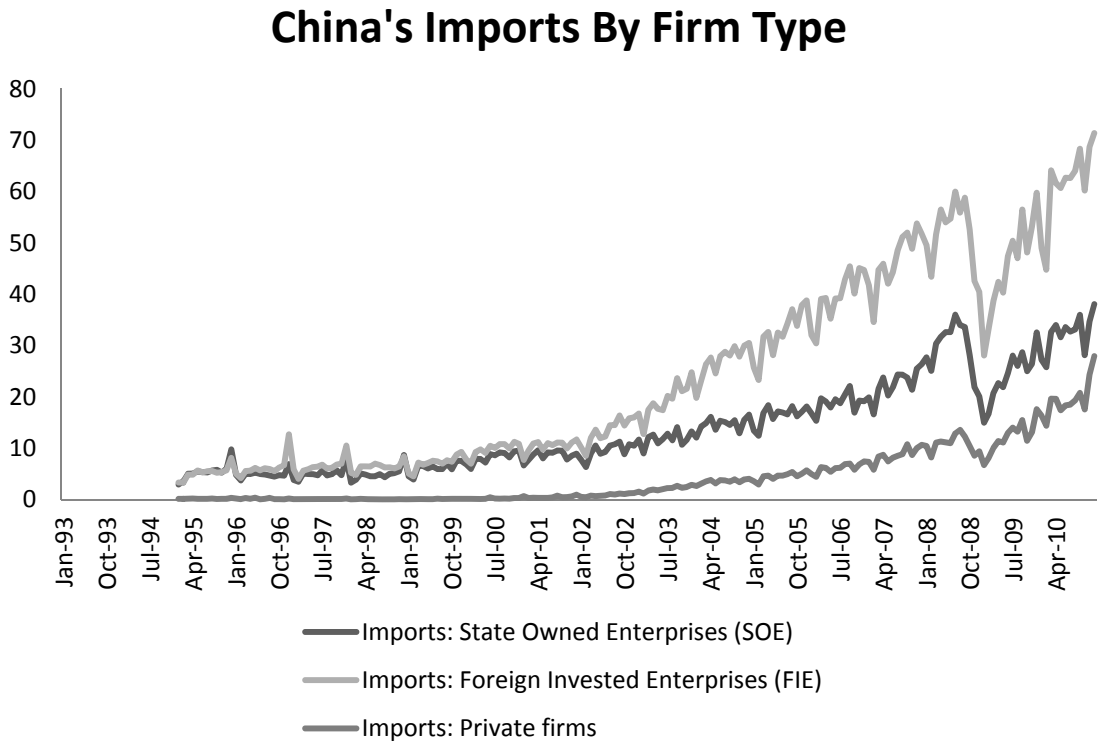

Figure 8: Imports by firm type (Billion USD)

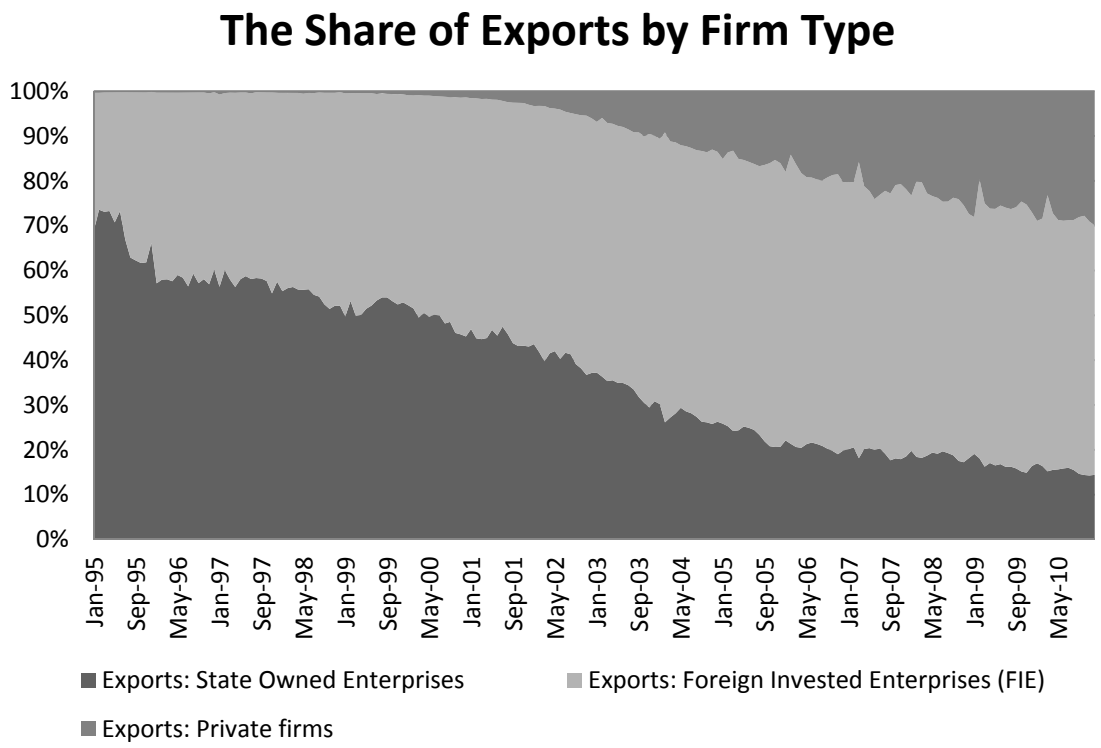

Figure 9: Shares of exports, by firm type

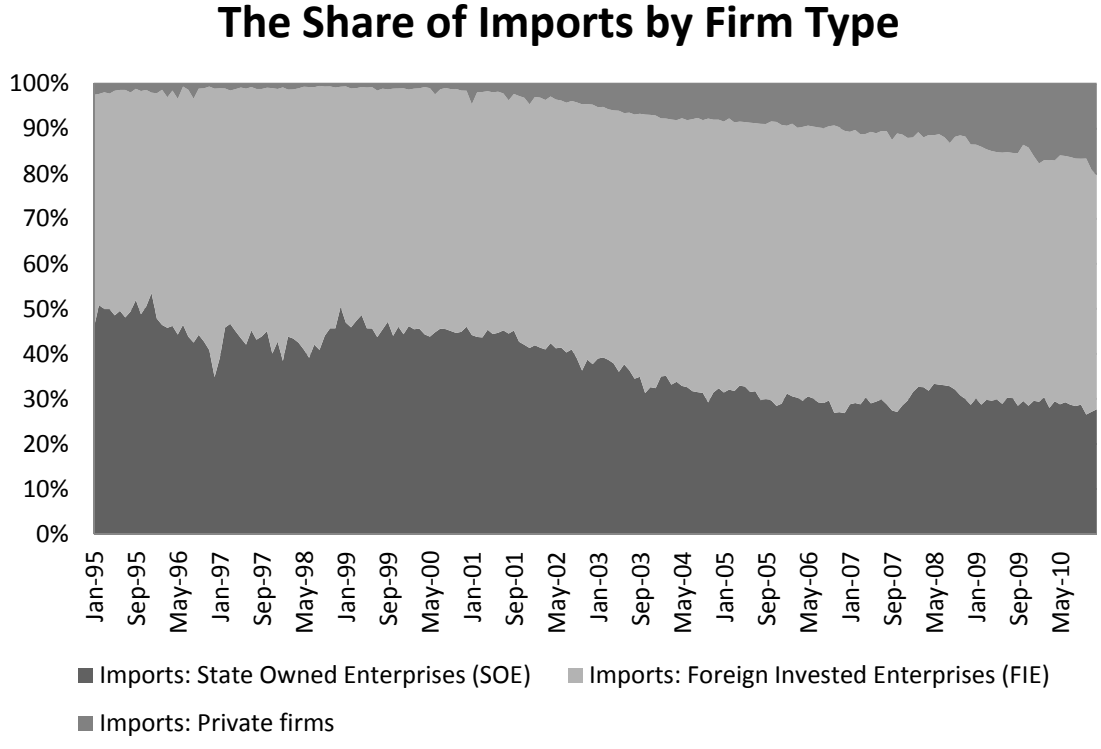

Figure 10: Shares of imports, by firm type