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The Diminishing Impact of Exchange Rates on China's Exports※

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Abstract

China's exports increased from $62 billion in 1990 to $3.6 trillion in 2022. This surge has generated protectionism abroad. Researchers found that renminbi appreciations in earlier years decreased China's exports. This paper presents time series and panel data evidence indicating that exchange rates after the 2008-2009 Global Financial Crisis no longer affect aggregate exports. It also finds that almost all individual export categories were sensitive to exchange rates before the GFC but that less than half are afterwards. These results imply that, if policymakers want to influence China's trade, they need to use instruments other than exchange rates.

Keywords: China, Exports, Exchange Rate Elasticities
JEL classification: F14, F41

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1. Introduction

China's merchandise exports increased from 62 billion U.S. dollars (USD) in 1990 to 3.6 trillion USD in 2022. In 1990, China's exports equaled 1.9% of world exports and in 2022 its exports equaled 14.3% of world exports.[1] China's export juggernaut threatens firms and jobs in importing countries. The Chinese economy is also slowing and its exports are facing protectionist policies abroad. Chinese policymakers consider a weaker renminbi as a tool to stimulate exports (Garcia-Herrero, 2024). How do exchange rates affect China's exports?

Cheung et al. (2012) examined how Chinese aggregate exports deflated using the Hong Kong re-export unit value index responded to the IMF CPI-deflated real effective exchange rate and to export-weighted real GDP over the 1994-2010 period. Using dynamic ordinary least squares (DOLS) estimation, they reported exchange rate elasticities that are correctly signed and statistically significant. These indicated that if the renminbi were 10% weaker, the steady state level of exports would be between 9 and 16% higher. They also reported GDP elasticities that are statistically significant and range from 1.4 to 5.7.

Exchange rates may not affect China's exports in recent years as they did during the period that Cheung et al. (2012) investigated. China's export basket now includes more advanced products than it did over the sample period that Cheung et al. investigated. In 1995, 46% of China's exports were in simple products such as textiles, toys, and agriculture while in 2021 this number had dropped to 18%. On the other hand, in 1995, 36% of China's exports were in advanced products such as machinery, electronics, chemicals, and vehicles while in 2021 this number had increased to 58%. The Asian Development Bank (2018) and Abiad et al. (2018) observed that more sophisticated goods are harder to produce than simple goods. This implies

[1] These data come from the World Bank's World Development Indicators.

that it is harder for those purchasing these goods to find substitutes than it would be for those purchasing ubiquitous products. Since finding substitutes is harder, price elasticities should be lower for more complex goods.

In addition, China has since become the dominant exporter in many categories. For instance, over 80% of all stages of solar panel manufacturing is performed in China (International Energy Agency, 2022). Similarly, 70% of smartphones are assembled in China (Counterpoint, 2022).

Jean et al. (2023) defined a dominant position at the product level as a country possessing a share of more than 50% of worldwide exports. They reported that China in 2019 held a dominant position in almost 600 products. This was six times greater than the U.S. or Japan and more than twice as much as the European Union taken as a whole. Moreover, China's dominant positions was not limited to a few sectors but extended across sectors including electronics, textiles/wearing apparel, footwear, and machinery. Jean et al. reported that China became dominant in many more sectors after 2008 than it was before.

Jean et al. (2023) also investigated Chinese exporters' pricing behavior based on their market shares. Using both naïve and theory-based models, they found that Chinese firms charged higher prices for products where their market shares are larger. They noted that when Chinese exporters have a dominant market share in a product, it is difficult for importers to find substitutes. This gives exporters substantial leverage. One would expect that the price elasticity of demand for goods where China is dominant to be lower.

Freund and Pierola (2012) examined 92 export surges. They found that, for emerging economies, export surges were preceded by large depreciations. They argued that exchange rates stimulate emerging economy exports partly by allowing them to enter new markets and export new products. Developed economies, on the other hand, exhibit less growth in the extensive margin of exports following depreciations. China in earlier years experienced export growth in many new products and new markets. In recent years, after China has already allocated resources to key markets and products, the stimulative impact of exchange rate depreciations on the extensive margin may be smaller.

On the other hand, more of the value-added of the products that China exports now comes from China. Xing (2021) documented the rise of Chinese brands producing cellphones. Branded firms receive more of the return from goods they produce than contract manufacturers do. In addition, McMorrow (2024) showed that much of the value-added going into Huawei's laptops now comes from China. Ahmed et al. (2016) and de Soyres et al. (2021) presented evidence indicating that the impact of exchange rates on exports increases as more of the value-added of the product is produced within a country.

It is thus an empirical question whether exchange rates have a greater impact on China's exports in recent years than they did in earlier years. This paper investigates whether the responsiveness of China's exports to exchange rates has changed. Results from both time series and panel estimation indicate that, after the Global Financial Crisis (GFC) of 2008 and 2009, exchange rates no longer impact China's aggregate exports. The evidence also indicates that this is not because China is exporting more sophisticated products in recent years. In addition the trend rate of growth of China's exports has slowed after the GFC.

Much of the previous work investigating how exchange rates affect China's exports has focused on earlier sample periods. In addition to Cheung et al.'s (2012) work over the 1994-2010 period, Ahmed (2009) reported that a 1.0 percentage point increase in the rate of appreciation of the CPI-deflated real effective exchange rate over the 1996-2009 period would decrease export growth by between 1.1 and 1.8 percentage points. Thorbecke and Zhang (2009) found that a 10% renminbi appreciation over the 1997-2006 period would reduce China's labor-intensive exports by between 16% and 18%. Marquez and Schindler (2007) reported that a 10% appreciation over the 1997-2006 period would reduce China's trade balance by between USD 75 billion and USD 92 billion. Cheung et al. (2016) found that a 10% appreciation of the bilateral renminbi exchange rate relative to the USD over the 1994-2012 period would reduce China's total exports to the U.S. by between 10% and 24%. Fatum et al. (2018) reported that a 10% appreciation of the renminbi relative to the USD over the 2000-2011 period would decrease China's total exports to the U.S. by 17.4%.

Kim (2020) investigated how exchange rates impact trade using data up to June 2017. He employed monthly data on the Chinese CPI-deflated real effective exchange rate, the Chinese trade balance in ratio to GDP, and other variables. Impulse response functions indicate that a depreciation improved China's trade balance over the December 2001 to December 2009 period but worsened China's trade balance over the January 2010 to June 2017 period. The response is statistically significant in both cases.

This paper focuses on China's exports, and whether their responses to exchange rates differ before and after 2009. The finding that depreciations stimulate aggregate exports before 2009 but not after 2009 is consistent with Kim's (2020) findings that depreciations improve China's trade balance during the earlier period but not during the later period.

The next section presents time series estimates of China's export elasticities. Section 3 presents panel data estimates of China's export elasticities. Section 4 concludes.

2. Time Series Evidence on China's Export Elasticities

2.1 Data and Methodology

The theoretical model guiding the work is the imperfect substitutes model. Goldstein and Khan (1985) provide a clear exposition of this framework. Export functions can be written as:

$$X_t = \alpha_1 + \alpha_2 rer_t + \alpha_3 y_t^* \qquad (1),$$

where X_t represents real exports, rer_t represents the real exchange rate, y_t^* represents foreign real GDP, and the variables are measured in natural logs.

Data on China's exports come from the General Administration of Customs via the CEIC database. They are measured in USD and deflated using the Bureau of Labor Statistics (BLS) deflator for exports from China to the U.S.[2] These data are available starting in 2003. Chinn (2006) used the BLS non-industrial country manufacturing price index for exports coming into the U.S. to deflate China's exports before 2003. For periods where data on both deflators are available, he showed that China's exports deflated using the two deflators track each other closely. This paper follows Chinn in using the non-industrial country manufacturing price index to deflate China's exports before 2003 and splicing this together with the BLS Chinese export price deflator starting in 2003. The data extend from 1994Q1 to 2024Q1.

The real exchange rate variable is the CPI-deflated Chinese real effective exchange rate. It is obtained from the Bank for International Settlements. The foreign GDP variable is real GDP in OECD countries. It is obtained from the OECD.[3] Augmented Dickey-Fuller tests do not permit rejection of the maintained hypothesis that real exports, the real effective exchange rate, and real GDP have unit roots.

[2] The website for CEIC is https://www.ceicdata.com/en and the website for the Bureau of Labor Statistics is www.bls.gov .

[3] The website for the Bank for International Settlements is https://data.bis.org/topics/EER . The website for the OECD is www.oecd.org .

This paper follows the methodology of Cheung et al. (2012). They employed DOLS estimation and quarterly data to estimate Chinese export elasticities. The estimated equation takes the form:

$$\ln X_t = \beta_0 + \beta_1 \ln rer_t + \beta_2 \ln y_t * + \sum_{k=-K}^{K} \gamma_{1,k} \Delta \ln rer_{t+k} + \sum_{k=-K}^{K} \gamma_{2,k} \Delta \ln y_{t+k} * + \varepsilon_t \qquad (2).$$

K represents the number of leads and lags of the first-differenced right-hand side variables and the other variables are defined above. K is set equal to 2. Following Stock and Watson's (1993) recommendation and Cheung et al.'s (2012) estimation, a time trend is included in the estimation. Quarterly dummy variables are also included. Since leads and lags are included, the sample period for the estimation extends from 1994Q4-2023Q3.

Structural breaks are also considered. Minimizing Dickey-Fuller t-statistics and examining Dickey-Fuller autoregressive statistics point to a break in the export series during the GFC. A dummy variable is set equal to one beginning in 2009Q2. The dummy variable is also interacted with a trend term and with the exchange rate.

In addition, export functions are estimated for 18 individual product categories. This can shed light on the results for aggregate exports. Data on individual export categories are obtained from the China General Administration of Customs Agency via the CEIC database.

2.2 Results

Table 1 presents the results from estimating equation (2). Column (2) presents the results over the entire 1994-2023 sample period, column (3) the results over the entire sample period accounting for structural breaks, column (4) the results over the 1994-2009 period, and column (5) the results over the 2009-2023 period. Consistent with what Cheung et al. (2012) reported, the dummy variable for the first quarter is negative and large in absolute value in every specification. This reflects the dampening effect that the Chinese New Year's period exerts on China's exports.

The exchange rate elasticity in column (2) for the 1994-2023 period equals −1.19 and is statistically significant. This implies that a 10% renminbi appreciation would reduce exports by 11.9%. This value is within the range of values between −0.9 and −1.6 that Cheung et al. (2012) reported for aggregate exports over the 1994-2010 period. GDP is closely correlated with the time trend. Regressing the GDP variable on a time trend yields a positive coefficient and a t-statistic of 62. Collinearity between these two variables makes it difficult to obtain precise estimates for the individual coefficients on these variables. In column (2) the GDP coefficient is large and statistically significant and the coefficient on the time trend is insignificant.

Column (3) allows for a differential trend and for a change in the exchange rate elasticity beginning in 2009Q2. The trend term is now statistically significant. Over the 1994-2009 period it indicates that the trend growth of exports equals 0.057 and over the 2009-2023 period $0.057 - 0.037 = 0.016$. These results indicate that between 1994 and 2009 China's exports grew at the breakneck speed of 5.7% per quarter and then between 2009 and 2023 at the slower pace of 1.6% per quarter. Between 1994 and 2009 China progressed from being a minor exporter on the world stage to being the world's largest exporter. It would have hardly been possible for China's exports to grow at the same pace after 2009 as they did over the previous 15 years.

The coefficients on the real effective exchange rate and the real effective exchange rate interacting with a dummy variable equaling one starting in 2009Q2 are both highly statistically significant. They indicate that the exchange rate elasticity over the 1994-2009 period equaled

−1.36 and over the 2009-2023 period −1.36+1.05 = −0.31. Thus exchange rates mattered much more for China's exports over the earlier sample period than they did over the later sample period.

It is noteworthy that, when accounting for a structural break in column (3), the standard error of regression is much smaller and the adjusted R^2 larger. Taking account of differential trends and different exchange rate responses before and after the GFC thus improves the fit of the model.

Column (4) presents results over the 1994-2009 period. The trend term is large and statistically significant. It indicates that China's exports grew on average by 7.4% per quarter over this period. The exchange rate elasticity is correctly signed and greater than unity in absolute value. This is in the range that Cheung et al. (2012) reported over the 1994-2010 period.

Column (5) presents results over the 2009-2023 period. The trend term is again statistically significant. It indicates that China's exports grew on average by 1.6 percent per quarter over this period. The exchange rate coefficient is now insignificant and close to zero. This reinforces the message in column (3) that exchange rates are not important for China's aggregate exports after 2008.

To investigate these findings further, Table 2 reports exchange rate elasticities for disaggregated exports over the earlier and later sample periods. Columns (2) and (3) present results for the 1994-2009 period and columns (4) and (5) for the 2009-2023 period. Before the GFC, renminbi appreciations are associated with declines in exports at at least the 10% level in 17 out of 18 sectors investigated. After the GFC, renminbi appreciations are associated with declines in exports in only 8 of 18 sectors. These findings indicate that exchange rates mattered more for China's exports before the GFC than they did after.

For those categories in Table 2 where China has become an especially strong exporter such as general industrial machinery, electrical machinery, manufactures, paper and articles thereof, and rubber manufactures, the exchange rate mattered in the earlier period but not in the later period. For those categories where Chinese exporters still compete strongly with foreign exporters such as chemicals, road vehicles, specialized machinery, and primary products, exchange rates matter in both the earlier and the later periods. Thus exchange rate depreciations even after 2009 increase the price competitiveness of China's exports in these contested sectors and enable Chinese firms to export more.

For textile yarn and fabrics and furniture and parts, the exchange rate elasticities change from negative and significant over the 1994-2009 sample period to positive and significant at at least the 10% level for the 2009-2023 period. As Thorbecke (2018) documented, China has moved upstream in these sectors. It now exports inputs to firms in these sectors in other countries. These firms then use these to produce final goods for re-export.

Many researchers have found that exchange rate elasticities are not correctly signed for exports of inputs used to produce final goods in other countries. As Kamada and Takagawa (2005) and Tang (2014) discussed, this is because an appreciation in an upstream country is often associated with a depreciation in the country producing the final goods. This depreciation increases the price competitiveness of the final goods and thus their demand for imported inputs from upstream countries. Nishmura and Hirayama (2013) reported that real exchange rate elasticities for Japanese electrical machinery exports to China take on the wrong sign. However, when they include China's exports as an additional explanatory variable, the exchange rate elasticity takes on the correct sign. Similarly, Cheung et al. (2012) found that exchange rate elasticities for China's imports took on the wrong sign unless they included China's exports as an independent variable. The incorrect signs on China's exports of textile yarn and fabrics and furniture and parts in Table 2 over the 2009-2023 period could reflect the fact that these are inputs that are used in the importing countries to produce goods for re-export.

For iron and steel, the exchange rate elasticity is negative and large in the earlier period but not in the later period. China produces more than half of the world's steel. It also produces much more than China needs domestically. As a result, China's steelmakers export their excess capacity. They often export these at low prices (see de Carvalho et al., 2024). As Chinese exporters have focused on exporting their excess production, they are less concerned about making a profit and more concerned about selling what they have produced. Thus exchange rates and price competitiveness matter less for China's steel exports in recent year than they did in earlier years when China had less excess capacity in steel.

For computers, the exchange rate did not affect exports during the first period but did during the second period. Dedrick et al. (2010) investigated the inputs used to make the Lenovo ThinkPad T43 Notebook PC and the Hewlett-Packard nc6230 Notebook PC in China during the earlier sample period. They found that almost all of the value-added came from parts and components manufactured in the U.S., Japan, South Korea, and other countries. They found that Chinese workers earned as little as one U.S. cent (USD 0.01) per minute. The finding that so little of the value-added of computers assembled in China came from China in the earlier period helps explain why the exchange rate coefficient for computers in column (2) of Table 2 is insignificant. More recently, much of the value-added of computers made in China comes from

China (see, e.g., McMorrow, 2024). This helps explain why the exchange rate coefficient for computers in column (4) of Table 2 is negative and significant.

The important implication of the results reported here is that exchange rates affect China's exports differently after the GFC then they did before. For aggregate exports, renminbi appreciations did not slow exports over the 2009-2023 period but did over the 1994-2009 period. The same is true for categories where China has become a strong exporter such as general industrial machinery, electrical machinery, and manufactures. For categories where there is fierce competition in the global economy such as chemicals, road vehicles, and specialized machinery, renminbi appreciations still reduce the price competitiveness and thus the quantity of China's exports. For areas such as computers where China's value-added has grown from minuscule to substantial, exchange rate appreciations reduce exports in the later sample period but not in the earlier sample period. These findings indicate that conclusions drawn from before the GFC may no longer explain China's exports after the GFC.

3. Panel Data Evidence on China's Export Elasticities

3.1 Data and Methodology

Tariffs also impact trade. In addition, as China's exports shift from one destination to another the weights on the effective exchange rate should change.[4] To control for these factors we estimate a model with China's exports to individual countries as a function of bilateral real exchange rates, tariffs, and GDP in the importing countries.

Data on bilateral exports between China and its trading partners come from the UN Comtrade database via the Harvard University Growth Lab. They are measured in USD and

[4] We are indebted to Professor Menzie Chinn for these comments. He is not responsible for any errors though.

deflated using the same deflator employed in the previous section. They include China's exports in 1,242 export categories disaggregated at the Harmonized System 4-digit level over the 1995-2018 period to 190 trading partners. Data on bilateral exchange rates and real GDP come from the CEPII-CHELEM database. Data on bilateral tariffs at the product level come from the World Integrated Trade Solution database.

We follow the methodology of Bénassy-Quéré et al. (2021). They seek to explain exports from economy *i* to economy *j* of product p during year *t* (X_{ijpt}) based on the bilateral real exchange rate ($BRER_{ijt}$), the tariff rate on exports from economy *i* to economy *j* of product p (t_{ijpt}), a series of fixed effect terms, and other control variables:

$$lnX_{ijpt} = \beta_0 + \beta_1 lnBRER_{jt} + \beta_2 \ln(1 + t_{ijpt}) + \lambda_{ipt} + \mu_{jpt} + \nu_{ij} + \epsilon_{ijpt} \quad (3),$$

where λ_{ipt} represents exporter, product, and time fixed effects; μ_{jpt} represents importer, product, and time fixed effects; ν_{ij} represents exporter, importer fixed effects; and ϵ_{ijpt} is the error term.

Since we investigate only one exporting country, China, we remove *i* from equation (3), and estimate the following equation:

$$lnX_{jpt} = \beta_0 + \beta_1 lnBRER_{jt} + +\beta_2 \ln(1 + t_{jpt}) + \beta_3 lnY_{jt} + \lambda_{jp} + \mu_t + \epsilon_{jpt} \quad (4).$$

Y_{jt} represents real GDP in importing country i. An increase in $BRER_{jt}$ is an appreciation of the Chinese yuan. Importer-product pairings are used because importer preferences are often connected to product characteristics.

We also investigate whether exchange rate elasticities are related to product complexity. To do this we use the product complexity index (PCI) constructed by the Harvard University Growth Lab. PCI is closely connected with the concept of an economy's complexity (Hidalgo and Huasmann, (2007, 2009, and 2014).

To measure an economy's complexity and a product's complexity quantitatively, Hidalgo and Hausmann (2009) and Hausmann et al. (2014) employed the method of reflections. For an economy, they calculated complexity based on the diversity of its export basket. They measured diversity as the number of products that an economy exports with revealed comparative advantage (RCA) greater than one. For a product, they calculated PCI based on its ubiquity. They measured ubiquity as the number of economies that export the product with RCA above one. They classified an economy that exports more products with RCA greater than one as more diversified, and a product that fewer economies export with RCA greater than one as less ubiquitous. Higher diversity indicates that a country has more capabilities and lower ubiquity indicates that a product requires more capabilities to produce. They iterate between measures of an economy's diversity and a product's complexity to calculate the PCI.

We use the average PCI values over our sample period. We divide the 1,242 products into five levels of sophistication based on their PCI. We then investigate whether exchange rate elasticities differ across these five categories during the 1995-2008 and 2009-2018 periods.

3.2 Results

Table 3 presents the results for estimating China's total exports over the 1995-2008 and 2009-2018 periods. Column (2) presents the results for the earlier sample period and column (3) for the later sample period.

In column (2) of Table 3 all of the coefficients are correctly signed and statistically significant. The coefficient on the exchange rate equals -1.03. This indicates that a 10% renminbi appreciation would reduce exports by 10.3%. This is within the range of 9 to 16% that Cheung et al. (2012) reported for the 1994-2010 period. The coefficient on the tariff rate equals

-0.80. This indicates that a 10 percent increase in tariffs would reduce exports by 8 percent. The coefficient on GDP equals 0.75. This indicates that a 10% increase in GDP in importing countries is associated with a 7.5% increase in China's exports.

In column (3) of Table 3 all of the coefficients except the exchange rate coefficient are correctly signed and statistically significant. The coefficient on the exchange rate equals -0.07 and is not significant. This implies that the exchange rate does not affect Chinese exports over the 2009-2018 period. The coefficient on the tariff rate equals -0.68. This indicates that a 10 percent increase in tariffs would reduce exports by 6.8 percent. The coefficient on GDP equals 0.99. This indicates that a 10% increase in GDP in importing countries is associated with a 9.9% increase in China's exports.

Table 4 reports trade elasticities for exports sorted into five sophistication categories over the 1995-2008 period. Column (2) is the least sophisticated category and the categories become more sophisticated moving to the right. The exchange rate coefficients are correctly signed and statistically significant for every category. They range from -1.20 for the least sophisticated category to -0.88 for the most sophisticated category. These indicate that a 10% depreciation will reduce exports by between 12% for the least sophisticated and 8.8% for the most sophisticated. The finding that exchange rates matter more for the least sophisticated than for the most sophisticated accords with the findings reported by Chen et al. (2023). The coefficients of tariffs and GDP are all correctly signed. They are all statistically significant except for the coefficient on tariffs for the most sophisticated category.

Table 5 reports trade elasticities for exports sorted into five sophistication categories over the 2009-2018 period. Column (2) again is the least sophisticated category and the categories become more sophisticated moving to the right. The exchange rate coefficients are small and not statistically significant for any category. On the other hand the coefficients on tariffs and on GDP are correctly signed and statistically significant for every category except for tariffs on medium-low sophisticated goods. In this case it is correctly signed but only significant at the 10% level.

The important implication of the results in Table 3 is that exchange rates do not matter for total exports during the 2009-2018 period. The results in Table 5 also indicate that they do not matter for any sophistication level over the later sample period. This indicates that the diminishing impact of exchange rates after the GFC cannot be explained by the increasing sophistication of China's exports over this period.

4. Conclusion

China's exports continue to grow. They threaten employment and firm profitability in importing countries. China's economy is also facing headwinds and its exports are confronting tariffs and other protectionist policies. This paper investigates how exchange rates, tariffs, and other factors affect China's exports.

Results reported here indicate that, while an appreciation would have reduced China's exports before the GFC, the impact now is tenuous. Examining China's aggregate exports using DOLS analysis, the findings indicate that exchange rates mattered before the GFC but not after. Examining individual sectors, the results indicate that a renminbi appreciation before the GFC caused a decline in exports in 17 out of 18 sectors investigated. However, a renminbi appreciation after the GFC caused a decline in exports in only 8 of 18 sectors.

Examining exports using a panel data model, the results also indicate that exchange rates affected exports before the GFC but not after. To investigate whether the exchange rate did not matter after the GFC because China's export basket has become more sophisticated, China's exports are divided into five levels of sophistication using Hidalgo and Hausmann's (2009) framework. For all five levels, exchange rates no longer affect exports after 2008. The results in this paper resonate with Kim's (2020) findings that a depreciation of the Chinese CPI-deflated real effective exchange rate improved the Chinese trade balance over the December 2001 to December 2009 period but not over the January 2010 to June 2017 period.

The Chinese renminbi depreciated by 10.5% against the USD between January 2012 and December 2019. As Figure 1 shows, Chinese export prices in USD fell by 7.4% over that period. There was thus significant pass-through from exchange rates to USD prices over this period. *Ceteris paribus* this should help exchange rates to influence exports over this period. Nevertheless, the evidence reported here indicates that the effect of exchange rates on exports became tenuous after the GFC.

While exchange rates have become less important, tariffs continue to deter China's exports at all sophistication levels. The international elasticity puzzle is an empirical finding that tariff increases deter exports more than exchange rate appreciations do (see, e.g., Bénassy-Quéré et al., 2021, Fontagné et al., 2018, and Fitzgerald and Haller, 2014). For China, the evidence reported here is more stark. It indicates that tariffs now deter exports but appreciations do not.

China's exports have soared. Setser (2024) reported that China's goods trade balance may be 50% higher than reported in the Chinese current account data. China's export juggernaut has generated tariffs abroad. Exchange rate appreciations will not help to stabilize the imbalances. Rather than stoking protectionism, China should seek to boost domestic consumption and countries such as the U.S. with outsized budget deficits should pursue fiscal consolidations.

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Table 1. Dynamic Ordinary Least Squares Estimates of China's Aggregate Export Elasticities

(1)	(2)	(3)	(4)	(5)
Variable				
Real Effective Exchange Rate	-1.19** (0.52)	-1.36*** (0.31)	-1.13*** (0.29)	-0.07 (0.23)
OECD GDP	7.05*** (1.25)	-0.79 (1.30)	-3.28 (2.27)	-0.04 (1.52)
Trend	0.005 (0.008)	0.057*** (0.009)	0.074*** (0.015)	0.016** (0.007)
Break starting at 2009Q2		2.31 (1.60)		
Break*Real Effective Exchange Rate		1.05*** (0.38)		
Break*Trend		-0.037*** (0.004)		
First Quarter	-0.25*** (0.04)	-0.22*** (0.02)	-0.22*** (0.04)	-0.20*** (0.03)
Second Quarter	-0.15*** (0.05)	-0.10*** (0.02)	-0.10*** (0.03)	-0.07** (0.03)
Third Quarter	-0.15** (0.06)	-0.07*** (0.02)	-0.05* (0.03)	-0.05 (0.03)
Sample Period	1994Q4-2023Q3	1994Q4-2023Q3	1994Q4-2009Q1	2009Q2-2023Q3
Number of Observations	116	116	58	58
Number of Leads & Lags	2,2	2,2	2,2	2,2
Standard Error of Regression	0.216	0.075	0.075	0.082
Adjusted R^2	0.963	0.996	0.992	0.913

Notes: The table presents dynamic ordinary least squares (DOLS) estimates of trade elasticities for China's exports to the world. China's total exports are measured in U.S. dollars and deflated using the Bureau of Labor Statistics (BLS) deflator for exports from China to the U.S. over the 2003-2023 period and the BLS deflator for manufacturing exports from non-industrial countries before this. Real Effective Exchange Rate is the CPI-deflated real effective exchange rate obtained from the Bank for International Settlements. OECD GDP is real GDP in OECD countries obtained from the OECD. Break starting at 2009Q2 is a dummy variable equaling zero until 2009Q1 and one after this. The break is also interacted with the real effective exchange rate and with a trend term. Quarterly dummy variables are included in the DOLS estimation. Two leads and lags of the first differences of the exchange rate and real GDP are also included. Heteroskedasticity and autocorrelation consistent standard errors are reported in parentheses.
*** (**) [*] denotes significance at the 1% (5%) [10%] level.

Table 2. Dynamic Ordinary Least Squares Estimates of China's Exchange Rate Elasticities for Individual Sectors

(1)	(2)	(3)	(4)	(5)
	1994Q1-2009Q1 Sample Period		2009Q2-2023Q3 Sample Period	
Sectors	Exchange Rate Elasticity	S.E.	Exchange Rate Elasticity	S.E.
Chemicals	-0.78**	0.31	-1.02***	0.37
Computers	-0.74	0.53	-0.68**	0.31
Electrical Machinery, Apparatus & Appliances	-1.11***	0.23	-0.50	0.32
Furniture & Parts	-1.07***	0.31	0.75***	0.18
General Industrial Machinery	-1.38***	0.19	-0.08	0.23
Iron and Steel	-1.85*	0.93	0.27	0.73
Manufactures	-1.12***	0.30	-0.04	0.23
Manufactures of Metals	-0.81***	0.29	0.05	0.26
Medical and Pharmaceutical Products	-0.57*	0.32	-0.95	0.66
Metal Working Machinery	-0.99**	0.39	-1.19***	0.42
Non-Ferrous Metals	-1.78***	0.65	-0.94**	0.39
Paper and Articles thereof	-1.56***	0.45	0.82*	0.42
Plastics in Primary Forms	-2.02*	1.18	-1.11**	0.47
Primary Products	-0.95***	0.23	-0.59***	0.21
Road Vehicles	-2.08***	0.31	-1.65**	0.63
Rubber Manufactures	-0.86***	0.27	-0.45	0.55
Specialized Machinery	-1.82***	0.37	-0.83**	0.38
Textile Yarn and Fabrics	-1.68***	0.34	0.48*	0.28

Notes: The table presents dynamic ordinary least squares (DOLS) estimates of exchange rate elasticities for China's exports to the world. China's exports are measured in U.S. dollars and deflated using the Bureau of Labor Statistics (BLS) deflator for exports from China to the U.S. over the 2003-2023 period and the BLS deflator for manufacturing exports from non-industrial countries before this. The exchange rate is the CPI-deflated real effective exchange rate obtained from the Bank for International Settlements. Real GDP in OECD countries obtained from the OECD is also included in the regression. Two leads and lags of the first differences of the exchange rate and real GDP are included in the DOLS estimation. Quarterly dummy variables and a time trend are also included. Heteroskedasticity and autocorrelation consistent standard errors are reported in columns (3) and (5).
*** (**) [*] denotes significance at the 1% (5%) [10%] level.

Table 3. Panel Data Estimates of China's Export Elasticities

(1)	(2)	(3)
Variable		
Bilateral Real Exchange Rate	-1.03*** (0.14)	-0.07 (0.09)
Tariff Rate	-0.80*** (0.23)	-0.68*** (0.16)
Importing Country Real GDP	0.75*** (0.28)	0.99*** (0.15)
Sample Period	1995-2008	2009-2018
Number of Observations	877,414	1,012,829
Adjusted R^2	0.836	0.886

Notes: The table presents panel data estimates of trade elasticities for China's exports. China's exports in 1,242 export categories disaggregated at the Harmonized System 4-digit level to 190 trading partners are included. Exports are measured in U.S. dollars and deflated using the Bureau of Labor Statistics (BLS) deflator for exports from China to the U.S. over the 2003-2018 period and the BLS deflator for manufacturing exports from non-industrial countries before this. Bilateral real exchange rates are CPI-deflated. Exchange rate and real GDP data come from the CEPII-CHELEM database. Data on bilateral tariffs at the product level come from the World Integrated Trade Solution database. Importer-product and time fixed effects are included.
*** denotes significance at the 1% level.

Table 4. Panel Data Estimates of China's Export Elasticities by Sophistication Level over the 1995-2008 Sample Period

(1)	(2)	(3)	(4)	(5)	(6)
Variable	Least Sophisticated Exports	Medium-Low Sophisticated Exports	Medium Sophisticated Exports	Medium-High Sophisticated Exports	Most Sophisticated Exports
Bilateral Real Exchange Rate	-1.20*** (0.17)	-1.10*** (0.14)	-0.99*** (0.14)	-1.06*** (0.13)	-0.88*** (0.14)
Tariff Rate	-0.87*** (0.19)	-0.64** (0.27)	-0.96*** (0.26)	-1.09*** (0.39)	-0.55 (0.41)
Importing Country GDP	0.85** (0.33)	0.65*** (0.27)	0.82*** (0.29)	0.73** (0.28)	0.61** (0.31)
Number of Observations	153,367	156,789	168,117	193,536	205,596
Adjusted R^2	0.849	0.840	0.824	0.846	0.831

Notes: The table presents panel data estimates of trade elasticities for China's exports. China's exports in 1,242 export categories disaggregated at the Harmonized System 4-digit level to 190 trading partners are included. The 1,242 products are separated into five equal categories based on the sophistication levels of the products. Product sophistication is determined using the product complexity index of Hidalgo and Hausmann (2009). Exports are measured in U.S. dollars and deflated using the Bureau of Labor Statistics (BLS) deflator for exports from China to the U.S. over the 2003-2008 period and the BLS deflator for manufacturing exports from non-industrial countries before this. Bilateral real exchange rates are CPI-deflated. Exchange rate and real GDP data come from the CEPII-CHELEM database. Data on bilateral tariffs at the product level come from the World Integrated Trade Solution database. Importer-product and time fixed effects are included.
*** (**) denotes significance at the 1% (5%) level.

Table 5. Panel Data Estimates of China's Export Elasticities by Sophistication Level over the 2009-2018 Sample Period

(1)	(2)	(3)	(4)	(5)	(6)
Variable	Least Sophisticated Exports	Medium-Low Sophisticated Exports	Medium Sophisticated Exports	Medium-High Sophisticated Exports	Most Sophisticated Exports
Bilateral Real Exchange Rate	-0.16 (0.11)	-0.06 (0.10)	-0.03 (0.09)	-0.09 (0.10)	-0.04 (0.09)
Tariff Rate	-1.02*** (0.25)	-0.38* (0.20)	-0.88*** (0.23)	-0.91*** (0.25)	-0.64** (0.26)
Importing Country GDP	1.04*** (0.18)	1.00*** (0.17)	1.02*** (0.15)	0.99*** (0.16)	0.93*** (0.18)
Number of Observations	170,774	180,171	193,472	223,854	243,515
Adjusted R^2	0.883	0.875	0.879	0.897	0.894

Notes: The table presents panel data estimates of trade elasticities for China's exports. China's exports in 1,242 export categories disaggregated at the Harmonized System 4-digit level to 190 trading partners are included. The 1,242 products are separated into five equal categories based on the sophistication levels of the products. Product sophistication is determined using the product complexity index of Hidalgo and Hausmann (2009). Exports are measured in U.S. dollars and deflated using the Bureau of Labor Statistics (BLS) deflator for exports from China to the U.S. Bilateral real exchange rates are CPI-deflated. Exchange rate and real GDP data come from the CEPII-CHELEM database. Data on bilateral tariffs at the product level come from the World Integrated Trade Solution database. Importer-product and time fixed effects are included.
*** (**) [*] denotes significance at the 1% (5%) [10%] level.

Figure 1. U.S. Dollar Export Prices for Chinese Exports

Source: U.S. Bureau of Labor Statistics.