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The Global Financial Crisis and the Export-Led Economic Growth in China

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The growing trade conflict with the United States has heightened concerns on the progress of China's economic rebalancing and restructuring from export-led growth strategy to one propelled by domestic consumption. This article examines the role of exports in China's economic growth in both the short run and the long run. Using an ARDL model and quarterly time series data from 1994 and 2018, we find evidence indicating heightened importance of exports in China's GDP growth after the Global Financial Crisis, and our results suggest that the transition from an export-led growth strategy is proceeding far less smoothly than hoped.

Keywords: exports; China; economic growth; global financial crisis; ARDL

INTRODUCTION

The trade tension between world's two largest economies escalated when the United States enacted a punitive tariff of 10% on US$200 billion of Chinese imports on September 24, 2018. This is one of a series of developments as China's trade war with America deepens. On July 6, 2018, the Trump administration announced the imposition of 25% duties on imports of US$34 billion of goods from China, notably machinery and electronic parts, prompting immediate retaliation from China dollar-for-dollar on soybeans and sport-utility vehicles. Subsequently in August, the United States enacted levies of 25% on US$16 billion of Chinese imports. These tariffs, if fully implemented, will make the imports from China prohibitively expensive, and effectively lead to a halt of the sale of such products, accounting for nearly 60% of China's exports to the United States.

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The most extensive trade conflict in decades has prompted many to wonder how China can weather the effects of this storm.[1] While the immediate direct impact of a trade shock on the Chinese economy are certainly negative, a more important question is how big the effect of drops in exports can be on China's growth outlook. In other words, to what extent does the Chinese economy depend on exports as an engine of economic growth? This has naturally pointed to the progress of China's economic restructuring from an export-led growth strategy to a more consumer-led economy, especially in view of dramatic changes in global aggregate demand after the onset of the global financial crisis (GFC).[2]

The study of China's economic growth and its sources are of interest to the general public, academics, as well as policy makers. Now the world's second largest economy, China accounted for almost 18% of the world's economic activity in 2016 according to the IMF. The country's ongoing economic slowdown has cross-border repercussions and long-term implications for the global economy. According to the IMF, the decline in China's rate of expansion from more than 10% in 2010 to an expected 6.3% in 2016 will knock as much as 0.75 percentage points off the global growth rate.

Already, China's slower growth has cut into the country's crude oil demand and has arguably played a role in the dramatic fall of crude oil prices. As the world's most important importer of metals, China's share in the global consumption of nonfuel commodities, especially base metals, has gone up from less than 20% in the early 2000s to more than 50% in 2015, due to the country's increasing role as a global manufacturing hub and as a result of the infrastructure investment and construction boom during the GFC.

The current slower metal-intensive investment growth in China is considered instrumental in weakening base metal prices, for example, iron ore, copper, and so on. The weakening Chinese demand has had significant impact on the economies and currencies of countries such as Australia and New Zealand. In addition to plunging commodity prices, spillover of China's reduced growth can also be reflected through trade channels as well as diminishing confidence and increasing volatility in financial markets.

After decades of blistering growth, the capital-intensive and export-oriented approach is delivering diminishing returns to the Chinese economy. As the global leader in international trade, the Chinese economy depends on foreign demand for its products and hence on the state of the world economy. The global financial crisis has provided clear evidence that China's export-driven economy is vulnerable to dips in demand in the rest of the world. Moreover, its dependence on investment has introduced distortions and imbalances into the Chinese economy.[3]

In the pursuit of sustainable long-term growth, China's leaders realized that they must restructure the country's economy from export-led growth to one driven by domestic consumption. As early as 2006,former Premier Wen Jiaobao in his speeches to the annual meetings of the National People's Congress had set the goal of strengthening domestic consumption as a major source of economic growth in place of investment and export-led development. This long-sought shift away from investment and manufacturing toward domestic consumption and services has been one of the nation's big themes of recent years and its progress has important and far-reaching implications.[4]

The economic development literature contains extensive studies on the relationship between exports and economic growth; and generally the consensus is that a higher level of

exports has arguably a positive impact on economic growth (See, Giles & Williams, 2000; Palley, 2012). Export-led growth strategy is aimed at increasing productive capacity by focusing on foreign markets. Export expansion enhances factor productivity through gains from trade between economies with different capital-labor ratios (Dornbusch, Fischer, & Samuelson, 1980). In addition, a higher degree of openness is beneficial for controlling rent seeking, a problem often arising from import-substitution strategies (Krueger, 1974). Most importantly, trade facilitates technology diffusion and knowledge spillovers which in turn contributes to higher efficiency and rapid total factor productivity growth (Grossman & Helpman, 1991). Abundant empirical literature on the export-led growth hypothesis has followed and the growth records of many economies are cited as such examples.

The export-led growth paradigm was pioneered by Germany and Japan in the 1950s and 1960s. In the 1970s and 1980s, the strategy had contributed to the success of Asian newly industrialized economies (NIEs) – namely South Korea, Taiwan, Hong Kong, and Singapore (World Bank, 1993). Subsequently, it spread further and several economies in South East Asia, Latin America, and China have all exemplified the paradigm.

In the context of China, the export-led growth hypothesis has been tested using causality analysis in various studies with mixed results. Tang (2006) found that there are no long-run relationship among exports, real GDP, and imports and no short-run causality between export expansion and economic growth in China for the period from 1970 to 2001.[5] In contrast, bi-directional Granger causality was found among exports and real industrial output during the 1987–1996 period by Shan and Sun (1998). Using data from 1978 to 2002, Tsen (2010) found bi-directional Granger causality indicating a dynamic relationship among exports, domestic demand, and economic growth. Mah (2007) examined the causal relationship among economic growth, exports, and export composition, supporting the export-led economic growth hypothesis. Herrerias and Orts (2010) provided further evidence supporting the export-led growth effect in accounting for China's economic growth and pointed out that exports exogenously drive output and productivity in the long run. Comparing China's export-led growth strategy with international experience, Xu (2010) argued that the Chinese experience of export-led industrialization is rather exceptional and that it is feasible for China to raise labor income so that more service sector jobs would be created and the external balance would become more sustainable.

No recent studies however have appeared to address the evolving role of exports in the Chinese economic growth, especially during the process of economic rebalancing. In addition, China fared relatively well during the GFC thanks to big stimulus programs but the massive lending has left many banks, companies, and local governments with a huge debt overhang that may hinder economic growth prospects (Liang, 2017).[6]

The contribution of this article is three-fold. First, we examine the progress of China's economic rebalancing by analyzing the role of exports in driving its economic growth, a timely topic with important policy implications at home and abroad. Second, a deteriorating global economy following the outbreak and ramifications of the GFC was believed to provide an opportunity for China to rely less on manufacturing and external demand and more on services and domestic consumption. How effective, if at all, is this global event on China's economic transition remains an empirical question and has yet to be explored fully. Third, this article adds to the current stream of literature on China's economic development and

export-led growth by adopting the most recent data available and a set of rigorous econometric techniques to test empirically the importance of exports in driving China's economic growth in order to shed new light on the economic transition and restructuring of the Chinese economy.

Our results show that there is a positive relationship between exports and economic growth both in the long term and short term. In particular, the relationship has become even stronger after the onset of the GFC, indicating that the process of shifting the Chinese economy from relying on manufacturing and exports to services and domestic consumption is going to be very slow and challenging.

The remainder of the article is organized as follows: The next section provides background information on China's economic growth and role of exports. Following that, there is a discussion of methodology and the data and empirical results. The final sections discuss the policy implications of our study and the conclusion of the article.

CHINA'S EXPORTS

During the past three decades, China has experienced a remarkable transformation, going from a poor and largely agricultural economy relying on central planning to becoming the world's manufacturing powerhouse. Strong and relentless economic growth has been underpinned by relatively low wages, ample labor supply, and exponential export growth since the reform and an open up policy implemented in 1978. The rapid expansion of China's international trade was accelerated by China's accession to the WTO in 2001 which allowed China to fully integrate into the world system and capture the gains of its comparative advantage in abundant labor supply. The average annual growth rate in exports of goods surged to 15% from 2002 to 2008, doubling the rate of growth in the 1990s.

On the back of a fast-growing urban workforce, various subsidies and incentives for the exporting sector, a favorable external economic environment as well as a huge investment in infrastructure and technologies, China has emerged as the final stage assembler in global manufacturing supply chains. Its merchandise exports reached a staggering 36% of GDP peak in 2006 with this ratio dropping to 18.1% by 2017. The value of China's exports increased from 18.1 billion USD in 1980 to 2,263.3 billion USD in 2017, with an annual growth rate of 14%.[7]

China's rise as a merchandise exporter over the recent decades is unparalleled, exhibiting a degree of external dependence well in advance of the world's other large economies. China surpassed both the United States and Germany in 2009 to become the world's largest exporter, accounting for over one-tenth of world merchandise exports by value in 2012. China's participation in the world export market increased from negligible values in the 1980s to more than 14% in 2017 according to the UN Comtrade Database.

China's export sector has proved pivotal to Chinese economic growth and for over 30 years until 2010 helped drive China's GDP to grow at an annual average rate in excess of 10%. Merchandise exports are believed to directly account for approximately one-fifth of China's "miracle" economic growth in the past decade.[8] While the export-oriented growth strategy has largely been successful in the past, some weaknesses started to show around the

time when the global financial crisis erupted as international trade flows fell sharply. Some suggested that China's export-led growth model appears to have run its course and the remarkable export performance is unlikely to continue, as Chinese exports reach saturation point in some export markets and domestic wages continue to rise (World Bank & The Development Research Center of the State Council, P. R. China, 2013; Deer & Song, 2012).

For several decades, the high Chinese economic growth is based on high investments, high energy and raw materials consumption, and exports-oriented manufacturing. Investments, fueled by capital inflows and negative real interest rates and abundant cheap labor (untilrecently), are often not very productive and economic efficiency is typically low.[9] To generate the same amount of output, more and more inputs, that is, capital, labor, and raw materials, are needed.

In term of its position on the value chain, Chinese manufacturing's value-added component is quite low (Wen, 2018). To make a profit, manufacturing firms have to rely on asset turnover which means producing as much as one can since the profit margin is very thin. The pursuit of high economic growth has led to serious problems such as high level of environmental pollution, income equality as well as overcapacity in many industries such as steel, shipping building, cement, electrolytic aluminum, plate glass and photovoltaic, and so on. Trade wars between China and its main export destinations such as European countries and the United States (See Appendix 1) have erupted from time to time as China is accused of dumping and unfair competition by having less stringent labor standards.[10]

To achieve sustainable economic growth and development, the government has embarked on a process of shifting the economy from relying on manufacturing and exports to one that depends on services and domestic consumption. The government is willing to accept a slightly lower GDP growth rate as it restructures the economy over the next decade and beyond. While a more balanced and sustainable approach to economic growth seems sensible, especially for a large economy with a very large consumer base, the risks abound. China is still a developing economy with ample growth potential, for example, per capita income is quite low relative to many developed countries. The shift from the export-led growth model poses a number of risks. Would the new strategy succeed without a proliferation of the recent economic slowdown, external imbalances such as a sharp fall in foreign exchange reserves, and debt overhang? And if domestic consumption does not grow fast enough, would reliance on export-led growth provide relief without eroding political support for economic reforms? It is therefore interesting to see if the government's effort has paid off and worth finding out if China's export-led growth model is less important in explaining China's economic growth, especially after the onset of the GFC.

METHODOLOGY

In this article, we examine the relationship between exports and economic growth both in the long run and in the short run. Before estimating the long-term equilibrium relationship between (log) exports and (log) GDP, we need to test whether they are cointegrated. In this study, we use the ARDL bounds test approach developed by Pesaran et al. (2001) to test if the variables are cointegrated. This approach offers a number of advantages over more

conventional approaches (e.g., Johansen's or Engle-Granger's cointegration test) used in previous studies; namely, (1) it is applicable even if there is a mixture of I(0) and I(1) variables, (2) allows different series to have different lags in the ARDL (autoregressive-distributed lag) model, (3) the model estimates are relatively more efficient in small samples which is very important when high frequency data are not available. For example, GDP data are often only available on a quarterly basis.

The bounds test estimates the following unrestricted error correction model using OLS:

$$\Delta Y = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 X_{t-1} + \sum_{k=1}^{p} \beta_k \Delta Y_{t-k} + \sum_{k=1}^{q} \delta_k \Delta X_{t-k} + \varepsilon_t \tag{1}$$

where Y denotes real GDP and X the amount of exports, both in billion U.S. dollars. Both variables are in natural logarithms.

The null hypothesis is H_0: $\alpha_1 = \alpha_2 = 0$, that is, there is no cointegration between the two variables. The computed F-statistics for cointegration is compared with two sets of critical values tabulated by Pesaran et al. (2001). The lower bound assumes that all of the regressors are I(0) whereas the upper bound assumes that all of the regressors are I(1). If the computed F-statistics is above the upper bound, the null hypothesis of no cointegration is rejected in favor of the alternative hypothesis of cointegration. On the other hand, if the computed F-statistics is below the lower bound, the null hypothesis cannot be rejected. Finally, if the F-statistics is between the two bounds, the inference is inconclusive.

Once cointegration is confirmed, we estimate the long-term relationship between exports and economic growth using fully-modified OLS (FM-OLS):

$$y_t = \alpha_0 + \alpha_1 x_t + \alpha_2 D_{1t} + \alpha_3 D_{1t} * x_t + \varepsilon_t \tag{2}$$

where y_t is the amount of real GDP; x_t represents the amount of exports, as defined previously. ε_t is the disturbance term; α_0 is the intercept; and α_1 measures the long-term relationship between the two variables. D_1 is the dummy variable for the GFC. It is equal to zero for the period prior to September 2008 and 1 afterward.[11] α_2 measures the impact of the GFC on the intercept whereas α_3 measures its impact on the long-term relationship. Equation (2) is valid only in the long term. FM-OLS modifies traditional OLS to account for serial correlation and for the endogeneity in the regressors resulting from the presence of a cointegrating relationship between the variables.

Secondly, to examine the short-run relationship between the two variables, we use the following error-correction representation:

$$\Delta y_t = \sum_{i=1}^{k} \beta_i \Delta y_{t-i} + \sum_{i=0}^{k} \gamma_{1i} \Delta x_{t-i} + \sum_{i=0}^{k} \gamma_{2i} \Delta x_{t-i} * D_{1t} + \theta \varepsilon_{t-1} + \mu_t \tag{3}$$

where Δ denotes first difference operator; ε_{t-1} is the residual of the long-run relationship given by Equation (2) and it represents the degree of disequilibrium at time $(t-1)$; μ_t is the error term. D_1 is the GFC dummy variable as described above. β_i are the autoregressive coefficients; γ_{1i} captures the short-term response of GDP to changes in exports. γ_{2i} captures the difference in the impact of the GFC on the short-term pass-through. θ measures the error correction adjustment speed when GDP is away from their long-term equilibrium relationship with exports.

DATA AND EMPRICIAL RESULTS

The sample period is from September 1994 to March 2018 covering a period of over 23 years. Although the exports data are available on a monthly basis, the GDP data is only available on a quarterly basis. We therefore use quarterly data in our study.

Our sample consists of 95 quarterly observations. The data were downloaded from the website of the Chinese National Bureau of Statistics. While the original GDP data are in CNY (or RMB), the exports data are in U.S. dollars. We hence convert the GDP data to U.S. dollars using end of quarter USD/CNY exchange rates.

Figure 1 plots the raw GDP and exports time series in billion U.S. dollars. The average ratio of exports to GDP over the sample is about 25%. The two-time series depict similar dynamic patterns over the sample period.

Figure 2 plots the seasonally-adjusted GDP and exports time series. Seasonal adjustment was done using Eviews's Census X-13 procedure. The seasonally-adjusted data are used for the rest of the statistical analyses, namely, cointegration analysis, the long-term relationship and the short-term dynamics. Appendix 2 shows the line charts for the adjusted and the unadjusted time series data.

The descriptive statistics of the raw data as well as the seasonally-adjusted data are reported in Table 1. Panel A shows the descriptive statistics for the level series and Panel B shows those for the first-difference of the data. For the raw data, exports and GDP are highly correlated with a correlation coefficient of 0.979 for the level and 0.878 for the first differenced raw data. For the seasonally-adjusted data, the correlation coefficients are 0.978 and

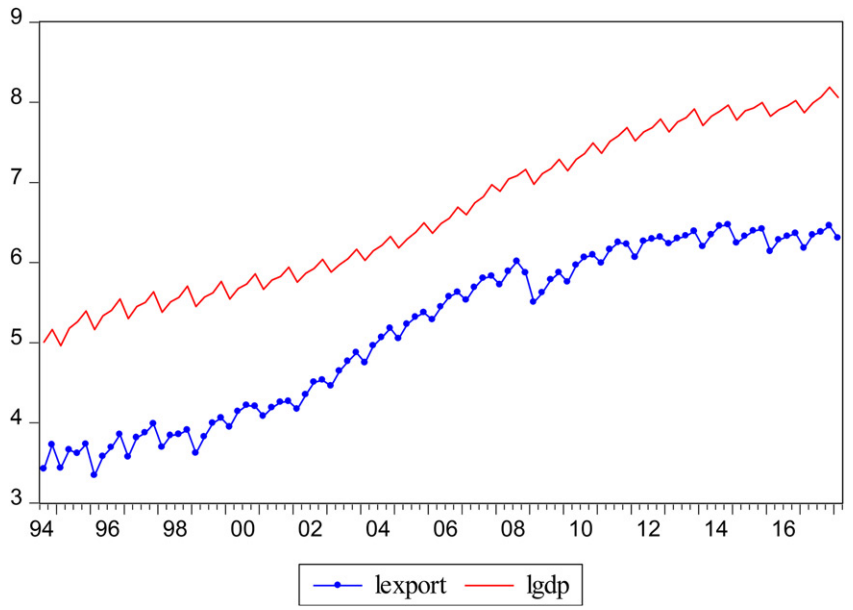

FIGURE 1 GDP and exports time series (in natural logarithms). *Source*: Chinese National Bureau of Statistics. *Notes*: lgdp = GDP in natural logarithms, lexport = Exports in natural logarithms.

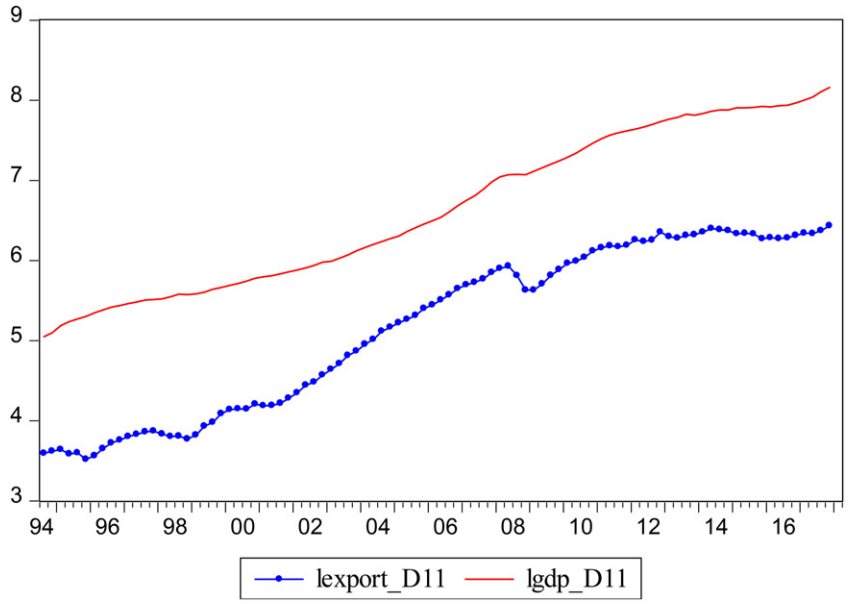

FIGURE 2 Seasonally-adjusted GDP and exports time series (in natural logarithms). *Source*: Chinese National Bureau of Statistics.
Notes: lgdp_D11 = seasonally-adjusted GDP in natural logarithms, lexport_D11 = seasonally-adjusted exports in natural logarithms.

0.429 for the level and the first differenced series, respectively. From the third quarter of 1994 to the first quarter of 2018, the average quarterly growth rate of China's GDP is 3.1% while for exports it is 3.2%.

Table 2 reports the results of the ARDL model. The autoregressive-distributed lag order, (ARDL 2, 1), is chosen based on the Schwarz Bayesian criterion and confirmed by the Akaike information criterion (AIC) and Hannan-Quinn information criterion. Table 3 reports the ARDL bounds test. The value of F-statistic of 4.71 suggests the rejection of the null hypothesis of no long-run relationship at the 1% significance level, implying there exists a long-run relationship between GDP and exports in China.

Table 4 shows the results of the long-run equilibrium model. The long run elasticity of economic growth with respect to exports is 0.68. This result is in line with the findings of Hye (2012) and Tsen (2010), among others. The global financial crisis dummy variable is found to be significant in both the intercept and the interaction with the export variable, implying the changing role of exports in explaining GDP after the onset of the GFC. In fact, after the global financial crisis, the long-run relationship between exports and GDP has become even stronger. The long-run elasticity of economic growth with respect to exports is 0.67 higher than the level prior to the global financial crisis, increasing to 1.35, indicative of the heightened role of exports in driving economic growth in China.[12]

Table 5 describes the short-run dynamics between the two variables under investigation. The change of GDP is positively related to that of exports. Other things being equal, 1%

TABLE 1
Descriptive Statistics

Panel A: Level						
	EXPORT	*GDP*	*lexport*	*lGDP*	*Lexport_D11*	*lGDP_D11*
Mean	270.69	1,161.37	5.16	6.62	5.18	6.63
Median	231.37	662.68	5.44	6.50	5.48	6.52
Maximum	646.04	3,605.46	6.47	8.1	6.44	8.16
Minimum	28.23	143.19	3.34	4.96	3.52	5.05
Std. Dev.	211.65	1,008.52	1.05	0.99	1.03	0.97
Obs.	95	95	95	95	94	94
Correlation coefficient			0.979		0.978	
Panel B: 1st difference						
	d(export)	d(gdp)	d(lexport)	d(lGDP)	d(Lexport_D11)	d(lGDP_D11)
Mean	5.48	32.12	0.03	0.03	0.03	0.03
Median	9.14	38.52	0.07	0.08	0.04	0.03
Maximum	94.53	425.15	0.30	0.21	0.11	0.09
Minimum	–148.40	–513.35	–0.39	–0.26	–0.18	–0.01
Std. Dev.	42.99	175.00	0.15	0.13	0.05	0.02
Obs.	94	94	94	94	93	93
Correlation coefficient			0.878		0.429	

Source: Calculated based on data from the Chinese National Bureau of Statistics.

Notes: lexport = exports in natural logarithms, lGDP = GDP in natural logarithms, lgdp_D11 = seasonally-adjusted GDP in natural logarithms, lexport_D11 = s easonally-adjusted exports in natural logarithms, d(lexport) = 1st difference of lexports. d(lGDP) = 1st difference of lgdp. d(lexport_D11) = 1st difference of seasonally-adjusted exports in natural logarithms. d(lGDP_D11) = 1st difference of seasonally-adjusted GDP in natural logarithms.

The sample period is from September 1994 to March 2018. The data are quarterly and were downloaded from the website of the Chinese National Bureau of Statistics.

TABLE 2
The Selected ARDL (2,1) Model

Variable	*Coefficient*	*t-Statistic*	*Prob.**
LGDP_D11(-1)	1.46	15.33	0.00
LGDP_D11(-2)	–0.49	–5.56	0.00
LEXPORT_D11	0.11	3.37	0.00
LEXPORT_D11(-1)	–0.08	–2.36	0.02
GFC_DUMMY	0.03	0.32	0.75
GFC_DUMMY*LEXPORT_D11	0.00	–0.17	0.86
Constant	0.09	1.66	0.10
Adjusted R-squared = 99.98%			

Source: Calculated based on data from the Chinese National Bureau of Statistics.

increase in exports will increase GDP by about 0.13% prior to the global financial crisis. For the post-crisis period, the short-term pass-through is not statistically significantly different from zero.

TABLE 3
ARDL Bounds Test.
$\Delta Y = \alpha_0 + \alpha_1 Y_{t-1} + \alpha_2 X_{t-1} + \sum_{k=1}^{p} \beta_k \Delta Y_{t-k} + \sum_{k=1}^{q} \delta_k \Delta X_{t-k} + \varepsilon_t$

Variable		*Coefficient*	*t-Statistic*	*Prob.**
LGDP_D11(–1)	α_1	–0.032	–1.84	0.069
LEXPORT_D11(–1)	α_2	0.026	2.13	0.037
D(LGDP_D11(–1))	β_1	0.493	5.56	0.000
D(LEXPORT_D11)	δ_0	0.107	3.37	0.001
D(LEXPORT_D11(–1))	δ_1	0.028	0.32	0.753
GFC_DUMMY		0.028	–0.88	0.753
GFC_DUMMY*LEXPORT_D11		–0.003	–0.17	0.863
Constant	α_0	0.085	1.66	0.100
F-statistic		4.71***		
Critical Value Bounds				
Significance	Lower Bound		Upper Bound	
10%	3.02		3.51	
5%	3.62		4.16	
2.50%	4.18		4.79	
1%	4.94		5.58	

Source: Calculated based on data from the Chinese National Bureau of Statistics.

Notes: The null hypothesis is that no long-run relationship exists between (log) GDP and (log) exports. Both are seasonally adjusted. The GFC dummy variable and the interactive term between the dummy variable and exports are also included in the bounds test equation.

***denotes significance at the 1% level.

TABLE 4
Long-term Relationship Between GDP and Exports.
$y_t = \alpha_0 + \alpha_1 x_t + \alpha_2 D_{1t} + \alpha_3 D_{1t} * x_t + \varepsilon_t$

Variable		*Coefficient*	*t-Statistic*	*Prob.*
LEXPORT_D11	α_1	0.68	24.16	0.00
GFC_DUMMY	α_2	–3.52	–4.52	0.00
GFC_DUMMY*LEXPORT_D11	α_3	0.67	5.25	0.00
Constant	α_0	2.91	22.60	0.00
Adjusted R-squared = 99%				

Source: Calculated based on data from the Chinese National Bureau of Statistics.

These findings clearly indicate the increasing importance exports have played in driving China's economy during and after the crisis period. This is consistent with Tong (2013) who argued that China's economy remains highly export-oriented after the global financial crisis when exports growth started to rebound in 2010 thanks to an initial recovery in global conditions. Our findings also echoes Xing and Pradhananga (2013) that the Chinese economy remains highly dependent on external demand in the form of exports, and rebalancing the economy toward domestic demand still has a long way to go.

The transition from an economy based on manufacturing and exports to one based on services and domestic consumption is a very long process. For example, it took the United States 50 years to increase its share of the service sector in the valued-added from 60% to 80% (see Buera & Kaboski, 2012). The service sector typically required less natural capital

TABLE 5
Short-term Dynamics Between GDP and Exports.
$\Delta y_t = \sum_{i=1}^{k} \beta_i \Delta y_{t-i} + \sum_{i=0}^{k} \gamma_{1i} \Delta x_{t-i} + \sum_{i=0}^{k} \gamma_{2i} \Delta x_{t-i} * D_{1t} + \theta \varepsilon_{t-1} + \mu_t$

Variable		*Coefficient*	*t-Statistic*	*Prob.*
D(LGDP_D11(–1))	β_1	0.57	5.52	0.00
D(LGDP_D11 (–2))	β_2	0.23	2.42	0.00
D(LEXPORT_D11)	γ_{10}	0.13	3.50	0.00
GFC_DUMMY*D(LEXPORT_D11)	γ_{20}	–0.01	–0.22	0.83
RES(–1)	θ	0.00	0.13	0.90
Adjusted R-squared = 45.9%		Durbin-Watson Statistic = 1.98		

Source: Calculated based on data from the Chinese National Bureau of Statistics.

and more human capital than the agricultural or manufacturing sector. Investment in education is a must. According to Heckman (2003, 2005), the ratio of China's investment in physical capital to human capital is much higher than that of most countries in the world. In the early 2000s, physical capital investment was about 30% of GDP while investment in education was about 2.5% of GDP. In comparison, in the United States, the figures were 17% and 5.4% for physical capital and education, respectively. Although the enrollment rate for tertiary education in China increased dramatically from less than 2% in 1990 to nearly 19% in 2010, college education is mainly financed by the student's family (see Heckman and Yi, 2012).

To increase domestic consumption, income distribution plays an important role. Matsuyama (2002) argues that income distribution is key in generating large domestic markets for consumer goods. It should not be too equal nor too unequal. If it is too equal, the economy will remain in a poverty trap. On the other hand, if it is too unequal, economic development will stop prematurely.

Over the past few decades, income distribution in China has changed dramatically. The Gini coefficient increased from 0.3 in the early 1980s to over 0.4 in the early 2000s. It peaked at 0.49 in 2008 before dropping slightly, but still well above 0.45 (see Li & Sicular, 2014). Furthermore, the income gap between urban and rural households has grown from less than two times in the mid- 1980s to over three times since the 2000s, which is very high by international standards (see Li & Sicular, 2014).

IMPLICATIONS

The enhanced role of exports in explaining economic growth in China after the GFC have broad implications both at home and abroad. First, our results suggest that if the economic slowdown gains further momentum, the RMB exchange rate against the U.S. dollar may have to fall further over time so that the Chinese exports can remain competitive. Second, the heightened importance of exports has rippled through the region and beyond. China's rebalancing, if successful, is perceived to have sizeable negative effects for trading partners mainly exporting commodities (such as Australia, Brazil, and Canada) and capital goods (such as Germany and Japan). Our findings suggest these negative impacts may not be

noticeable in the immediate future given China's continued appetite for their imports. With consumption yet to edge out exports and investment as the economy's main engine, substantial headwinds for exports to China by its major trading partners will not be an immediate threat. By the same token, some Asian economies that hope to benefit from China's transition and the marked increase in consumer goods may have to wait a little longer before such potential can be fully realized.

The ongoing trade war with the United States and falling export orders have already taken a blow to the Chinese economy especially its manufacturing sector. Major economic indicators have weakened. Reinforcing the impression is the equities market that had plunged into bear-market territory with more than a 20% fall from January 2018 to September 2018. Already, recognizing the important role of exports in propelling economic growth, China's policy makers have implemented measures to cushion the impact from its ongoing trade spat with the United States. A natural market reaction to the U.S. protection, the closely managed yuan is allowed to devaluate by more than 8% against the U.S. dollar from April 2018 to August 2018 in order to boost exports and in June the yuan had its biggest monthly fall against the dollar in years. In the meantime, China is shifting to a more active fiscal policy to boost credit and liquidity in the financial system and to make up for falling exports to the United States. State-owned banks are directed to provide ample credit to exports, small and medium-size businesses, and infrastructure projects.

China's exports-driven growth and the resultant current account surplus have been held responsible for the global savings glut and the global imbalance. Therefore, the pace with which China can rebalance itself domestically and how fast China's imports grow in relation to its exports will have a bearing on China's external balances and global imbalance as well. Our results point that the export-led growth model is still prevailing in China; therefore, a significant shrinking of current account surpluses is unlikely to occur in the near future.

China's transition from exports to domestic consumption will have significant implications not only for China but also for the world economy. As of 2014, household final consumption expenditure as a percentage of GDP stood at 37.4%, far below the world average of 58.3% and that of the United States (68.4%), Japan (60.7%), and even India (58%), according to the statistics from the World Bank.[13] As the second largest economy in the world, China is an increasingly important engine of world economic growth as its domestic consumption increases.

CONCLUSIONS

In this article we use the ARDL approach to examine empirically the role of exports in driving China's economic growth, paying particular attention to its contribution after the onset of the global financial crisis in 2008. Based on the most recent data available, our results show that there is a positive relationship between exports and economic growth both in the long term and short term. In particular, the relationship has become even stronger after the onset of the GFC, indicating that the process of shifting the Chinese economy from relying on manufacturing and exports to services and domestic consumption is going to be very challenging. Despite the government's manifested objectives of rebalancing the economy away

from manufacturing and exports and toward domestic demand and services, we find that China's economy remains highly export-oriented. After experiencing a sharp decline in 2009 following the global financial crisis, exports resumed pre-crisis levels and contributed considerably to GDP growth during the period from 2010 to 2018. Our findings suggest that exports are playing a bigger, rather than smaller role in explaining China's post-crisis GDP growth both in the long run and short run.

Our results provide supporting evidence that exports continue to play an important role in China's economic development and that China is still in the early stages of shifting its growth model away from exports and investment toward domestic consumption. The transition from an export-led growth strategy to a sustainable domestic consumption-led growth model has proven to be rather challenging. It appears that the rebalancing is proceeding far less smoothly than hoped. In fact, continued weaknesses in the industrial sector run the real risk of a systemwide loss of momentum in the economy. Policy makers have to maneuver between long-term efforts to restructure the economy and the near-term bid to prop up growth, generate jobs, and raise living standards. This could imply that China may still need to push the old export-led model beyond its limits and the imbalances in the Chinese economy may get worse before they can get better. It is expected that exports are likely to remain a powerful engine of China's economic growth for the coming years.

NOTES

1. China recorded a pronounced deceleration in economic growth in 2013–2015. China's growth rate has slowed from the double-digit rates recorded over the last three decades. Its growth rate fell from 10.6% in 2010 to 7.7% in 2013, 7.3% in 2014, 6.9% in 2015, to 6.7% in 2016 and 2017.

2. The situation has become even more urgent at present as fears of a trade war between China and the United States are escalating. An important issue for the People's Bank of China and the Chinese government is to weigh the importance of currency as a tool in trade negotiations with the United States vis-à-vis using another devaluation to offset the impact of any trade deal that curbs exports.

3. Sharp increases in investment, especially large-scale projects, have long been the driving force of China' rapid economic growth over the past 30 years. While it is an obvious choice as China transitioned from an agricultural to an industrialized country, such an economic growth model is not sustainable in the long term given its huge implication for government debt, energy consumption, and carbon emissions, among others.

4. For instance, China's 13th Five-Year Plan, unveiled in November 2015, emphasizes continued economic reforms and especially the urgent need to enhance innovation and domestic consumption in order to make the economy less dependent on fixed investments and exports.

5. The findings are not surprising as China officially adopted its open-door policy only in 1978 and exports played a small role in the economy during the 1970s and the1980s. Exports started to take off after 2001 when China was allowed to join the WTO.

6. In 2015, China's total debt, according to UBS Group AG estimates, equaled almost 260% of annual economic output, up from less than 160% in 2007. During the first 11 months of 2015, China's state-owned enterprises saw profits fall 9.5% while their debt increased 18.2%, according to BMI Research Corp.

7. https://www.statista.com/statistics/263661/export-of-goods-from-china/, accessed September 24, 2018.

8. http://www.eastasiaforum.org/2013/03/09/chinas-prospects-for-export-driven-growth/, accessed March 13, 2016.

9. Interest rates in China are still controlled by the Chinese government, though they are being slowly liberalized. Over the past few decades, China has strictly implemented the one-child policy, leading to huge demographic changes in the country. To address the issue of a rapidly aging population and the rising cost of labor, the Chinese government recently relaxed the one-child policy and couples can now have a second child.

10. For example, in March 2012 in response to a complaint from SolarWorld Industries America, a U.S. manufacturer that is a subsidiary of Germany's SolarWorld, the U.S. Commerce Department began imposing tariffs on Chinese solar panel imports which were hit with tariffs ranging from 2.9% to 4.7%. In December 2014, on the grounds that the companies were selling products below the cost of manufacture and that the Chinese companies were benefiting from unfair subsidies from their government, the department announced anti-dumping duties of 26.71% to 78.42% on imports of most solar panels made in China. In addition, the department announced anti-subsidy duties of 27.64% to 49.79% for Chinese modules. Subsequent to the "anti-dumping and anti-subsidy" measures taken by the United States, European Union, Canada, Australia, and India announced an investigation of China's solar power products. Domestic producers were hard hit by these measures as they rely overwhelmingly on overseas markets since domestic demand for solar energy and the related products is far smaller than supply.

11. Global aggregate demand has been significantly affected since the onset of GFC. Ten years after the financial crisis erupted, the global economy remains fragile and at risk of another recession, according to IMF research. As such, by the end of our sample period of March 2018, it is suggested that the global demand has not returned to what it was before the start of GFC and therefore the GFC dummy is set to zero for the period prior to September 2008 and set to 1 thereafter, in order to capture the prior- and post- crisis effects.

12. As a robustness test, we created and tested another dummy variable. It is equal to 1 for the period March 2005 to December 2009 and 0 otherwise. The results show that neither dummy variable nor the dummy*exports interactive variable is statistically significant at the 10% level. Other time periods for the dummy variable were also used and the results are robust.

13. As of 2014, the share of services in GDP was 48.1%, compared to the world average of 68.5%, United States (78%), Japan (72%), and India (52.6%), according to the World Bank statistics.

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APPENDIX 1. MAJOR TRADING PARTNERS OF CHINA IN 2017

Leading destinations of China's exports	*Exports value (USD billion)*	*Share of total (%)*
USA	430.3	19.0
Hong Kong	279.2	12.3
Japan	137.3	6.1
Rep. of Korea	102.7	4.5
Viet Nam	71.6	3.2
Germany	71.1	3.1
India	68.0	3.0
Netherlands	67.1	3.0
United Kingdom	56.7	2.5
Singapore	45.0	2.0
Leading suppliers of China's imports	Imports Value (USD billion)	Share of total (%)
Rep. of Korea	177.6	9.6
Japan	165.8	9.0
Other Asia, nes	156.0	8.5
USA	154.4	8.4
China	132.4	7.2
Germany	96.9	5.3
Australia	95.0	5.2
Brazil	58.9	3.2
Malaysia	54.4	3.0
Viet Nam	50.4	2.7

Source: UN ComTrade Database, http://comtrade.un.org/.

APPENDIX 2. SEASONALLY-ADJUSTED VS. NONADJUSTED TIME SERIES DATA, 1994–2018