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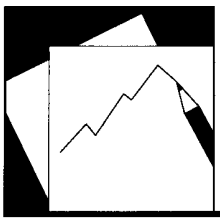

IMF Working Paper

Is China's Export-Oriented Growth Sustainable?

Kai Guo and Papa N'Diaye

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Asia and Pacific Department

Is China's Export-Oriented Growth Sustainable?

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Abstract

This paper assesses the sustainability of China's export-oriented growth over the medium to longer term. It shows that maintaining the current export-oriented growth would require significant gains in market share through lower prices in a range of industries. This, in turn, could be achieved through a combination of increases in productivity, lower profits, and higher implicit or explicit subsidies to industry. However, the evidence suggest that it will prove difficult to accommodate such price reductions within existing profit margins or through productivity gains. Moving up the value-added chain, shifting the composition of exports, diversifying the export base, and increasing domestic value added of exports could give room to further export expansion. However, experiences from Asian economies that had similar export-oriented growth suggest there are limits to the global market share a country can occupy. Rebalancing growth toward private consumption would provide a large impetus to output growth and reduce the need for gaining further market share.

JEL Classification Numbers: F14, F17, O57

Keywords: Export-oriented growth, rebalancing.

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I. INTRODUCTION

The global financial crisis has taken a toll on China's rapid growth of the past three decades. Indeed, after an average growth rate of around 10 percent during 1980−2008, China's GDP growth is expected to fall to 7½ percent this year. This sharp slowdown reflects China's dependence on exports, particularly to advanced economies—the culmination of years of reforms to open up and become more market oriented. Looking ahead, there is a question whether this export-oriented growth is tenable over the medium- to longer-term. This question is all the more relevant given the significant downside to global demand going forward. The authorities are well aware of such risks and intend to rebalance growth toward domestic demand, particularly private consumption. They have taken measures to boost consumption, increase needed infrastructure investment, and reduce households precautionary savings. All of these measures should provide more sustainable support to growth.

> *"The biggest problem with China's economy is that the growth is unstable, unbalanced, uncoordinated, and unsustainable."*
> Premier Wen Jiabao, National People's Congress Press conference, March 2007.

Against this backdrop, this paper assesses the sustainability of China's export-oriented growth over the medium to longer term, taking into account the current World Economic Outlook (WEO) assumptions. First, the paper first takes stock of the historical of experience of other economies to get some insights on the tenability of and limits to an export-oriented growth. Second, the paper looks at the implications of this export-oriented model on China's growth composition, both from the expenditure and the production side. The paper then analyzes the implications from a global perspective, by looking at the expansion of key export industries that would be required and the potential constraints placed on China by the absorption capacity of global markets. Finally, the paper discusses alternative growth patterns that could prove more easily tenable over the medium term.

The conclusions are the following:

- For China, maintaining the current export-oriented growth would require a rapid increase in exports and significant gains in market share. Achieving such a goal will likely be challenging in light of the sluggish recovery in global demand and possibly lower global growth potential.

- An illustrative analysis of what the current export-oriented growth would imply for China's key export industries, such as steel, shipbuilding, and machine tools suggests that China would have to accept substantial reduction in prices for these products over the medium term in order to gain greater market share. These price cuts could be achieved through some combination of the three following channels: (1) increases in relative productivity to lower costs below that of competitors, (2) a squeeze in corporate profits, and (3) greater implicit or explicit subsidies through continued price distortions. While perhaps feasible, the evidence suggests that even a combination of

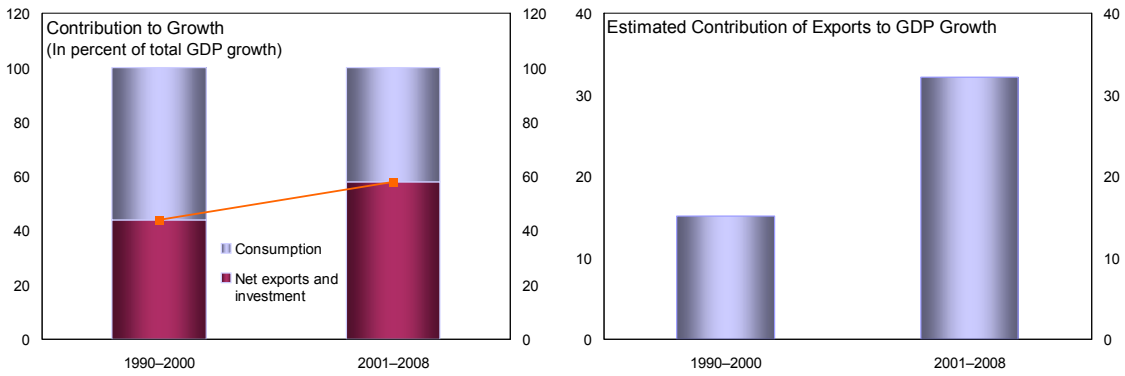
all these factors would likely be insufficient to achieve the scale of export expansion needed in the coming years.

- Moving up the value-added chain, entering new industries, shifting the composition of exports, diversifying the export base, and increasing domestic value added of exports (through import substitution), as well as increased globalization could give room to further export expansion. Indeed the leading export sectors of today were minor industries in China as little as 5 to 10 years ago. However, experiences from Asian economies that had similar export-oriented growth, such as Japan and Korea, suggest that such measures may not be sufficient to support permanent gains in market share of a scale that could be needed for China.

- Raising private consumption over the longer term through structural reforms that lower precautionary savings would provide a large impetus to output growth and reduce the need for gaining further market share. It could allow productive capacity in tradable sectors to be directed to the internal market and new capacity built in sectors that serve local consumers. As such, it would avoid the limits to over-reliance on export-oriented growth that were seen in other major exporters such as Japan and Korea.

II. China's Recent Growth Pattern

China's growth relies heavily on external demand and investment with much of that investment concentrated in manufacturing, and this dependence has increased in recent years. During 2001−08, net exports and the investment which is predominantly linked to building capacity in tradable sectors have accounted for over 60 percent of China's growth, up from 40 percent in the 1990s. This is much larger than the 2001–08 average of the G7 (16 percent), euro area (30 percent) and the rest of Asia (35 percent).

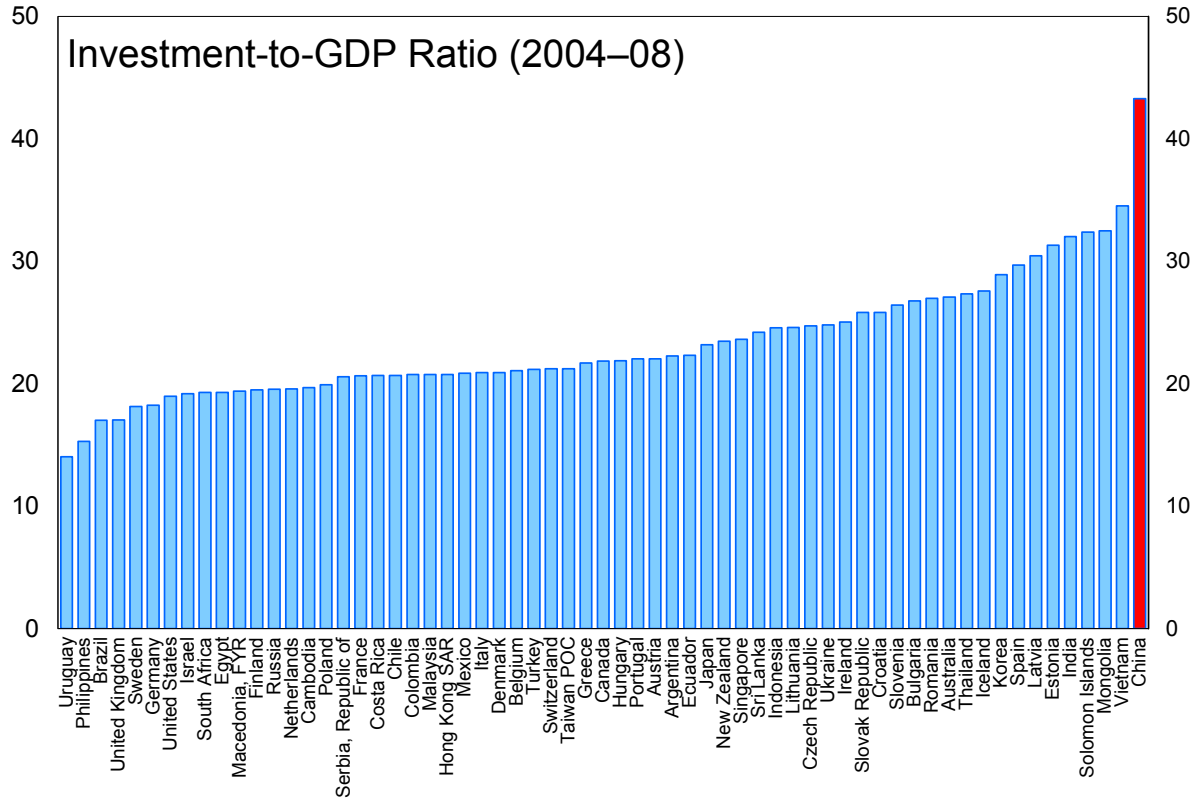


Source: Staff estimates.

From the production side, exports are estimated to contribute now over 30 percent in terms of value added to output growth—a striking figure for a economy of the size of China—up from

15 percent in the 1990s.[1] This large contribution reflects a rapid growth in exports (on average by 18½ percent since end of the 1990s) and also an increase in the domestic content of these exports. This, in turn, has led to a substantial expansion of China's global market share, reaching 9⅓ percent of world goods exports in 2008 (up from 3½ percent in 1999). In the latest WEO, IMF staff projections expect China's exports to account for about 12 percent of world trade by 2014.

At around 40 percent of GDP, China has now one of the highest investment rate in the world. Investment goes predominantly into manufacturing (30 percent), infrastructure (18 percent), and the real estate sector (23 percent). It is financed primarily through retained earnings and bank loans. Therefore, around one-third of investment is ultimately connected to tradable sector's expansion.



Source: World Economic Outlook.

[1] These estimates, which reflect both the direct and indirect value added of exports (through consumption and investment), have been derived using the Koopman, Wang, and Wei (2008) estimates of the domestic value added of processing and nonprocessing trade and their shares in exports. There is, however, a large uncertainty on these figures. Studies by Hummels, Ishii, and Yi (2001) find even larger domestic value added in China's exports, while He and Zhang (2008) finds it to be relatively small. Cui, Shu, and Su (2009) estimate that for every 10 percent growth in exports GDP expands by 2½ percentage points, which in our metric would mean that exports contribute to 45 percent of GDP growth.

Exports and investment have been encouraged by significant cost advantages from the low cost of capital, low cost of utilities, pollution, energy, land, tax incentives, and a substantial undervaluation of the exchange rate. However, there have also been rapid gains in relative productivity in the manufacturing sector—we estimate total factor productivity growth averaged 6½ percent during 2002−07. For the economy as a whole, we estimate productivity growth at an average of 3⅓ percent during the same period, which is about three times as much as the OECD average.[2]

III. What Can We Learn from Other Economies' Experience?

China's export-oriented growth is not unprecedented; Korea, Japan, and the newly industrialized economies (NIEs) of Asia have all maintained rapid exports growth and increased market shares over a sustained period of time. On the face of it, it even seems that China has still some way to go when compared with these economies experience that have pursued export-oriented growth. However, there seems to be a clear pattern attached to the market share. Few have managed to maintain such high growth rates of exports beyond a certain market share in the world market. Japan stands out as being the only economy across Asia that has achieved similar growth rates and a global market share of around 10 percent, but this export expansion ended in a prolonged period of declining market share.

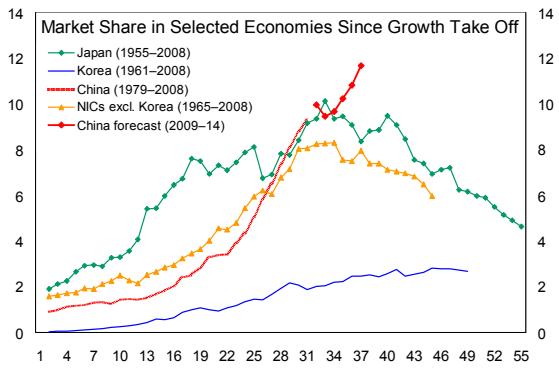
Focusing on the expansion period, there has been a clear shift in the composition of exports with economies like Japan and Korea exporting more higher-value added products. In the case of Japan, for example, in the 1960s low value added goods such as textile represented around 25 percent of total exports, while machinery (including transportation equipment and precision instruments) accounted for about 40 percent of total exports. By the end of Japan's longest expansion period, textiles represented less than 4 percent of total exports, while the share of machinery had increased to more than 70 percent.

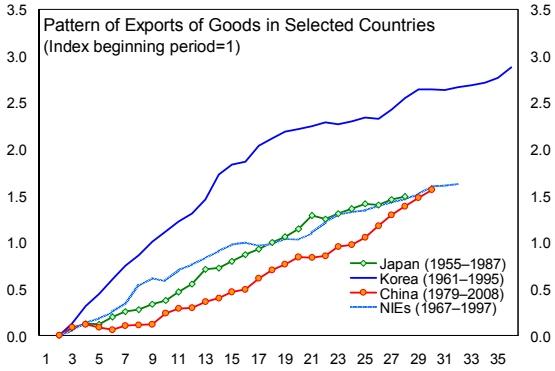
China's composition of trade has also changed in recent years, along the vertical specialization of production within Asia. China is at the end of a supply chain in the manufacturing sector in East Asia, importing primarily raw materials, intermediary goods, and finished capital goods that are either assembled or go into the production of final consumption goods destined for exports in third economies. Processing trade represent around one-half of China's exports and one-third of its imports. While limited in its early stages, the domestic value added content of exports increased steadily with import substitution and trade in higher-technology. China now exports goods that are more sophisticated, including machinery and electronics, and produce a greater share of the component inputs further down the supply chain. But, even such shift in the composition of

[2] Young (2003) claimed that TFP growth in China may have been as low as 1.4 percent per year between 1978 and 1998, after adjusting official GDP growth numbers and more careful treatments of labor force and human capital. More studies, however, seem to suggest the TFP growth should fall between 2 percent and 4 percent per year in the post-reform era, depending on methodology and data used (Maddison, 1998; Zheng and Hu, 2006; Chow and Li, 2002; and Kuijs and Wang, 2006). For OECD average TFP growth, the data are from OECD Factbook; and 2008 Economic, Environmental, and Social Statistics.

exports seems not to have been sufficient to support permanent gains in market share in the selected economies.

Admittedly, multiple ancillary factors may have stalled the expansion in global markets of these economies. In the case of Japan, these factors include inflated asset prices, rapid credit growth in the property market, and gaps in its financial regulatory and supervisory system. These problems are today less likely to disrupt China's growth since the authorities have carefully avoided bubbles in construction-related sectors, equity markets, and real estate. China, as a result, could hence well be more successful in pursuing such growth pattern for longer. However, there are froths in some export-related sectors where a much smaller return on investment than envisaged runs the risks of a worsening of credit quality in the banking system, which would ultimately lower growth and have quasi fiscal implications.

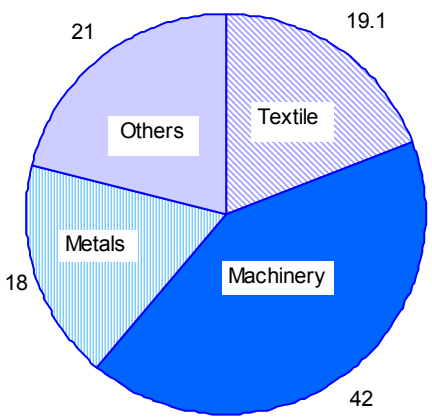




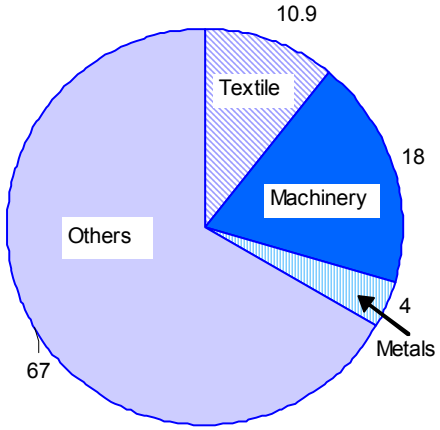
Source: World Economic Outlook; and Fund staff estimates.

Composition of Exports

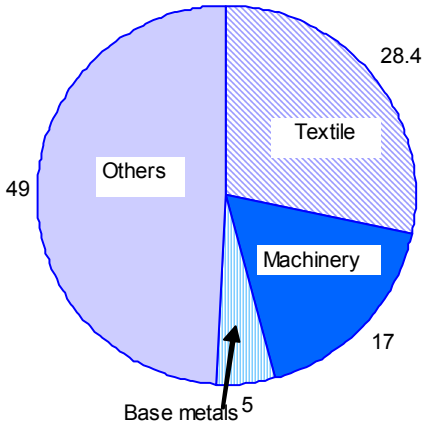
Japan Exports Composition (1960s)



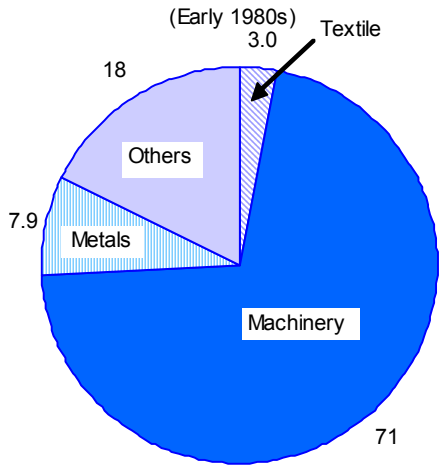
Korea Exports Composition (1977)



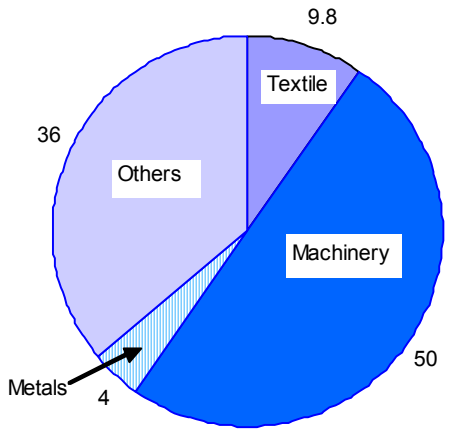
China Exports Composition (1993)



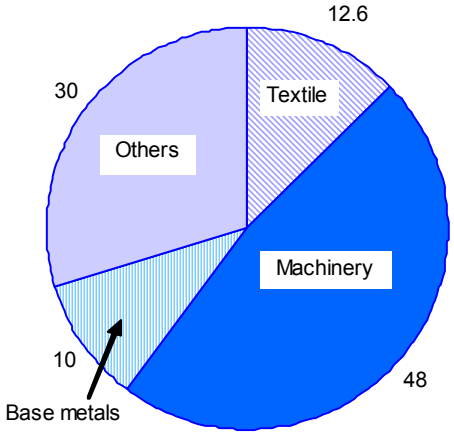
Japan Exports Composition (Early 1980s)



Korea Exports Composition (1997)



China Exports Composition (2008)



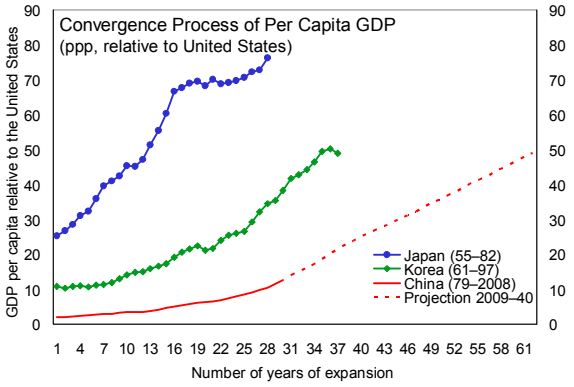
Source: CEIC Data Co., Ltd.; Statistics Bureau of Japan; and IMF staff estimates.

IV. Can China Maintain Its Export-Oriented Growth Going Forward?

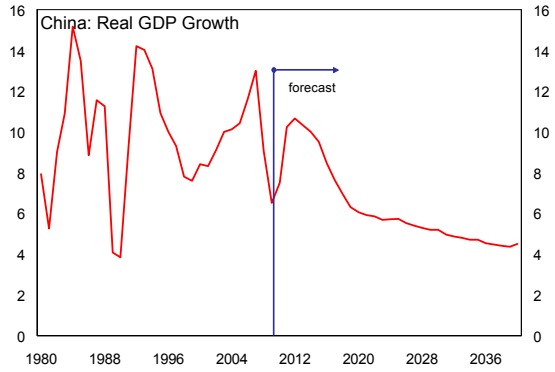
To answer this question, we performed an illustrative scenario that envisages a continuation of China's current growth pattern over the medium term and takes into account the current WEO assumptions on world trade. Our illustrative scenario involves (1) deriving a medium-term path for China's exports, (2) comparing that path with the absorption capacity of the global economy, and (3) at a more disaggregated level, obtaining a path for the exports of key industries (notably steel, shipbuilding, and machinery).

A. An Illustrative Medium-Term Path for Exports

First, we use WEO projection for 2009−14 and determine China's real GDP growth during over the medium to longer term. In doing so, we assumed that China follows a similar pace as Korea in closing the gap in income per capita relative to the United States. China's income per capita (ppp) today is at about 13 percent that of the United States, roughly the same level as that of Korea at the beginning of its longest expansion period. Korea managed to raise its income per capita to around 50 percent of that of the United States during its 30 years of expansion. Using the United Nations' forecasts for China population, the income gap path of Korea, and assuming a 2½ percent growth for U.S. GDP, we derived a path for China's GDP growth (see Figure below).



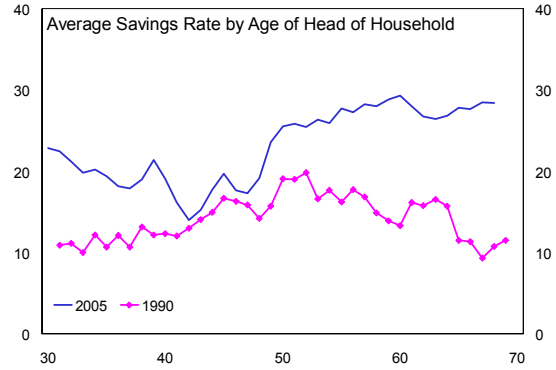
Source: IMF staff estimates.



Sources: CEIC database; and IMF staff estimates.

The envisaged output growth path shows an average growth rate of 8¼ percent between 2009−20 and about 5 percent thereafter. Overall, output growth decelerates gradually as China becomes richer and the labor force shrinks. Under this scenario, China's level of real GDP will grow sevenfold between 2009 and 2040, making China's economy 17 percent of world (and over twice as large as the U.S.) by 2040.

Second, we assume that between 2015−40, consumption grows in line with output. This scenario seems reasonable under a baseline scenario of no additional structural reform, such as healthcare, pension, education, to lower households high savings rate and when compared with the past—consumption grew on average well below output between 1990 and 2008. Moreover, recent data on the structure by age of Chinese households savings rates show that savings rates are higher for the older people—that is, on current policies, population aging would not necessarily lower savings rates.

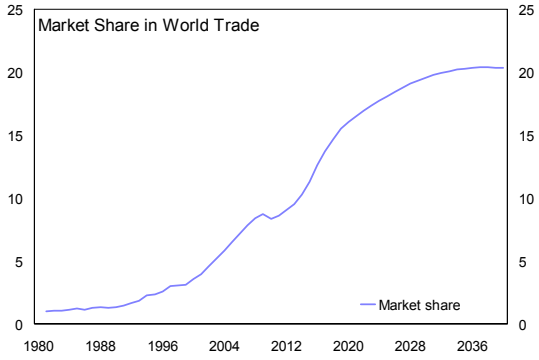


Source: CEIC Database.

Third, we determine investment by calculating the capital stock consistent with the growth path obtained in step 1, assuming an average TFP growth of 3 percent (i.e., equal to the average of the past 10 years), and using the population forecasts from the United Nations. The capital stock is derived from a standard growth accounting framework. Investment is then constructed using the perpetual inventory method.

Fourth, we computed net exports and its components. Net exports are obtained by netting out of the GDP (step 1), consumption and investment (steps 2 and 3). Assuming a constant elasticity of import demand for ordinary trade (total trade excluding processing trade) of around 1.7 (average of 2001−08), we derived a path for imports for ordinary trade. For imports related to processing trade, we assumed they would grow at the same rate as ordinary trade imports. This assumption in essence implies that the share of domestic value added of exports rises over time. Total imports are simply the sum of processing trade imports and ordinary imports. Exports are then residual from net exports and imports.

The estimated import and export growth under this scenario are shown below. While both export growth and import growth are expected to moderate, they will still be elevated in the next several decades. To sustain the growth needed for convergence to U.S. income levels under the current export-oriented growth model implies real exports will grow by an annual average of around 14½ percent during 2011−20, while imports would grow modestly below that level (with the current account balance reaching about 15 percent of GDP). On such trends, China exports would stabilize at around 20 percent of world exports by 2040, more than doubling its current market share.

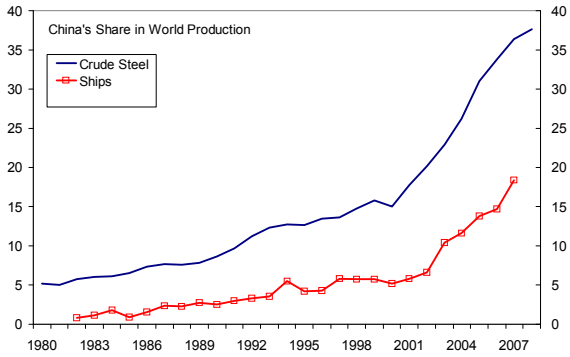


Sources: World Economic Outlook; and Fund staff estimates.

Sources: World Economic Outlook; and Fund staff estimates.

B. Prospects for Key Exports Industries and Implications for Prices

Is it feasible for China to obtain 20 percent of global trade in the next 30 years? To answer this question we look at the key industries that would provide the growth potential needed to achieve this goal. Our industry analysis focuses on steel, shipbuilding, and machine tools (which belongs to the broader category of machinery), industries where China is either a big player or has big growth potential. Steel, shipbuilding, and machinery account for over 50 percent of China's exports. The medium-term path for the industries are obtained by assuming, for simplicity, that China maintains its market share in all other export industries, with growth in those industries following global trade.[3] These three industries provide the growth in market share to achieve the average 9 percent real growth in exports calculated in section A—growing by an average of 18¼ percent between 2011−20. The price implications are then obtained through estimated export demand functions, assumptions about world demand of each of these commodities, and the price elasticity of world demand. This is, of course, intended to be illustrative. China may well not see such growth in these sectors but rather rely on other alternatives and industries such as green energy, biotechnology, or even products not yet widely commercialized. Nonetheless, the idea is to indicate the scale of the challenge that a rapid increase in global market share of tradable goods present and the risks, particularly those related to overcapacity and rising nonperforming loans.



Sources: World Steel Association; Lloyd's Register of Shipping; and Fund staff estimates.

Steel industry

China's steel industry drives the global market. In 2008, China accounted for just under 40 percent of world crude steel production (about 500 million tons), up from 5 percent in the

[3] Sensitivity analyses of this exercise's main assumptions are carried out in the next section.

early 1980s. China's capacity is now estimated at about 600 millions tons, contributing to substantial levels of excess capacity in this industry worldwide. The steel industry may benefit from further domestic demand associated with China's urbanization and development process, and its production is destined primarily to the domestic market. Nevertheless, China's role in global markets has increased markedly in recent years, accounting for 14 percent of world exports (2006 figure) with around 52 million tons, the largest exporter of steel ahead of Japan and Russia. China's exports rose about 90 percent between 2005 and 2006.

Baseline Elasticity Assumptions

	Demand	Price
Steel		
Export	2.0	-1.6
World demand		-0.3
Ship building		
Export	2.0	-0.4
World demand		-1.0
Machine tools		
Export	2.0	-1.6
World demand		-1.0

Source: IMF staff estimates.

For our industry analysis, the following assumptions about the export demand and price elasticities and the price elasticity of demand have been made. We set the export price elasticity to the value estimated by Aziz and Li (2007) for total exports because of limited data availability. For the demand elasticity, we set it at one-half of Aziz and Li's estimate given China's size in the global steel market. This assumption still appears conservative (i.e., on the high side) given that the elasticity could be expected to decline as China gains market share. The price elasticity of world demand for steel is set at −⅓, the value estimated by Winters (1995). With regard to the growth of world demand for steel, we used the medium-term forecast of the World Steel Association (around 3 percent growth a year) before taking into account any price effects. The investment needs in the steel industry have been obtained by assuming a constant capital-output ratio and applying the perpetual inventory method.

Under such assumptions, of the 18¼ percent required export growth, about 9 percentage points could be absorbed through higher external demand and the remaining amount would have to come from a reduction in steel prices and an increase in its market share. World prices would have to fall by a cumulative 45 percent during 2011−20 to accommodate additional export of China (Table 1), with China's production accounting for around 50 percent of world output by 2020. In addition, there will likely be a need to increase investment to expand production capacity by about 100 percent over the same horizon. Given current profit margins in the steel industry are about 5½ percent, without either productivity gains and cost reductions, profit margins would be eliminated within two years. This means that achieving the required growth in steel export could become significantly difficult as early as by 2012.

Shipbuilding industry

China is the world's third largest producer of ships in terms of gross tonnage (GT) behind Korea and Japan. In 2007, China's production was 10.5 millions GT compared with 20.6 GT for Korea and 17.5 GT for Japan. Its production is expanding very rapidly, with its order

book representing about one-third of world orders, second after that of Korea (38 percent of world orders) according to data compiled by Lloyd's Register. The authorities expect China to become an even more important player in shipbuilding by 2015. There are two top shipbuilding conglomerates, the China Shipbuilding Industry Corporation (CSIC) and the China State Shipbuilding Corporation (CSSC). In the shipbuilding industry, China has moved quickly up the value-added chain, producing sophisticated vessels, such as very large crude carriers, liquefied natural gas carriers and high-speed container ships, in addition to bulk carriers and crude oil tankers.

For the industry analysis, the demand and price elasticities (2 and −0.4, respectively) have been estimated using data on China's exports, world fleet production, and a price index for ships.[4] With regard to the growth of world demand for ships, we obtained the global demand (7½ percent) by 1) regressing the size of world fleet on the volume of world trade to get the stock of ships, and 2) deriving from the estimated stock of ships the annual flow of new ships.[5] The investment needs in the ship industry have been obtained in a similar manner as for the steel industry.

Under such assumptions, of the 18¼ percent required export growth, about 17¾ percentage points could be absorbed through higher external demand and the remaining amount would have to come from a reduction in ship prices and an increase in its market share. World prices would have to fall by a cumulative 12¾ percent during 2011−20 to accommodate additional export of China (Table 1), with China's production accounting for around 40 percent of world output by 2020 (up from 18½ percent in 2007). In addition, there will likely be a need to increase investment by 8½ percent a year to expand production capacity over the same horizon. Unlike the steel industry, profit margins in the shipbuilding allow such an expansion to be feasible for quite some time without either productivity gains and cost reductions. At about 10 percent, profit margins could cover around seven years of expansion.

Machine tools

Machinery is the largest export industry in China (over 40 percent of total exports), but because it includes wide ranging products, we focus on machine tools. China's machine tool industry accounted for 15 percent of world production of machine tools in 2007. China's production increased 43 percent in 2007, the third largest producer behind Japan and Germany. Machine tool export has continued to grow rapidly. In 2007, it made $5.2 billion, up 36.2 percent year-on-year, including metal processing machine tool, numerical control metal processing machine tool, metal-cutting machine tool, and forming machine tool. While China remains by far the world's largest consumer of machine tools, absorbing one-fourth of the value of all new installations around the globe, it has started to play an increasingly

[4] Oil prices have also been added to the equation to control for the effects of energy prices on the demand for ships. The estimated coefficient of oil prices is positive (0.3), that is rising energy cost increase the demand for ships, but not statistically significant at standard levels.

[5] This is based on an estimated annual depreciation rate of 2 percent using data from 1989−2007.

important role in export markets. China accounted for around 4¾ percent of world export in 2008, and has a large growth potential going forward.

For the industry analysis, we assume that the demand elasticity is similar to that of shipbuilding, but because China plays a smaller role in the market, we chose a higher price elasticity (equal to the aggregate price elasticity estimated by Aziz and Li, 2007). Here again, our assumptions on the demand elasticities appear conservative (i.e., on the high side). The projected growth in demand for machine tools (6¼ percent) is based on expected world growth (4¾ percent per year) and an estimated elasticity with respect to world growth of 1¼. The investment needs in the machine tools industry have been obtained in a similar manner as for the steel industry.

Under such assumptions, of the 18¼ percent required export growth, about 16 percentage points could be absorbed through higher external demand. World prices would have to fall by a cumulative 14½ percent during 2011−20 to accommodate additional export of China (Table 1), with China's production accounting for around 35 percent of world output by 2020. In addition, there will likely be a need to increase investment by 15 percent a year to expand production capacity over the same horizon. Profit margins are around the same magnitude as in the steel industry, providing little room for price reductions without productivity gains and cost reductions. At about 6½ percent, profit margins could cover around four years of expansion (i.e., through 2014).

C. Sensitivity Analysis

This section explores the sensitivity of the conclusions of the illustrative scenario presented above to assumptions on China's competitors' behavior, price elasticities, world growth, the composition of exports, the domestic value added of exports, and the current account surplus (Table 2).

Increased production capacity from competitors

The baseline scenario assumes that other producers respond passively to China's expansion and they simply occupy the residual world demand. However, if China's competitors were, for example, to expand their capacity at a pace consistent with the underlying world demand for steel, ships, and machine tools (3 percent, 7½ percent, and 4¾ percent), prices would fall even more. In such a case, it would be more challenging for China to achieve the required export growth.

Price elasticities

The conclusions remain also qualitatively unchanged under alternative assumptions about the price elasticity of world demand. Under the assumption of a totally inelastic world demand, prices would naturally have to be reduced by more in all three cases. Under another scenario of more elastic world demand (twice as much as in the baseline scenario), the price cuts would be smaller, but such an assumption might not be very realistic for the selected industries given that the exported commodities are capital goods, which have generally low price elasticities.

World growth

This scenario envisages rates of growth of world demand 20 percent above and below that assumed under the baseline. With stronger demand than under the baseline, prices for steel and machine tools would still have to fall substantially to accommodate China's exports (particularly for steel), while the pressure on ship prices to decline would be much lower. However, the pressure on ship prices could remain significant if other producers scale up their production. Alternatively, lower demand would increase the need for prices to decline by more relative to baseline, particularly for the shipbuilding industry.

Export diversification

A more diversified export structure could be a relatively more sustainable strategy. Indeed, if the required medium-term aggregate export growth was achieved by expansion in all export industries (with all of them growing on average by 9 percent a year), the downward pressure on prices in China's key industries would be much smaller, particularly in machinery. Prices could even rises in industries with strong world demand, such as shipbuilding. For the steel industry, however, deep price cuts appear to be unavoidable. Such large price cuts would of course not be necessary if China responds to demands for new products—a scenario not envisaged in this exercise.

Increased domestic value added

Raising the domestic value added of China's exports could provide some breathing room to China's export-oriented growth, but it would likely remain untenable. Assuming that the share processing imports falls to one-fifth of total imports by 2020, down from just over one-third in 2008, China's total exports would have to grow 1½ percentage points less than under the baseline, and hence its key industries would need to expand by less (about 2 percentage points). Prices would still have to be reduced markedly to gain the needed market share in global markets.

Steady current account surplus

This scenario maintains the current account surplus at 10 percent of GDP between 2015−20 (compared to an increase to about 15 percent of GDP in the baseline) and assumes the same GDP and consumption as in the baseline. As expected, exports growth is smaller than under the baseline. The results suggest that even under such scenario, prices would have to fall by a substantial amount to build market share, particularly for the steel industry.

V. Maintain Growth Without Hitting the Global Absorption Constraint

As shown in the illustrative scenario, maintaining this export-oriented growth going forward would require continued rapid expansion of exports, which can be achieved only through some combination of the three following channels: (1) larger increases in relative productivity in key export sectors to lower costs below that of competitors, (2) a further squeeze in profits, and (3) greater implicit or explicit subsidies through continued price distortions. Each of these strategies will prove increasingly difficult to realize:

- Productivity growth and the marginal return to investment have been slowing in recent years, signaling perhaps overinvestment in some key sectors of the economy, (particularly in manufacturing), as well as China's moving further up the production frontier.
- Reducing profit margins in key export sectors provides some scope for expansion since profits are at relatively healthy levels. However, such margins would be exhausted well before the required expansion in market share could be achieved and in many industries in a matter of just a few years.
- Further price distortions and subsidies to lower the cost of capital and make tradable sectors more competitive runs the risk of fueling more overinvestment in the manufacturing sector, of raising nonperforming loans, increasing trade tensions, and of ultimately lowering growth.[6]

The task ahead could prove even more daunting as the recovery in demand from China's main trading partners may be far slower than that assumed under the WEO and could remain well below its pre-crisis levels. Slower import demand from those economies would naturally lower the feasible pace of China's export expansion. In such case, China's would have to gain even bigger shares in world markets.

Instead, implementing policies to lower precautionary savings, such as reforming the healthcare, education, and pension systems, would raise private consumption, and support growth in a more sustainable manner. As an illustration, were private consumption to substitute in part for net exports in order to make the contribution of net exports to growth zero during 2011−20, the need to build market share would fall noticeably implying much smaller reductions in global prices, a reduced risk of corporate losses, and lower exposure to a worsening of credit quality (Table 3). In some instances, the required growth in exports could be even smaller if as a result of a rebalancing of the Chinese economy from a highly productive tradable sector to a less productive nontradable sector GDP growth declines. But such a scenario might not necessarily prevail if the rebalancing is brought about by structural reforms, while things like increased diffusion of ICT could also lift productivity in both the nontradable and the tradable sector just like in the United States (N'Diaye, 2008).

[6] In its 11th five-year economic plan, the Chinese government has vowed to make the ship industry one of the world's largest by 2020. The government plans to achieve this goal through further financial support to the industry, expansion of capacity, consolidation of the industry, investment in and support for research and development, greater openness (including through cooperation with foreign firms and foreign direct investment).

Table 1. Illustrative Conditions to Sustain China's Growth Strategy
(In percent, unless otherwise specified)

	2007	Baseline 2011–20
Production volume		
Steel (in percent of world production)	35.5	51.4 1/
Shipbuilding	18.4	38.8 1/
Machine tools	15.0	36.2
Excess capacity utilization rate		
Steel	18.5	-96.4
Shipbuilding		
Machine tools		
Annual investment growth		
Steel	12.3 2/	9.6
Shipbuilding		8.5
Machine tools	34.7	15.0
Annual average profit margin		
Steel	5.5	
Shipbuilding	9.6	
Machine tools	6.4	
Scenario: Annual average export growth		
Steel	66.6 2/	18.3
Of which:		
Annual average world demand		9.3
Cumulative required price change		-45.1
Shipbuilding	31.5	18.3
Of which:		
Annual average world demand		17.8
Cumulative required price change		-12.8
Machinery	14.7	18.3
Of which:		
Annual average world demand		15.8
Cumulative required price change		-14.5

1/ end of period.
2/ Average 2005–07.

Table 2. Illustrative Conditions to Sustain China's Growth Strategy

	2007	2011-20							
		Additional Supply	Low Price Elasticity of World Demand	High Price Elasticity of World Demand	High World Growth	Low World Growth	Export Diversification	Increased Domestic Value Added	Constant Current Account Surplus
Scenario: Annual average export growth									
Steel	66.6 1/	18.3	18.3	18.3	18.3	18.3	14.3	16.3	16.1
Of which:									
Annual average world demand		9.9	5.8	11.2	10.1	8.4	8.2	8.7	8.7
Cumulative required price change		-50.8	-57.0	-37.2	-41.9	-48.2	-33.3	-39.5	-39.0
Shipbuilding	31.5	18.3	18.3	18.3	18.3	18.3	14.3	16.3	16.1
Of which:									
Annual average world demand		20.6	15.0	18.0	18.2	17.3	14.4	16.1	15.9
Cumulative required price change		-24.6	-59.7	-7.1	-1.1	-23.2	3.0	-5.3	-4.5
Machinery	14.7	18.3	18.3	18.3	18.3	18.3	14.3	16.3	16.1
Of which:									
Annual average world demand		17.3	12.7	16.7	16.9	14.7	13.6	14.7	14.6
Cumulative required price change		-20.7	-30.2	-9.6	-8.2	-20.5	-4.4	-9.7	-9.2

1/ Average 2005–07.

Table 3. Higher Consumptiopn and Zero Net Exports Contribution to Growth

	2007	Average 2011–20 Scenario	Average 2011–20 Baseline
Annual average export growth			
Steel	66.6 1/	15.0	18.3
Of which:			
Annual average world demand		8.4	9.3
Cumulative required price change		-35.5	-45.1
Shipbuilding	31.5	15.0	18.3
Of which:			
Annual average world demand		15.0	17.8
Cumulative required price change		0.0	-12.8
Machinery	14.7	15.0	18.3
Of which:			
Annual average world demand		14.0	15.8
Cumulative required price change		-6.3	-14.5

1/ Average 2005–07.

REFERENCES

Aziz, Jahangir, and Xiangming Li, 2007, "China's Changing Trade Elasticities," IMF Working Paper 07/266, (Washington: International Monetary Fund).

Bosworth, Barry, and Susan Collins, 2007, "Accounting for Growth: Comparing China and India," NBER Working Paper No. 12943 (Cambridge, Massachusetts: National Bureau of Economic Research).

China Machine Tool and Tool Builders Association, *Annual Report on the Machine Tool Industry*, (Beijing, various issues).

Chow, Gregory C., and Kui-Wai Li, 2002, "China's Economic Growth: 1952−2010," *Economic Development and Cultural Change*, Vol. 15, Issue 1, pp. 247−56.

COSTIND, *Annual Report on National Shipbuilding Industry*, (Beijing, various issues).

Cui, Li, Chang Shu, and Xiaojing Su, 2009, "How Much Do Exports Matter for China's Growth?," Hong Kong Monetary Authority China Economic Issues 01/09.

Gardner Publications, Inc., 2009, World Machine Tool Output and Consumption Survey 2009 (Cincinnati).

He, Dong, and Wenlang Zhang, 2008. "How Dependent is the Chinese Economy on Exports and in What Sense has its Growth been Export-Led?" Working Paper 0814, Hong Kong Monetary Authority.

Hummels, David, Jun Ishii, and Kei-Mu Yi, 2001. "The Nature and Growth of Vertical Specialization in World Trade," *Journal of International Economics*, Vol. 54, pp. 75-96.

International Monetary Fund, 2009, *World Economic Outlook* (Washington)

Koopman, Robert, Zhi Wang, and Shang-Jin Wei, 2008, "How Much of Chinese Exports is Really Made In China? Assessing Domestic Value-Added When Processing Trade is Pervasive," NBER Working Paper 14109.

Kuijs, Louis, and Tao Wang, 2006, "China's Pattern of Growth: Moving to Sustainability and Reducing Inequality," *China and the World Economy*, Vol. 14, Issue 1, pp. 1-14.

Lloyd's Register of Shipping, *World Fleet Statistics*, various issues.

Maddison, Angus, 1998, *Chinese Economic Performance in the Long-Run* (Paris: Organisation for Economic Co-operation and Development).

N'Diaye, Papa, Ping Zhang, and Wenlang Zhang, 2009, "Structural Reform, Intra-regional Trade, and Medium-term Growth Prospects of East Asia and the Pacific—Perspectives From a New Multi-region Model," Journal of Asian Economics, forthcoming.

Organisation for Economic Co-operation and Development, 2008, "The Shipbuilding Industry in China," Working Party on Shipbuilding Report C, WP6(2008)7, Rev. 1 (Paris).

————, 2005, *Economic Survey of China 2005* (Paris).

Prasad, Eswar, 2004, *China's Growth and Integration into the World Economy: Prospects and Challenges*, IMF Occasional Paper No. 232 (Washington: International Monetary Fund.

United Nations, 2008, *World Population Prospects: The 2008 Revision* (New York).

Winters, L. Alan, 1995, "Liberalizing European steel trade," *European Economic Review*, Vol. 39, pp. 611-21.

World Steel Association, 2008, *World Steel in Figures 2008* (Brussels).

Young, Alwyn, 2003, "Gold into Base Metals: Productivity Growth in the People's Republic of China during the Reform Period," *Journal of Political Economy*, Vol. 111(6) (December), pp. 1220–61 (Chicago: University of Chicago Press).

Zheng, Jinghai and Angang Hu, 2006, "An Empirical Analysis of Provincial Productivity in China (1979−2001)," *Journal of Chinese Economic and Business Studies*, Vol. 4, Issue 3, pp. 221−39.