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Yuqing Xing
Manisha Pradhananga

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7-22-1 Roppongi, Minato-ku,
Tokyo, Japan 106-8677

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Yuqing Xing¹

and

Manisha Pradhananga²

Abstract

The Global Financial Crisis and the recent slowdown of China's growth have led to questions about the sustainability of China's growth. The argument is that, China is too dependent on external demand and that it needs to "rebalance" its economy toward domestic consumption. However, conventional measures of external: net exports-over-GDP and exports-over-GDP are biased and do not accurately measure the contribution of external demand to GDP growth. In this paper, we propose two measures that are simple modifications of the conventional measures. We argue that our proposed measures provide a more accurate estimate of the vulnerability of China's economy to external shocks, in the form of exports and FDI. Our estimates show that in 2001, exports and FDI accounted for 18.2% of GDP growth and by 2004 the share rose to 49 percent. During 2005-2007, the contribution of exports and FDI to growth remained in the range of 38-40 percent. Our estimates also show that the impressive recovery of the Chinese economy in the post-crisis period owed at least 53% of its growth to exports and FDI. Based on these results, we conclude that the Chinese economy remains highly dependent on external demand in the form of exports and FDI, and re-balancing the economy towards domestic demand has not been achieved yet.

Key Words: Chinese economy, growth, external demand, GDP accounting

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¹ Director, Capacity Building and Training, Asian Development Bank Institute, Tokyo; and Professor of Economics, the National Graduate Institute for Policy Studies, Tokyo.

² Research Associate, Asian Development Bank Institute; and PhD Candidate, University of Massachusetts- Amherst.

1. Introduction

In the last three decades, the Chinese economy grew at around 10% annually. In 2010, it overtook Japan as the second largest economy in the world. Exports and foreign direct investment have been performing a critical role in powering this rapid economic growth. The Chinese economy has been regarded as the new success story of the export-led growth strategy, after Japan and the four Asian tigers: Hong Kong, Korea, Singapore, and Taiwan. There exists a plethora of literature on the export/FDI and growth nexus in the context of the Chinese economy concluding that the Chinese economic growth has been highly dependent on external demand. The global financial crisis and the Euro-zone crisis have revealed the vulnerability of the export-oriented growth model and have led to questions about the sustainability of China's rapid growth. Rebalancing—reorienting the Chinese economy from external demand to domestic demand, especially household consumption, has been proposed as a strategy for mitigating external shocks and maintaining long-term sustainable growth (IMF 2010, ADB 2009).

Despite heated debates, few studies provide accurate numerical measure of the contribution of external demand to the Chinese economy. Investigating the exact contribution of external demand to Chinese GDP growth is crucial for understanding the urgency of rebalancing and the challenges of structural reform. Traditionally, net exports-over-GDP and exports-over-GDP have been used as a quantitative measure of the contribution of external demand to the economy.³ In this paper we will argue that both of these measures are biased. Net-exports underestimates the contribution of external demand to economic growth as it assumes all imports are for exports. This is the reason why *The Economist* (2007) claimed that the US downturn will not be too bad for the Chinese economy. On the contrary, China witnessed sharp slow-down in the second-half of 2008 and the first-half of 2012. The second measure of external demand, exports, ignores the foreign content of exports, and allocates all foreign value-added to the final exporting country. This leads to an overestimation of the contribution of external demand to GDP. This problem is especially critical for the case of China which imported US\$322 billion worth of intermediate inputs to produce its exports in 2011.

³ These measures are also reported in national accounts of most countries as a way to determine the dependence of the economy on external demand.

In this paper, we seek to reconcile this data inconsistency. We propose two approaches based on simple GDP accounting technique for China that will more precisely measure the contribution of external demand to GDP growth, and reflect the nature of China's vulnerability to external shocks. In the next section, we provide a brief literature review on China's export-led growth hypothesis. In section three, we elaborate on the problems with conventional methods of measuring external demand. Finally, in section four, we introduce two related approaches based on simple GDP accounting technique that will more accurately measure the contribution of exports and FDI to GDP. Using this framework also allow us to assess China's efforts to "rebalance" its economy away from exports to domestic demand.

2. Literature Review

Theoretically, there is no general consensus on the role of exports and FDI on economic growth. It is indeed one of the most debated issues in the growth and development literature. In a Keynesian national accounts framework, net export represents external demand for the country's output, which may lead to an increase in the country's real output. Strictly speaking, this relationship between net exports and GDP is an accounting identity and does not imply causal relations. Various channels have been identified between exports/FDI and growth that has led to the export-led growth hypothesis and the thesis that an outward oriented economy promotes growth. Exports is expected to promote growth by relaxing balance of payments constraints and enhancing the country's capacity to import essential intermediate and capital goods, promote specialization and productivity gains through access to knowledge spillovers, advanced technologies, learning-by-doing, better management practices etc. (Thirlwall 1979, Melitz 2003, Helpman and Krugman 1985).

The most important critique of the export- and FDI- led growth hypothesis is the argument that any correlation between FDI/Exports and GDP growth might be due to reverse causality. Countries which are growing at a rapid rate, by definition, produce more good and services and thus export more. Similarly, countries with a high rate of GDP growth attract more FDI seeking high returns. Another important critique of the export-led growth that has gained much traction in the today's global environment is that export-led growth strategy suffers from fallacy of composition – all developing

countries cannot simultaneously pursue export-led growth strategy unless there is a comparable increase in demand from developed countries. Furthermore, the financial and sovereign debt crises in the US and the EU have highlighted risks associated with high exposure to the volatility to the world markets. These arguments have especially been emphasized in the case of China, a large economy which does not have the constraint of a small domestic market, like most other economies.

Empirical evidence from export-led growth hypothesis is mixed. Tingvall and Ljungwall (2012) use a multi-country, meta-analysis and conclude that exports have contributed to the growth of Chinese economy more than in other countries. Shan and Sun (1998) examine data over 1987 and 1996 using an augmented growth equation and results show bidirectional Granger causality between exports and real industrial output in China. Similarly, Lui (2002) finds bidirectional causality between trade, FDI, and economic growth. Others like Jin, Lee, and Kim (2008) argue that the role of exports and foreign investment in China's growth has been changing, they were more important from mid-1980s to early 1990s. However, from the 1990s to 2003, Jin et al find that knowledge and innovation variables have become more important. While, Tsen (2010) examines the relative importance of exports and domestic demand to economic growth using the Geweke (1982) methodology for China between 1978 and 2002. He concludes that there are bidirectional causality between external demand (measured by exports), domestic demand (measured by consumption and investment) and economic growth.

The evidence for FDI-growth relationship is similarly mixed. Some have found causality running from FDI to economic growth. For example, Dees (2001) found positive effects of FDI on growth for the 1984-1995 time period. Similarly, Tang, Selvanathan, and Selvanathan (2008) found that FDI complemented domestic investment and promoted growth in China between 1978 and 2003. While other studies point to the reverse causality of economic growth attracting FDI into China. For example, Mah (2010) finds that for the 1983-2001 FDI did not cause growth, but that China's growth attracted FDI to the country. Similarly, Zhao and Du (2007) find that FDI was attracted to China due to high growth instead of the other way round.

Causality or not, the fact is that exports and FDI account for a large share of China's GDP, while domestic consumption especially household consumption has been falling over the years. A sudden drop in exports and/or FDI will have a large negative impact

on China's GDP and thus growth rate. In this paper, we will propose two measures that seek to measure this dependence of China on exports and FDI. As mentioned before, conventional measures of external demand are biased, our proposed measures will seek to correct this bias and provide a more accurate estimate. In the next section, we will discuss in detail the problems with conventional measures of external demand that lead to either an underestimation or overestimation of their importance to GDP growth.

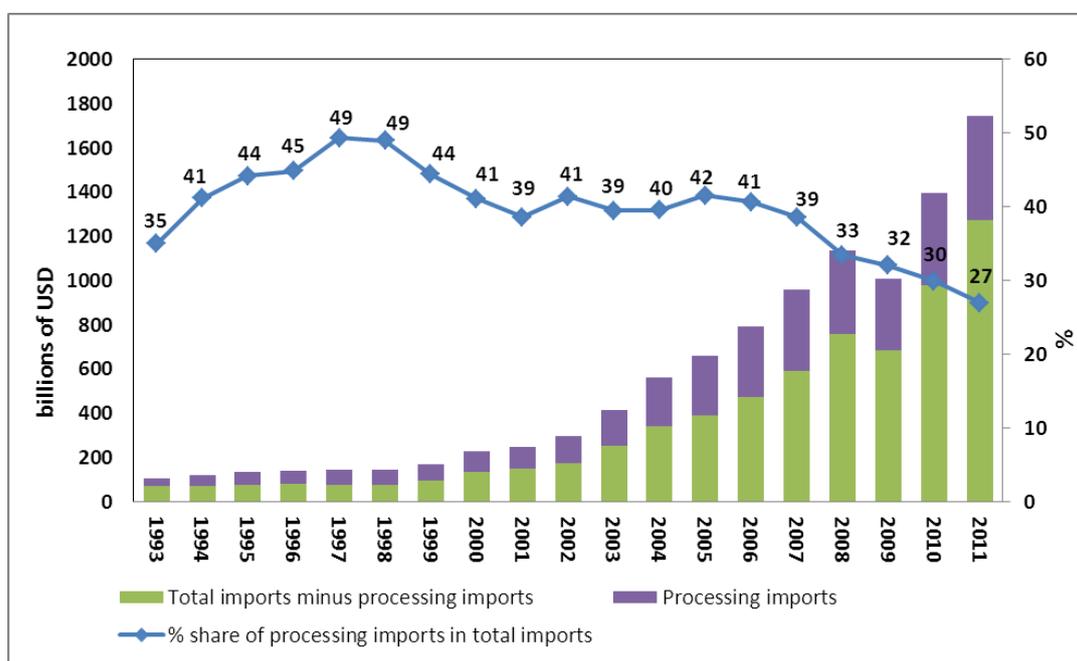
3. Flaws of the Conventional Measures of External Demand

In standard national accounts, two measures i) share of net exports in GDP, the difference between exports and imports of goods and services, and ii) share of exports in GDP, are used as proxies to measure the contribution of external demand to the economy. These measures either underestimate or overestimate the contribution of external demand to GDP and are thus biased. Using net exports as a proxy for external demand simply assumes that all imports of goods and services are for exports, while in fact some imports might be for consumption and investment. It thus, ascribes all leakages from the economy through foreign goods and services to exports and ignores the leakage through consumption and investment. As a result, the contribution of external demand to economic growth is underestimated while that of consumption and investment is exaggerated. For instance, from 2001 to 2011, China's exports grew at around 22 percent annually, but according to China Statistics Bureau, external demand only contributed between -3.5 to 2.6 percentage points to growth per year (National Bureau of Statistics of China, 2012). The apparently low contribution contradicts assertions about China's export driven economic growth.

Using exports-over-GDP, the second measure, causes the opposite problem. If all value-added and inputs of the economy's exports were produced domestically, the ratio could be used as a direct measurement on the contribution of external demand to GDP. However, modern international trade in manufacturing products is accomplished through global supply chains, in which companies located in various countries contribute to manufacturing a single product. Gross export often includes values for parts and components imported from other countries, thus fails to take into account the foreign content of exports. This is especially true for the case of China because of its central role in the East Asian production network. Many of the manufactured products

exported by China, in particular information and communication technology products such as computers and mobile phones, are made of imported parts and components (Xing 2012). Processing imports—imported intermediate inputs for producing exports—have been a substantial part of China’s total imports. The share of processing imports was as high as 49% in 1997, which declined gradually and fell to 27% in 2011 (figure 1). In 2011, China imported over US\$322 billion as intermediate inputs for producing its exports. The iPhone trade is a typical example. Despite the fact that Chinese workers contribute only US\$6.5 to the manufacture of a 3G-iPhone, US\$179 is credited to China’s gross exports whenever a 3G iPhone is shipped abroad (Xing and Detert 2010). Finally, both net exports and exports ignore the contribution of foreign investment to the economy.

Figure 1: Processing Imports and its Share in Total Imports

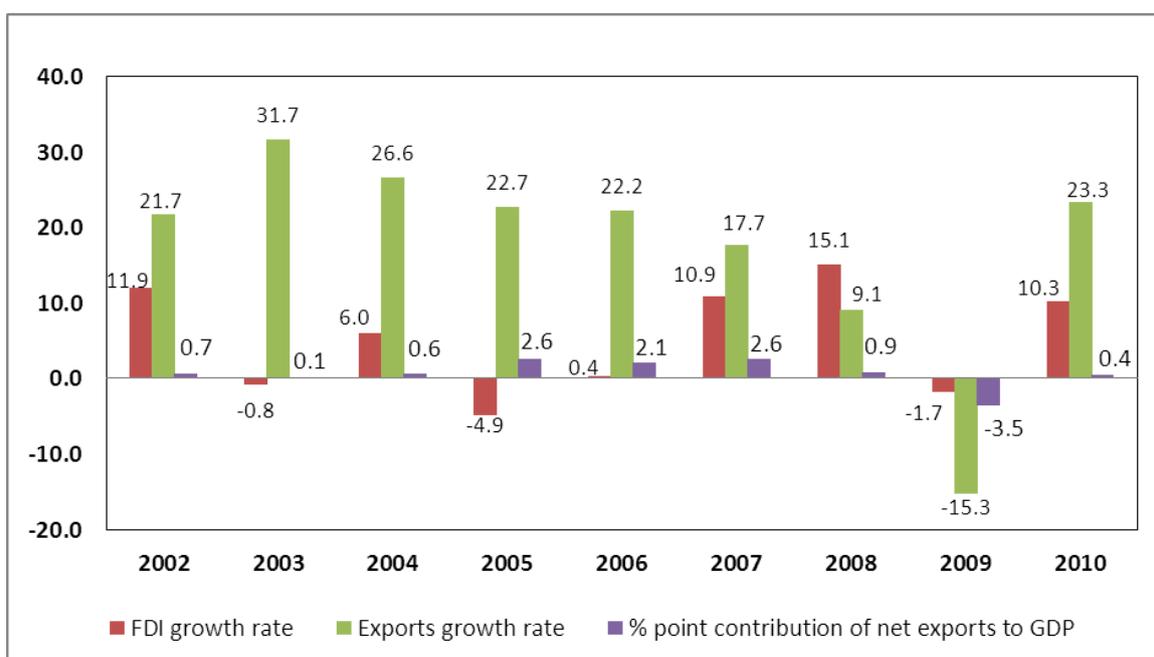


Source: authors’ calculations based on the data from China Customs

The above discussion implies that both the conventional measures of external demand are biased. Figure 2 compares the real annual growth of FDI and exports with the percentage point contribution of net exports to the economy from 2002 to 2010. In 2002, exports and FDI grew 21.7 percent and 11.9 percent respectively in real terms, but net exports was estimated to contribute merely 0.7 percentage points to the 9.1 percent

GDP growth. In 2005, despite the 22.7 percent real growth in exports and 2.6 percent in FDI, net exports was estimated to contribute a negative 4.9 percentage point to the overall growth of the economy! The estimated contributions of net exports are absurd and inconsistent with the persistent high growth and fail to support the general consensus of the important role of exports and FDI in China's growth. It is misleading to use both net exports and exports to gauge the contribution of external demand to growth, and it is imperative to come up with a more accurate measure to understand the role of the external demand in the Chinese economy.

Figure 2: Growth of Exports & FDI and Contribution of Net Exports to GDP



Source: authors' calculation based on the data from China Statistics Yearbook.

A few others have recognized this measurement error, for example Akyuz (2011) suggests estimating import intensities of consumption, investment, and exports to obtain a more accurate estimate of the contribution of external demand to GDP growth. In the next section, we propose two simple GDP accounting techniques for China that utilizes available data and will more precisely measures the contribution of exports and FDI to GDP (Xing 2009).

4. Alternate Measures of External Demand

In this section, we will propose two measures that we are a better measure the contribution of exports and FDI to China's growth. We will use the standard Keynesian GDP accounting method which is often used by national accounts statisticians to analyze the contribution of consumption, investment, and exports to GDP. As emphasized before, these are accounting techniques, and do not imply any causal relations between the variables.

The standard demand-side GDP accounting decomposes aggregate demand into consumption, investment, and net exports:

$$GDP_t \equiv C_t + I_t + (EX_t - IM_t) \quad (1)$$

Where, C_t is consumption, I_t investment, EX_t exports and IM_t imports.

Net exports ($EX_t - IM_t$) and exports (EX_t) are usually taken as a measure of the contribution of external demand to GDP. However, as discussed before exports need to be adjusted for their import content. Fortunately for the case of China, trade data is divided into two parts: processing and ordinary. All imported intermediate inputs used for producing exports are recorded as processing imports. We can separate imports servicing domestic demand from imports for producing exports. Following this classification, we divide total imports into—processing and ordinary:

$$IM_t = IM_t^p + IM_t^o \quad (2)$$

Where, IM^p denotes processing imports and IM^o ordinary imports to meet the demand of domestic consumption and investment.

The first measure of external demand that we propose is,

$$\mathbf{M1:} \quad EX_t - IM_t^p \quad (3)$$

This modification allows us to account for processing imports while sticking closely with the conventional measure. As mentioned before, this accounting modification is important especially in the case of China, as at its peak, processing imports accounted for close to 50 percent of its imports. We believe this will give us a lower-bound on the contribution of external demand on the Chinese economy as it ignores the role of FDI.

Besides exports, foreign direct investment to China can also be considered an important component of external demand. As FDI is a significant component of China's

GDP, fluctuations in FDI can have a large impact on GDP. To take into account this vulnerability of China to external shocks through FDI, we will include FDI in our second measure. Including investment in external demand raises a knotty issue: in essence we would be assuming that all investments made by foreign funds are used to manufacture goods and services for foreign consumption, while investments made by domestic funds are used to produce goods for domestic consumption. However, this is increasingly untrue as many companies invest in China not just for its abundance of cheap labor but also to access to its large market. China has emerged as the largest market for consumer vehicles, with foreign brands dominating around 70 percent of the market. Similarly, China is an important market for consumer electronics: it is the second largest market for Apple, and is expected to over-take the US as the largest market.⁴

There are also issues related to secondary or multiplier effects of foreign-consumption-based investment in the economy. For example the increased employment generated by establishing a new factory, would raise the disposable income of the workers employed and thus demand for goods and services, which will have a positive impact on GDP. It is indeed very difficult to calculate the contribution of investment to the GDP, which is further complicated by the growing importance of China as a market rather than world factory. We neither have firm-level data to estimate the share of FDI and domestic investment that is used to manufacture goods for domestic consumption, nor do we have estimates of the multiplier effects of FDI. Given these data limitations, once again we use the simple GDP accounting framework to estimate the primary impact of an external shock through exports and FDI to the Chinese GDP.

Continuing our framework, we divide total investment in the economy into two parts—investment through foreign funds and domestic funds:

$$I_t = I_t^f + I_t^d \quad (4)$$

Substituting (2) and (4) into (1) and rearranging the terms yields:

$$GDP_t \equiv (C_t + I_t^d - IM_t^o) + (EX_t + I_t^f - IM_t^p) \quad (5)$$

⁴ <http://www.ft.com/intl/cms/s/0/e60b68e2-5b51-11e2-9d4c-00144feab49a.html#axzz2PwLVdRo7>
The recent apology by the CEO of Apple for the company's warranty and repair policies in China highlights the growing importance of the Chinese market. <http://www.bloomberg.com/news/2013-04-01/apple-ceo-cook-apologizes-for-china-iphone-warranties.html>

The first term ($C_t + I_t^d - IM_t^o$) is domestic consumption and investment adjusted for leakage via imports. It measures the actual demand of domestic consumption and investment for domestic outputs. The second term represents the share of exports and foreign investment in China's GDP, and is the proposed second measure of China's vulnerability to external shock.

$$\mathbf{M\ 2:} \quad EX_t + I_t^f - IM_t^p \quad (6)$$

If we let, Domestic demand: $DD_t = C_t + I_t^d - IM_t^o$ and

External demand: $ED_t = EX_t + I_t^f - IM_t^p$, then identity (4) can be simplified as:

$$GDP_t \equiv DD_t + ED_t \quad (7)$$

The real GDP growth rate g_t can be calculated as

$$g_t = (1 - \alpha_{t-1})g_t^d + \alpha_{t-1}g_t^e \quad (8)$$

Where,

$$g_t = \frac{GDP_t - GDP_{t-1}}{GDP_{t-1}}, \text{ real growth rate of GDP at year } t;$$

$$g_t^d = \frac{DD_t - DD_{t-1}}{DD_{t-1}}, \text{ real growth rate of domestic demand at year } t;$$

$$g_t^e = \frac{ED_t - ED_{t-1}}{ED_{t-1}}, \text{ real growth rate of external demand at year } t;$$

$$\alpha_{t-1} = \frac{ED_{t-1}}{GDP_{t-1}}, \text{ weight of external demand in the GDP at year } t-1; \text{ and}$$

$$(1 - \alpha_{t-1}) = \frac{DD_{t-1}}{GDP_{t-1}}, \text{ weight of domestic demand in the GDP at year } t-1$$

Equation (8) decomposes GDP growth of the Chinese economy into two measurable components: $\alpha_{t-1} \cdot g_t^e$ measures the percentage point contribution of the exports and FDI to GDP growth, while $(1 - \alpha_{t-1}) \cdot g_t^d$ is the percentage point contribution of domestic demand to GDP growth.

5. Our Estimates

In this section we present estimates of our proposed measures (M1 and M2) and compare them to conventional measures of external demand. We apply actually utilized

FDI as a proxy for foreign investment (I_t^f)⁵. Data for GDP, consumption, gross capital formation, exports, and imports are retrieved from various issues of China Statistics Yearbook. Data for processing imports IM_t are provided by China's Customs General.

Fluctuations of the exchange rates between the Yuan and the Dollar affect estimated growth rates of external demand. Specifically, when the Yuan depreciates against the dollar, the calculated growth of external demand tends to be higher in Yuan than in dollars. Since the variables measured in Yuan—consumption and domestic investment—are comparatively larger than variables measured in US dollars—FDI, processing trade—to minimize the error due to exchange rate fluctuations, we convert all variables into Yuan. Average exchanges rates of the Yuan to the Dollar, published in China Statistics Yearbook are used for the conversion.

Table 1: Conventional measures vs. our estimates

	exports/GDP	M2/ GDP	M1/ GDP	net exports/ GDP
1994	20.75	18.73	12.93	0.92
1995	19.70	16.30	11.35	2.22
1996	16.96	15.25	10.57	1.37
1997	18.57	16.27	11.68	4.11
1998	17.59	15.42	11.07	4.16
1999	17.73	14.84	11.17	2.66
2000	20.90	16.95	13.54	2.02
2001	20.20	17.05	13.49	1.71
2002	22.37	18.07	14.45	2.09
2003	26.56	20.57	17.33	1.53
2004	30.51	23.20	20.08	1.66
2005	33.43	25.07	22.43	4.47
2006	34.84	26.68	24.43	6.39
2007	35.10	27.90	25.77	7.60
2008	31.77	26.55	24.52	6.60
2009	23.52	19.44	17.67	3.85
2010	26.57	22.02	20.24	3.06
2011	26.46	22.00	20.39	2.16

Source: authors' own calculations

⁵ Actually utilized foreign investment is divided into three components: foreign direct investment, foreign loan, and other foreign investment. Data for foreign loan is not available from 2001. To keep the data consistent, we use FDI as a proxy for foreign investment. FDI makes up between 78-99% of annual foreign investment during 1994-2011.

Table 1 reports compares the conventional measures of external demand to our measures MI and M2 as a share of GDP. As expected, our estimates are lower than estimates using exports/GDP and higher than estimates using net exports/GDP. Our results suggest that the Chinese economy remains highly dependent on exports and FDI. The economy is extremely vulnerable to external shocks; any significant external shock could slow down the economy substantially. Given the high level of the growth dependence of the economy on the external demand, it is unrealistic to expect the Chinese economy can be re-oriented to domestic demand in the short run.

Table 2: The Contribution of external demand to China's GDP growth

Year	ED/ GDP (α_{t-1})	ED growth (g_t^e)	% point contribution of ED to GDP growth ($\alpha_{t-1} \cdot g_t^e$)	GDP growth (g_t)	% contribution of ED to GDP growth ($\alpha_{t-1} \cdot g_t^e / g_t$)
1994	0.13	62.5	8.1	12.7	63.9
1995	0.19	-3.6	-0.7	10.7	-6.4
1996	0.16	3.1	0.5	10.2	4.9
1997	0.15	15.8	2.4	8.5	28.4
1998	0.16	1.3	0.2	6.9	3.0
1999	0.15	2.7	0.4	6.7	6.1
2000	0.15	21.3	3.2	6.2	51.0
2001	0.17	8.8	1.5	8.2	18.2
2002	0.17	16.5	2.8	9.8	28.5
2003	0.18	25.8	4.7	10.5	44.3
2004	0.21	24.3	5.0	10.2	49.0
2005	0.23	21.1	4.9	12.1	40.6
2006	0.25	21.9	5.5	14.5	37.9
2007	0.27	16.3	4.3	11.2	38.8
2008	0.28	4.6	1.3	10.0	13.0
2009	0.27	-18.7	-5.0	11.1	-44.9
2010	0.19	22.7	4.4	8.3	53.1
2011	0.22	7.2	1.6	7.3	21.8

Source: authors' own calculations

In Table 2 we report estimates of the contribution of the newly defined external demand (M2), which is the sum of adjusted exports and FDI inflows, to China's growth rate for the period 1994-2010. In 1994, M2 rose by over 62% and accounted for almost 64% of China's GDP growth. The exceptional high external growth was partially due to the sharp devaluation of the Chinese Yuan, from 5.8 Yuan/US\$ to 8.6

Yuan/US\$ between 1993 and 1994. The devaluation magnified the annual increase of both exports and FDI inflows when measured in Chinese Yuan. China joined the WTO in 2001, until then, the growth of external demand was quite volatile and the dependence of the economy on external demand was moderate. Excluding 1994, only in one year (2000), more than one third of the growth was generated from external demand. In 1995, although exports and FDI expanded, so did nominal external demand, however a high inflation rate translated to negative growth for external demand. The high contribution of 51 percent by external demand to GDP growth in 2000 was due to rapid expansion of exports. Chinese exports grew by more than 28% in nominal terms in 2000. We can also observe that dependence of the economy on external demand gradually increased in the post WTO era.

External demand grew steadily and maintained a two-digit annual growth rate until the eruption of the global financial crisis in 2008. The estimates suggest that, the weight of external demand in the economy increased gradually during this period: in 2001 external demand accounted for 18.3% of GDP growth, by 2004 almost half of the 10.2% GDP growth could be attributed to external demand. During the period 2005 to 2007, share of external demand dropped slightly, but remained in the range of 38-40%. In the second half of 2008, the Global Financial Crisis disrupted China's exports and inflows of foreign direct investment. Consequently, external demand grew by merely 4.6% and its contribution to overall economic growth fell sharply to 13%. Global economic turmoil continued into 2009, and drove external demand to fall by 18.7%. In 2010, external demand recovered and rose by 22.7%, accounting for 53% of the economic growth of that year.

6. Testing the Reliability of the Estimates

How reliable are the estimates? As our decomposition approach is derived from the standard GDP accounting framework, theoretically there should be no concerns. It is possible that significant discrepancy may exist due to exchange rates and other data inaccuracies. To test the reliability of our approach and estimates, we first estimate growth rate of external and domestic demand separately, then calculate the corresponding GDP growth (g_t) (see table 3). The estimated g_t is compared with the

growth rate calculated directly from the GDP data by expenditure method published in China Statistics Yearbook. As expected, the two growth rates match exactly.

As mentioned before, we follow the expenditure approach to GDP accounting. The China Statistics Bureau calculates GDP growth using the production method, although it publishes GDP figures based on both expenditure and production method. It is an interesting exercise to compare the growth rates calculated from the two different approaches. The comparison may provide further evidence on the reliability of our estimates. Figure 3 compares the growth rates between 1994 and 2011 based on the two approaches. As we can see the difference between the two approaches is quite large, especially in recent years. It is common to have some discrepancies between GDP calculations using different methods. There may be several reasons for this, for example because they are based on different data sources and thus face different limitations in data collection etc. However, if we examine figure 3 closely, we can observe a clear lag

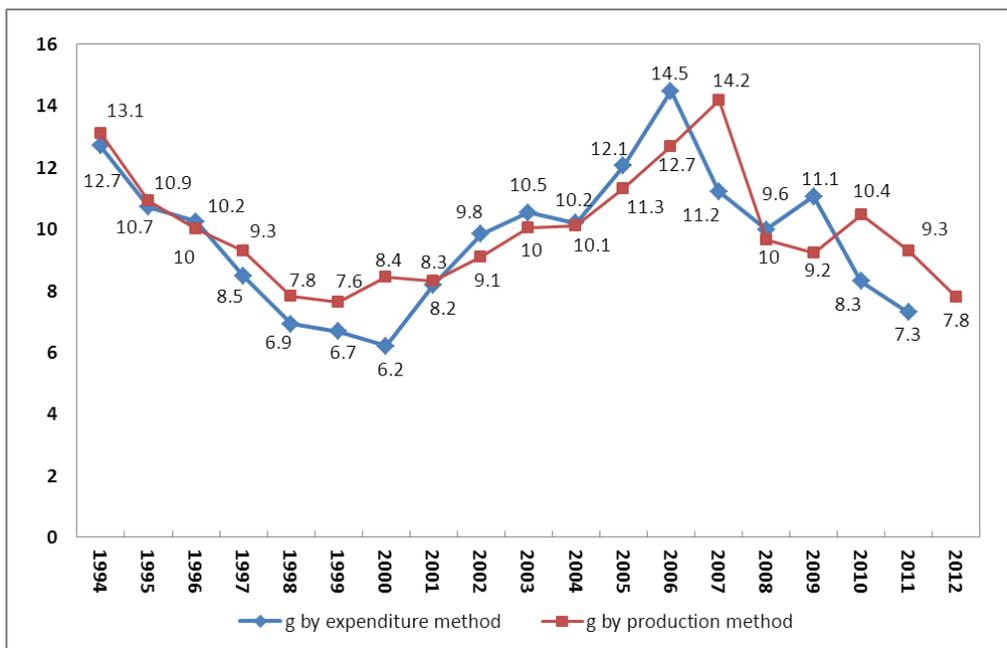
Table 3: Testing the reliability of the estimates

Year	% point contribution of ED to GDP growth $(\alpha_{t-1}) \cdot g_t^e$	% point contribution of DD to GDP growth $(1 - \alpha_{t-1}) \cdot g_t^d$	GDP growth g_t
1994	8.12	4.58	12.7
1995	-0.68	11.39	10.7
1996	0.50	9.73	10.2
1997	2.40	6.06	8.5
1998	0.21	6.71	6.9
1999	0.41	6.26	6.7
2000	3.16	3.04	6.2
2001	1.49	6.70	8.2
2002	2.81	7.03	9.8
2003	4.66	5.87	10.5
2004	4.99	5.20	10.2
2005	4.89	7.16	12.1
2006	5.48	8.99	14.5
2007	4.35	6.86	11.2
2008	1.30	8.68	10.0
2009	-4.96	16.02	11.1
2010	4.41	3.89	8.3
2011	1.59	5.70	7.3

Source: authors' own calculations

effect between the expenditure approach and the production approach. Specifically, the low growth in expenditure is consistently followed by the low growth of the output. The lag effect is consistent with standard dynamics of macroeconomics models. From a policy standpoint, this is reasonable to expect as government interventions through monetary or fiscal policy interventions may show up in the expenditure data comparatively faster, but may take a while to affect output.

Figure 3: GDP growth rates by expenditure and production methods



Source: The authors' calculation based on China Statistics Yearbook

For example, in November 2008 the Chinese government announced a massive economic stimulus package of 4 trillion Yuan, equivalent to about 16% of China's GDP. The effect of this stimulus package can be seen in the 2009 expenditure data; the expenditure based GDP grew 11.2 percent while the output based GDP rose only by 9.2 percent, 0.8 percentage points lower than the preceding year. As there may be a lag for this fiscal intervention to affect output, it shows up in the 2010 production data; the output based GDP grew 10.4 percent in 2010, 1.2 percentage higher than previous year. Similarly, in 2007 China carried out a series of contractionary monetary policies to slow down the overheated economy. The deposit interest rate was progressively increased from 2.52 percent in August 2006 to 4.14 percent by the end of 2007. In addition, the

required reserve ratio was increased 10 times by 0.5 percent each time from November 2006 to December 2007, to jump from a low 8.5 percent to 13.5 percent. Again, this radical dis-acceleration of the economy shows up in the 2007 expenditure data as it immediately reduced both supply and demand of bank loans, and dampened overall expenditure in particular investment spending, but not in the 2007 production data. This explains the big difference in growth rates between the two methods in 2007---the expenditure based GDP growth dropped sharply to 11.2 percent compared with 14.5 percent the proceeding, while the growth of the output based GDP accelerated to 14.2 percent.

7. Concluding Remarks

In the post-crisis environment, sustainability of China's growth pattern has been highly debated. The argument is that, China is too dependent on external demand and that it needs to "rebalance" its economy toward domestic consumption. However, the commonly used ways of measuring the contribution of external demand to the economy is biased. Net exports underestimates the contribution of external demand as imports are deducted from exports, even though they are used in-part for domestic consumption and investment. While exports overestimates the contribution of external demand by assuming the entire value-added of exports are produced domestically. In this paper, we propose two measures that are based on simple modification of the conventional measures. We argue that our proposed measures provide a more accurate measure of the vulnerability of China's economy to fluctuations in the form of exports and FDI share of external demand in China's economy. Our estimate suggests that, the dependence of the Chinese economy on external demand increased significantly after its entry to the WTO in 2001. The contribution of exports and FDI to the growth of the economy rose from 18 percent in 2001 to its peak at 49 percent in 2004. As the growth of exports and FDI slowed down in 2008, the growth rate of GDP fell sharply. However, in the post-crisis period, the Chinese economy remained highly dependent on the external demand. As exports and FDI together contributed to over 53 percent to the impressive recovery of the Chinese economy in 2010. Our results are important in the context of present debates on the sustainability of China's growth as it implies that China is still highly

vulnerable to fluctuations in external demand, in terms of both exports and FDI, and rebalancing of the economy towards domestic demand has not been achieved yet.

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