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## The People's Republic of China's growth, stability, and use of international reserves

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**ADB Working Paper Series**

**The People's Republic of China's  
Growth, Stability, and Use of  
International Reserves**

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**Abstract**

In the run-up to the financial crisis, the world economy was characterized by large and growing current account imbalances. Since the onset of the crisis, the People's Republic of China and the United States have rebalanced. As a share of gross domestic product, their current account imbalances are now less than half their pre-crisis levels. For the People's Republic of China, the reduction in its current account surplus post-crisis suggests a structural change. Panel regressions for a sample of almost 100 economies over the thirty-year period, 1983–2013, confirm that the relationship between current account balances and economic variables such as performance, structure, wealth, and the exchange rate, changed in important ways after the financial crisis.

**JEL Classification:** F32, O57

## Contents

1.	Introduction.....	3
2.	Data and Estimation .....	11
3.	Baseline Results and Robustness Checks.....	12
4.	The People's Republic of China's Current Account and International Reserves.....	18
5.	Conclusion.....	21
	References .....	23
	Appendix.....	25

## 1. INTRODUCTION

In 2007–2009, the United States (US) faced a severe financial crisis that resulted in the worst downturn in output and employment since the Great Depression. Economists and policymakers have concentrated on trying to understand the fundamental causes of this crisis and how to end it. In addition, the dramatic collapse in world trade that was triggered by the crisis and helped spread it, has led to new research on the linkages between financial distress and global trade flows. A topic that has received less attention is how East–West global imbalances—particularly those of the People’s Republic of China (PRC) and the US—have changed in the aftermath of the financial crisis. That is the focus of this paper.

In the run-up to the financial crisis, the world economy was characterized by enormous current account imbalances. The PRC’s surplus alone was 0.7% of world gross domestic product (GDP) in 2008, while the US had a deficit of more than 1% of world GDP that year. The current account balances of the world’s surplus economies (e.g., the PRC, Germany, Japan, and the oil exporting economies) exceeded 2.5% of global GDP in 2008; the current account balances of the world’s deficit economies (e.g., the US, the non-Asian emerging markets, and the eurozone excluding Germany) were also about 2.5% of global GDP.

Prior to the financial crisis, some suggested large imbalances could be sustained for the foreseeable future. Dooley, Folkerts-Landau, and Garber (2003, 2005), for example, argued an Asian periphery, primarily the PRC, could pursue a development strategy of export-led growth supported by undervalued exchange rates and capital controls for many years. Large current account surpluses and official capital outflows in the form of accumulated reserve asset claims on the US would characterize the Asian periphery for perhaps a decade or more. Moreover, the strategy was a “win” for the center (e.g., the US) as well, since virtually unlimited demand for its financial assets would allow it to run large current account deficits, living beyond its means for years.

At some point, the Asian periphery would grow sufficiently to graduate to the center. It would then undertake financial liberalization and adopt greater exchange-rate flexibility. But when that happened, another set of developing economies would step forward to become the new periphery, pursuing the same export-led growth strategy against the center as had the PRC and the Asian periphery, and before them, post-war Europe and Japan. As a result, global imbalances, with the periphery running large current account surpluses and the center large current account deficits, would be a regular feature of the international monetary system for years to come.

In later work, Dooley et al. (2004) provided an asset market interpretation of the “win-win” view of global imbalances. The interpretation went as follows. US deficits supplied international collateral to poorer economies on the periphery eager to undertake capital formation; the collateral freed them from a reliance on inefficient domestic financial markets. Foreign direct investment (FDI) flows into the PRC provided supporting evidence for this claim.<sup>1</sup>

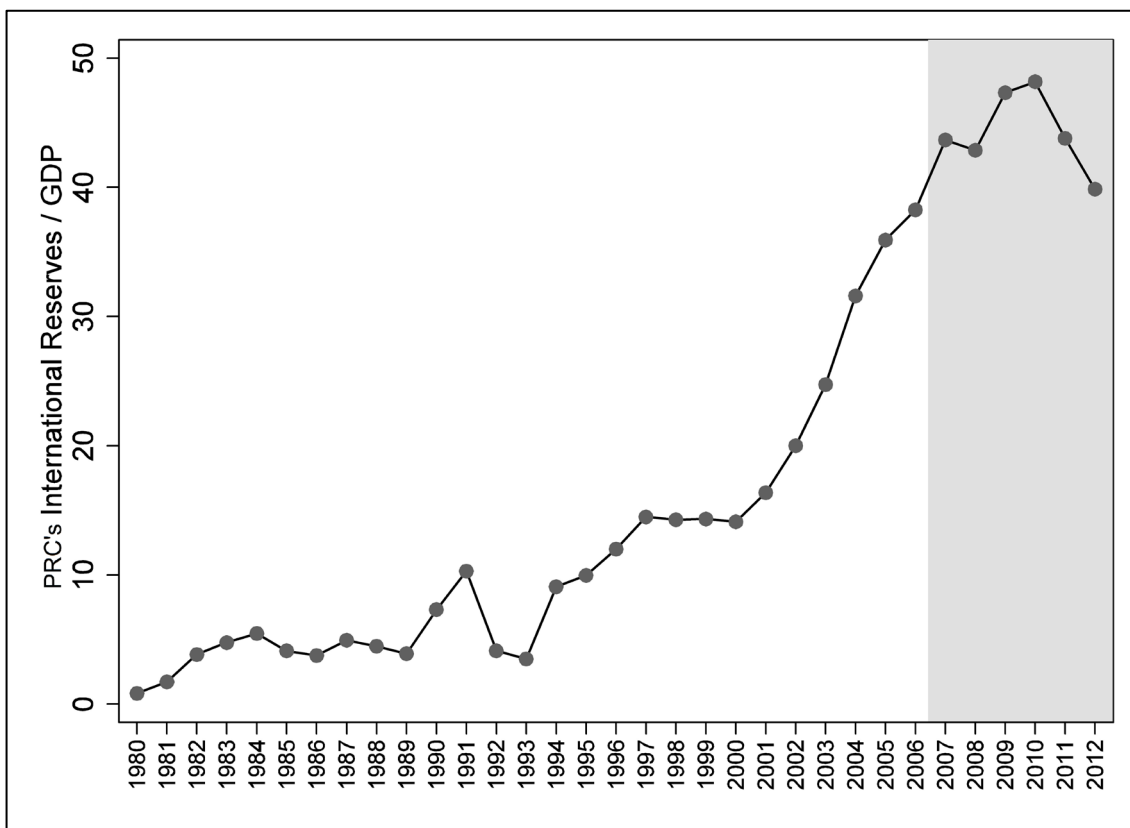
The modern mercantilist view, embraced by Aizenman and Lee (2007, 2008) and others, provided a less sanguine interpretation of the persistent global imbalances that emerged in the 2000s. While Aizenman and Lee confirmed the hoarding of international reserves that accompanied current account surpluses was dominated by a

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<sup>1</sup> Caballero, Farhi, and Gourinchas (2008), Ju and Wei (2010), and others explored this interpretation in models with FDI and global imbalances.

precautionary motive prior to 2000, a finding consistent with Aizenman and Marion's (2003, 2004) earlier interpretations, there appeared to be a regime change afterwards. The PRC's international reserves that had been trendless during the second half of the 1990s, hovering around 15% of GDP, after 2000 grew at an annual rate of about 4%, reaching almost 45% of GDP in 2007 (Figure 1).

**Figure 1: The People's Republic of China's International Reserves/GDP (%), 1980–2012**

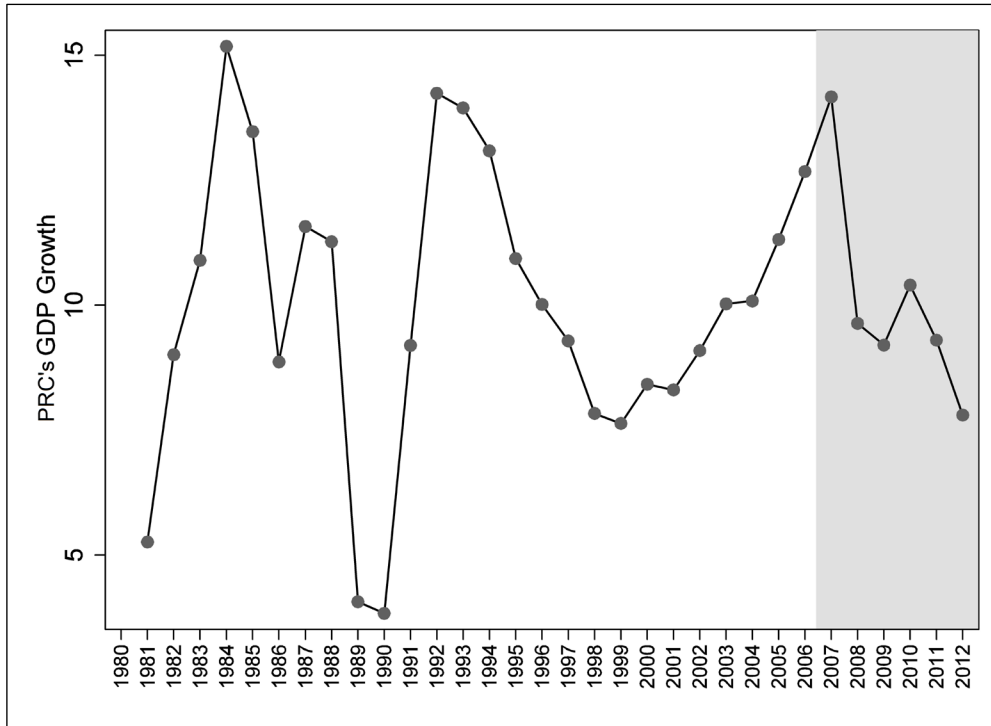


GDP = gross domestic product.

Source: Authors' calculation.

Aizenman and Lee (2008) pointed to monetary mercantilism as the main reason for the regime change. Like earlier mercantilist efforts to expand export markets and accumulate gold described by Adam Smith (1776), after the year 2000 emerging economies such as the PRC started pushing exports to promote growth, racking up current account surpluses and growing stockpiles of international reserves. The numbers were impressive. On the eve of the financial crisis, the PRC's real GDP growth had reached 14% (Figure 2), its current account surplus had grown to 10% of GDP (Figure 3), and its international reserves had reached almost 45% of GDP prior to the crisis, peaking at about 50% in 2010 (Figure 1). However, unlike Dooley et al.'s (2003, 2004, 2005) win-win view of global imbalances buffered by international reserve hoarding, Aizenman and Lee (2008) warned that modern mercantilism could lead to unintended adverse consequences such as competitive hoarding.

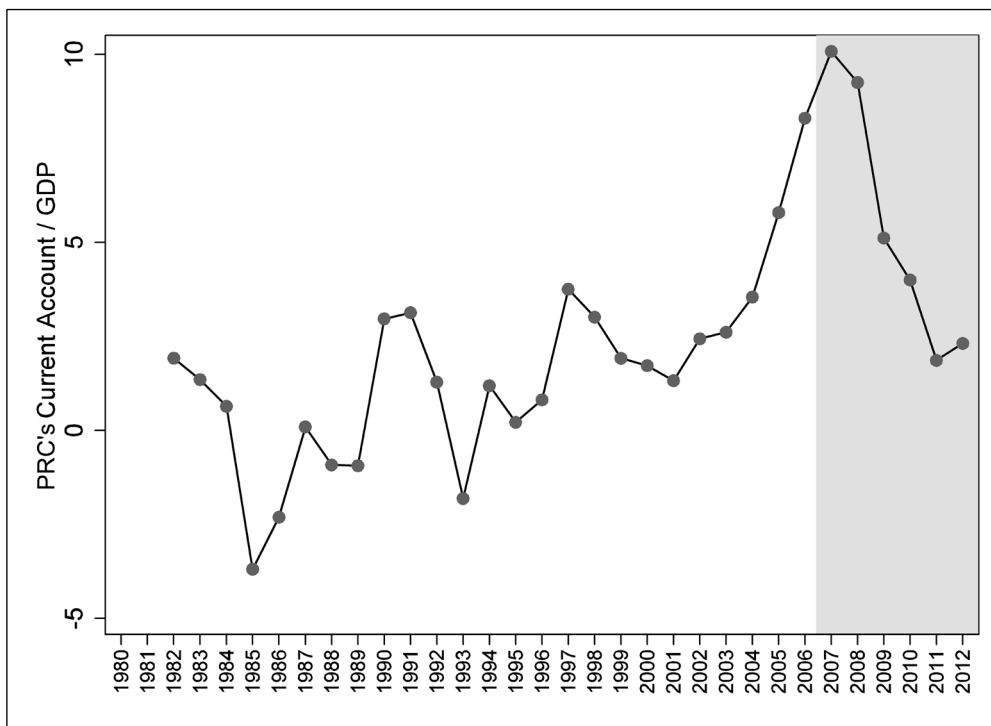
**Figure 2: The People’s Republic of China’s Real GDP Growth (% , annual), 1980–2012**



GDP = gross domestic product.

Source: Authors' calculation.

**Figure 3: The People’s Republic of China’s Current Account/GDP (%), 1980–2012**



GDP = gross domestic product, PRC = People’s Republic of China.

Source: Authors' calculation.



The view that large East–West global imbalances could be sustained for a long period was not shared by everyone. Eichengreen (2007) and Feldstein (2008), for example, argued the Asian periphery was not monolithic; some member of the periphery might abandon fixed exchange rates against the dollar sooner rather than later, either willingly or in response to speculative pressures, thereby reducing East–West global imbalances. Obstfeld and Rogoff (2005) also saw large imbalances as unsustainable and worried they might unwind abruptly rather than gradually.

Alfaro, Kalemli-Ozcan, and Volosovych (2011) observed that global imbalances where poorer economies financed richer ones were driven mainly by government decisions and official capital flows, since private funds tended to move in the opposite direction, attracted by higher growth rates in poorer economies. They raised concerns about the global efficiency and sustainability of these trends.<sup>2</sup>

Aizenman and Sun (2010) also raised doubts that large global imbalances could be sustainable. They argued that with the PRC growing at twice the rate of the US, the US current account deficits needed to absorb the PRC's surpluses in coming years—in the absence of other big economies willing to run large deficits—would be unrealistically high and hence self-limiting in the not too distant future.<sup>3</sup>

Then the financial crisis hit. In the US the private sector was forced to deleverage and reduced its demand for imports. Other crisis-hit developed economies also cut back on imports. As the PRC experienced weaker export demand, it took seriously the call by the International Monetary Fund (IMF) for more reliance on domestic spending to sustain growth. It began promoting greater domestic consumption and investment with the help of a domestic credit boom. It also pursued fiscal stimulus and allowed its real exchange rate to appreciate. It attempted to diversify its holdings of dollar-denominated reserve assets by creating a sovereign wealth fund and encouraging outward FDI.

The data are revealing. Since the onset of the financial crisis, East–West global imbalances have fallen dramatically. The current account balances of the world's big surplus economies that totaled 2.5% of world GDP in 2008 have been below 2% since 2009; the current account deficits of the biggest deficit economies have shown a similar decline (see Tables 1a and 1b).

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<sup>2</sup> Feenstra and Hong (2010) raised questions about the efficacy and sustainability of export-led growth in the PRC as the way to increase future employment. They calculated that export growth over the period 2000–2005 could explain the entire increase in the PRC's employment over that period, but comparable employment gains could have been achieved by growing domestic demand.

<sup>3</sup> Aizenman and Jinjark (2009) captured empirically the asymmetric effect of the US as the "demander of last resort." For the period 1981–2006, a 1% increase in the lagged US current account deficit was associated with a 0.5% increase in the current account surpluses of surplus economies. They projected a sizable drop in the PRC's current account surpluses after 2006, possibly falling to 1% of the PRC's GDP by 2013 in a "worst-case scenario" where all conditioning variables deteriorated by one standard deviation.

**Table 1a: Distribution of Sudden-Stops in Current Accounts (% GDP)**

Year	Drop in 1 Year			Drop in 2 Years		
	Average Size (%)	No. of Economies with Reductions > 4% GDP	Economies	Average Size (%)	No. of Economies with Reduction > 4% GDP	Economies
1980	.	0		.	0	
1981	.	0		.	0	
1982	.	0		.	0	
1983	.	0		.	0	
1984	-3.7	0		-1.8	0	
1985	-1.1	0		-1.4	0	
1986	-2.5	2	DZ, ET	-3.7	2	IL, MZ
1987	-1.8	1	PH	-4.4	1	TW
1988	-2.7	0		-3.8	3	MA, MY, ZA
1989	-3.1	2	MA, KR	-3.9	1	KR
1990	-1.4	0		-6.1	1	SY
1991	-9.8	1	SY	-13.8	1	SY
1992	-2.2	0		-4.2	1	CO
1993	-1.7	0		-6.3	1	EG
1994	-0.4	0		-2.0	0	
1995	-2.7	1	CI	-1.1	0	
1996	-0.8	0		-2.0	0	
1997	-0.8	0		-3.5	1	SA
1998	-3.0	1	MZ	-7.0	2	MZ, IQ
1999	-2.4	0		-5.0	2	LK, TH
2000	-0.6	0		-2.0	0	
2001	-3.1	1	RU	-4.2	1	RU
2002	-1.6	0		-2.5	0	
2003	-2.1	0		-3.8	3	AR, PK, SY
2004	-1.9	0		-3.0	1	TW
2005	-0.7	0		-2.2	0	
2006	-3.3	1	NG	-5.2	3	NG, SA, UG
2007	-5.4	2	AO, VN	-5.7	4	AO, DZ, PE, VN
2008	-2.4	2	IR, MM	-7.5	4	CN, IR, IQ, MM
2009	-22.5	1	IQ	-16.7	1	IQ
2010	-2.3	1	TR	-4.0	1	TR
2011		0		-0.7	0	
2012	-2.2	1	BF		0	

GDP = gross domestic product. For economy abbreviations, see Appendix.

Notes: This table reports the distribution of current account reduction (% GDP) for economies that experienced increasing current account surpluses in the prior three or more years, i.e., incidence of current account reversals. "Average size (%)" is the mean reduction in current accounts (% GDP) of reversal economies. The calculation excludes economies with population of less than 10 million.

Source: Authors' calculation.

**Table 1b: Distribution of Sudden-Stops in Current Accounts (% World GDP)**

Year	Drop in 1 Year			Drop in 2 Years		
	Average Size (%)	No. of Economies with Reductions > 0.1% GDP	Economies	Average Size (%)	No. of Economies with Reduction > 0.1% GDP	Economies
1980	.	0		.	0	
1981	.	0		.	0	
1982	.	0		.	0	
1983	.	0		.	0	
1984	-0.02	0		-0.02	0	
1985	-0.01	0		0	0	
1986	-0.01	0		-0.01	0	
1987	-0.02	0		-0.05	1	JP
1988	-0.01	0		-0.02	0	
1989	-0.01	0		-0.04	0	
1990	-0.02	0		-0.09	1	DE
1991	-0.02	0		-0.03	0	
1992	-0.08	1	US	-0.12	1	US
1993	0	0		-0.01	0	
1994	-0.02	0		-0.04	1	JP
1995	-0.01	0		-0.01	0	
1996	-0.01	0		0	0	
1997	-0.02	0		-0.03	0	
1998	-0.01	0		-0.02	0	
1999	0	0		-0.03	0	
2000	-0.03	0		-0.04	0	
2001	-0.01	0		-0.02	0	
2002	0	0		0	0	
2003	0	0		-0.01	0	
2004	-0.02	0		-0.03	0	
2005	-0.01	0		-0.02	0	
2006	0	0		-0.02	0	
2007	-0.02	0		-0.01	0	
2008	-0.03	0		-0.07	2	CN, DE
2009	-0.10	1	CN	-0.12	1	CN
2010	-0.05	0			0	
2011	0	0		-0.02	0	
2012	-0.01	0			0	

GDP = gross domestic product.

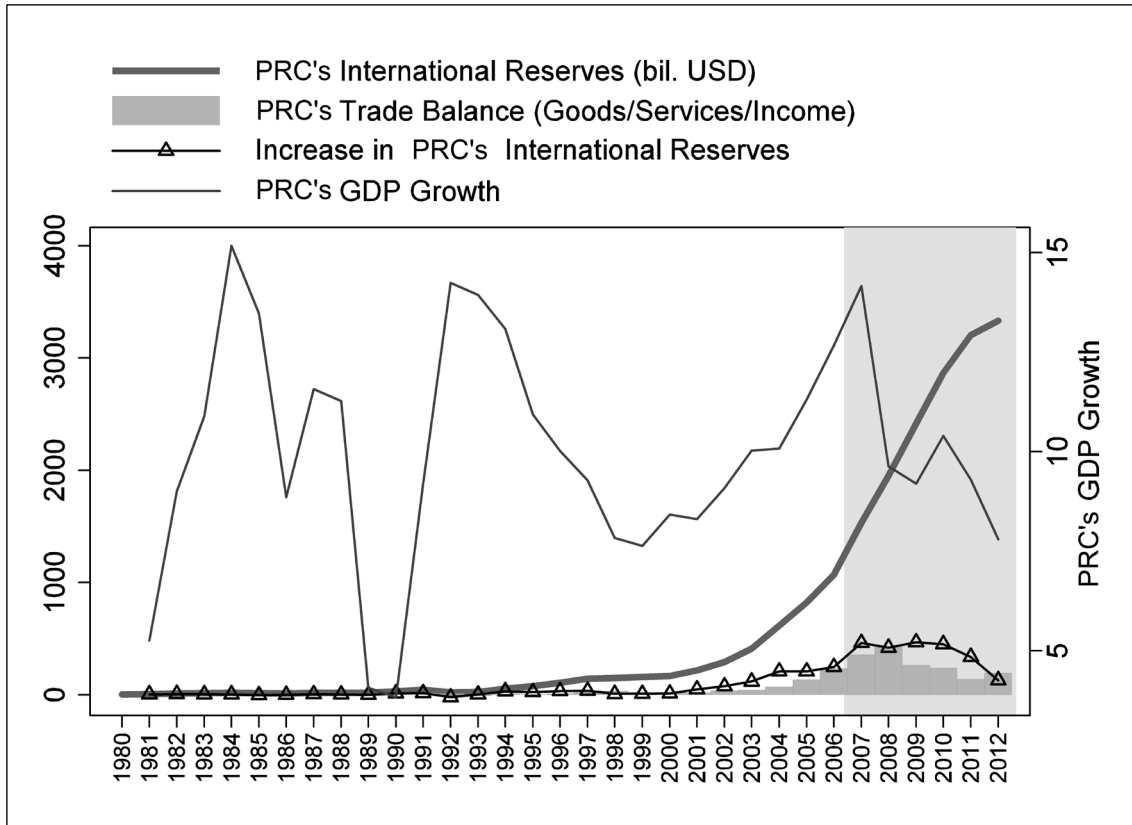
Notes: This table reports the distribution of current account reduction (% World GDP) for economies that experienced increasing current account surpluses in the prior three or more years, i.e., incidence of current account reversals. "Average size (%)" is the mean reduction in current accounts (% GDP) of reversal economies. The calculation excludes economies with population of less than 10 million.

Source: Authors' calculation.

The PRC and the US have also seen their imbalances shrink (see Figures 4 and 5). The PRC's current account surplus fell from 10.1% of GDP in 2007 to 5.1% in 2009 and to 2.3% in 2012 (Figure 3). As a share of global GDP, the PRC's surplus fell from 0.7% in 2008 to 0.27% in 2012. The drop in 2009 alone was the largest ever recorded

in the last thirty years (Table 1b). According to the IMF, the PRC's current account surplus is expected to be 0.32% of world GDP at the end of 2013.

**Figure 4: Adjustment of the People's Republic of China's International Reserves (\$ billion)**

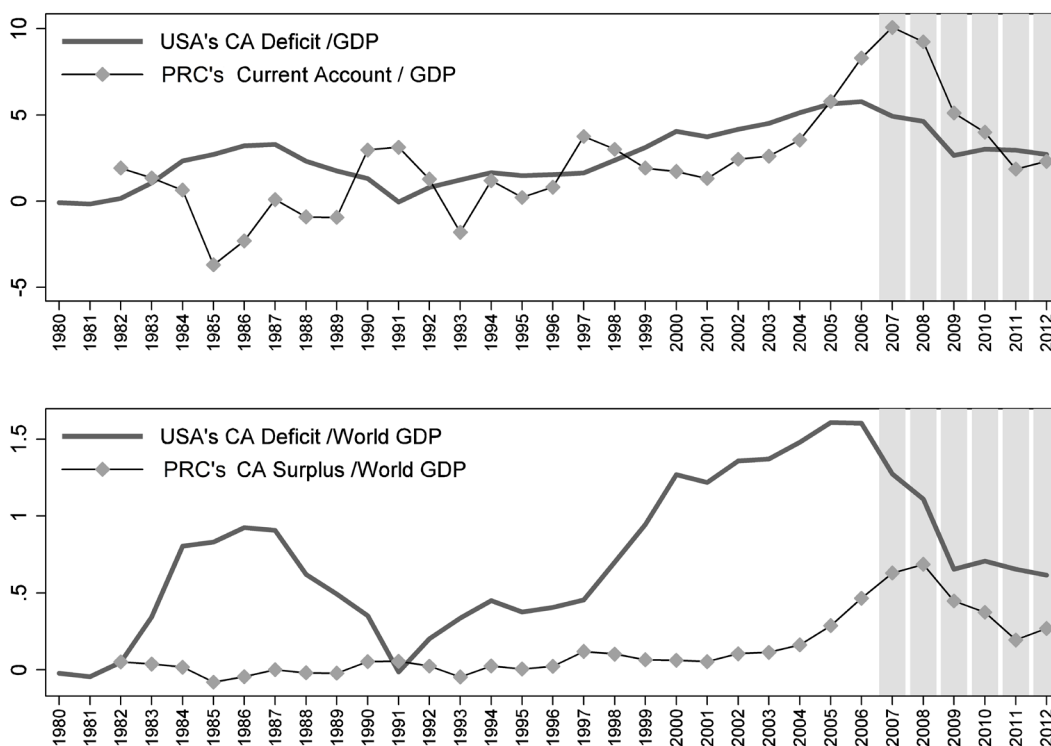


GDP = gross domestic product, PRC = People's Republic of China.

Source: Authors' calculation.

Before the financial crisis, the US current account deficit was about 6% of US GDP in both 2005 and 2006 and 5% in 2007. After the onset of the financial crisis it fell to 2.7% in 2009 and 2.8% in 2012. As a share of global GDP, the US current account deficit also fell dramatically. The IMF expects it to be at a sixteen-year low of 0.64% by the end of 2013.

**Figure 5: Current Accounts (%) of the People’s Republic of China and the United States**



GDP = gross domestic product, PRC = People’s Republic of China.

Source: Authors’ calculation.

Standard macroeconomic models can easily account for the reduction in global imbalances in the immediate aftermath of a financial crisis. Financial frictions and household deleveraging reduce import demand as well as aggregate demand in crisis-hit economies, reducing their current account deficits. The decline or reversal in international financial inflows during a financial crisis also depreciates their real exchange rates, further reducing their deficits. If weak demand impacts many economies, there are few to take up the slack. Economies with large current account surpluses, such as the PRC, will see demand collapse for their exports and will experience declining current account surpluses. Policies that stimulate domestic demand to make up for the export shortfall can reduce current account surpluses even more.

In this paper, we look at the data and move directly to an empirical investigation. We explore panel regressions as a way to highlight important correlations between current account balances and economic variables both before and after the financial crisis. Although data are only available for six years since the onset of the financial crisis, the regression estimates provide some suggestive evidence of whether the crisis will have a long-lasting impact on moderating current account imbalances, particularly those of the PRC and the US.

The rest of the paper is organized as follows. Section 2 describes the data and our estimation procedure. Section 3 presents baseline results and checks their robustness compared with alternative specifications. Section 4 focuses on the PRC. It compares the actual decline in the PRC’s current account surpluses post-2006 with predicted

values based on the panel regression's pre-crisis sample coefficients and on its post-crisis sample coefficients. The results indicate a structural change post-crisis. The decline in the PRC's reserve stockpile post-crisis is also shown to be driven somewhat by a new wave of outward FDI into developed economies as the PRC seeks higher-yielding real foreign assets. We speculate that the PRC's smaller current account surpluses and more moderate reserve accumulation may become a longer-term norm as lower global growth forces the PRC to rely more on domestic demand to expand its economy and as the high cost of holding international reserves pushes the PRC to place even more emphasis on outward FDI. Section 5 concludes.

## 2. DATA AND ESTIMATION

We assembled panel data on current account balances and other economic variables for a group of developed and developing economies over the period 1980–2012. Data definitions, data sources, and country coverage are described in the Appendix. Most data are from the Economist Intelligence Unit (EIU). The EIU data are obtained from individual country sources, the International Monetary Fund's *International Financial Statistics*, and the World Bank's *World Development Indicators*. We supplement these data with data from the *External Wealth of Nations* and other sources.

We restrict the sample to economies with annual observations in each of two sub-periods, one before the financial crisis and the other after its onset. The sample is further restricted by data availability. Our final sample contains 95 economies; 30 of these economies are Organisation for Economic Co-operation and Development (OECD) members.

The estimation draws on the empirical framework in Chinn and Prasad (2003) and Gruber and Kamin (2007). The estimating equation is:

$$CAY_{i,t} = \alpha CAY_{i,t-1} + BX_{i,t-1} + C_i + \gamma DEMAND_{USA,t-1} + e_{it}; C_i = \{c_1, \dots, c_{94}\} \quad (1)$$

where  $CAY_{it}$  is the current account balance as a percentage of GDP of country  $i$  at time  $t$ ,  $X_{it-1}$  is a vector of lagged economic variables,  $C_i = \{c_1, \dots, c_{94}\}$  is a vector of country fixed effects, and  $DEMAND_{USA,t-1}$  is the lagged US current account balance as a share of GDP. The economic factors included in  $X$  are economic performance, captured by the growth rate of real GDP and real GDP per capita; structure, represented by openness to trade and the share of natural resources exports in GDP; external wealth, measured by international reserves as a share of GDP; debt, measured by the stock of public debt as a share of GDP; and the real exchange rate.<sup>4</sup>

Since the current account is the result of saving and investment decisions, the empirical specification in (1) uses standard variables that are correlated with these decisions along with structural and policy measures. The specification also includes the US demand variable (measured by the US current account deficit as a percentage of GDP) used in Aizenman and Jinjarak (2009) to capture the notion that the US acted as a “demander of last resort” for the exports of the PRC and other economies, enabling them to run big current account surpluses over part of the sample period.

The Appendix provides a table of summary statistics for the variables used in the estimation.

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<sup>4</sup> We also consider the role of liquidity, captured by bank lending to the public and private sectors as a share of GDP, in one version of our estimation. Including the liquidity variable reduces the number of economies in the sample from 95 to 83.

### 3. BASELINE RESULTS AND ROBUSTNESS CHECKS

Before proceeding with the formal estimation, we first test for possible non-stationarity. For each variable, we perform panel data unit-root tests using a Fisher-type procedure, including one lag in the test. The test is not limited to a balanced sample and has a null hypothesis that all the panels contain a unit root. Based on the test results, non-stationary variables are then first-differenced.

Table 2a presents baseline results over the sample period 1983–2012 and two sub-periods—1983–2006 and 2007–2012. The panel regressions explain over one-half of the variation in the current account. The goodness of fit is better for the 1983–2006 sub-period ( $R^2 = 0.69$ ) than for the 2007–2012 sub-period ( $R^2 = 0.55$ ), suggesting a change after the onset of the financial crisis.

**Table 2a: Baseline Estimation**

Dependent Variable = Current Account (%GDP)	1983–2012		1983–2006		2007–2012	
	coeff.	(s.e.)	coeff.	(s.e.)	coeff.	(s.e.)
Lagged Current Account (%GDP)	-0.42	(0.02)***	-0.44	(0.03)***	-0.54	(0.06)***
Lagged Increase in International Reserves (%GDP)	0.08	(0.02)***	0.06	(0.02)***	0.12	(0.04)***
Lagged Increase in GDP per Head (\$1,000 at PPP)	0.10	(0.09)	0.35	(0.10)***	0.07	(0.19)
Lagged Exports of Natural Resources (%GDP)	0.01	(0.01)	0.02	(0.01)*	-0.02	(0.02)
Lagged Real GDP Growth (%)	-0.24	(0.02)***	-0.17	(0.03)***	-0.15	(0.07)**
Lagged Real Exchange Rate Appreciation	-0.01	(0.00)***	0.00	(0.00)	-0.02	(0.02)
Lagged Change in Stock of Public Debt (%GDP)	-0.07	(0.01)***	-0.02	(0.01)***	-0.14	(0.03)***
Lagged Trade/GDP	2.35	(0.77)***	6.32	(1.07)***	-12.58	(2.48)***
Lagged Increase in US Demand (CA Deficit %GDP)	0.49	(0.04)***	0.26	(0.05)***	0.26	(0.20)
Constant	-0.92	(1.18)	-4.34	(1.20)***	5.63	(3.03)*
Observations	1455		995		460	
Economies	95		95		95	
Country Fixed-Effects	Yes		Yes		Yes	
R <sup>2</sup>	0.55		0.69		0.55	
F-Test: H <sub>0</sub> : All the coefficients from 1983–2006 regression are the same as all the coefficients from 2007–2012 regression	F(20,1341)=69.12; Prob>F=0.0000					

GDP = gross domestic product, coeff. = coefficient, s.e. = standard error, PPP = purchasing power parity, CA = current account.

Notes: The panel estimation is done over the specified period and includes country fixed-effects. The variables are first-differenced if they contain (panel) unit-roots identified from panel non-stationary tests. Standard errors, clustered by country, are in parentheses; \*\*\* (\*\*, \*) denotes statistical significance at the 1% (5%, 10%) level.

Source: Authors' calculation.

The results in Table 2a indicate that most of the economic variables are significantly correlated with the current account in the whole sample and across the two sub-

periods. The signs on the correlations are as expected. The correlations can be characterized as follows:

- The correlation between the current account surplus and an increase in international reserves is always positive and significant.
- The correlation between the current account surplus and an increase in US demand is positive and significant for the full sample period and pre-crisis period. The correlation is insignificant post-crisis. The latter result suggests a possible structural change in the role of the US as the demander of last resort following the financial crisis.
- The correlation between the current account surplus and real GDP growth is always negative and significant; the same is true of the correlation between the current account surplus and the increase in public debt.
- The correlation between the current account surplus and trade is positive and significant for the full sample period and pre-crisis period, but negative and significant post-crisis.
- The correlation between the current account surplus and appreciation of the real exchange rate is negative and significant for the full sample period, but insignificant in each of the two sub-periods.

The correlation results for trade and the real exchange rate are consistent with the complementary relationship between the surplus economies and the US prior to the financial crisis and its reversal after the crisis. Prior to the crisis, the relatively high rates of employment and low rates of unemployment in the US as well as the presumption that *The Great Moderation* was the new normal put to rest most concerns about increasing global imbalances. Moreover, large and growing US current account deficits translated into large and growing world demand for US assets that helped keep US interest rates low and allowed the US to access global savings when its own saving rate was low. These trends were complemented by the growing exports and current account surpluses of the PRC and other emerging markets as they pursued export-led growth strategies.

The financial crisis forced economies to confront a changed global picture, with much slower growth in the OECD economies and reduced demand for the exports of emerging markets that had previously relied on export-led growth strategies. In the post-crisis environment, depreciating currencies and hoarding international reserves are not enough to sustain robust export-led growth. The estimates in Table 2a confirm that a structural change has taken place post-crisis. An F-test rejects the null of no structural change between the pre-crisis period (1983–2006) and the post-crisis period (2007–2012).

To explore further possible differences between the pre- and post-crisis periods, we re-estimate the regression over the entire sample period, now including a dummy variable equal to one for the post-crisis years 2007–2012 plus interactive terms. The results are reported in Table 2b. The F-test confirms that the null of no structural change between the pre-crisis and post-crisis periods can be rejected with high confidence.



**Table 2b: Estimation with Post-Crisis Dummy**

Dependent Variable = Current Account (%GDP)	1983–2012	
	coeff.	(s.e.)
Lagged Current Account (%GDP)	-0.38	(0.03)***
Lagged Increase in International Reserves (%GDP)	0.06	(0.02)**
Lagged Increase in GDP per Head (\$1,000 at PPP)	0.42	(0.10)***
Lagged Exports of Natural Resources (%GDP)	0.01	(0.01)
Lagged Real GDP Growth (%)	-0.19	(0.02)***
Lagged Real Exchange Rate Appreciation	-0.00	(0.00)**
Lagged Change in Stock of Public Debt (%GDP)	-0.04	(0.01)***
Lagged Trade/GDP	2.31	(0.87)***
Lagged Increase in US Demand (CA Deficit %GDP)	0.35	(0.05)***
DUM0712	0.38	(0.52)
DUM0712 x Lagged Current Account (%GDP)	0.02	(0.03)
DUM0712 x Lagged Increase in International Reserves (%GDP)	0.14	(0.05)***
DUM0712 x Lagged Increase in GDP per Head (\$1,000 at PPP)	0.03	(0.15)
DUM0712 x Lagged Exports of Natural Resources (%GDP)	0.01	(0.01)
DUM0712 x Lagged Real GDP Growth (%)	-0.20	(0.05)***
DUM0712 x Lagged Real Exchange Rate Appreciation	0.00	(0.00)
DUM0712 x Lagged Change in Stock of Public Debt (%GDP)	-0.06	(0.02)***
DUM0712 x Lagged Trade/GDP	-0.21	(0.44)
DUM0712 x Lagged Increase in US Demand (CA Deficit %GDP)	-0.28	(0.20)
Constant	-1.50	(1.07)
Observations	1492	
Economies	97	
Country Fixed-Effects	Yes	
R <sup>2</sup>	0.61	
F-Test: H <sub>0</sub> : Dummy Variable for 2007–2012 and the Interaction Terms are All = 0	F(10,1341)=7.39; Prob>F=0.0000	

GDP = gross domestic product, coeff. = coefficient, s.e. = standard error, PPP = purchasing power parity, CA = current account.

Notes: The panel estimation is carried out for the specified period and includes country fixed-effects. The variables are first-differenced if they contain (panel) unit-roots identified from panel non-stationary tests. DUM0712=1 for years 2007–2012, =0 otherwise. Standard errors, clustered by country, are in parentheses; \*\*\* (\*\*, \*) denotes statistical significance at the 1% (5%, 10%) level.

Source: Authors' calculation.

Several results in Table 2b are noteworthy. The positive correlation between the current account surplus and international reserves prior to the crisis is significantly more positive in the post-crisis period. This pattern is consistent with greater competitive hoarding in times of global recessionary pressures. The negative correlations of the current account surplus with real GDP growth and the increase in public debt are significantly more negative after the crisis. This result is consistent with greater fiscal retrenchment in the surplus economies in the aftermath of the crisis.

The correlation between the current account surplus and US demand in the pre-crisis period ( $\rho = 0.35$ ) is positive and highly significant. The positive correlation is much weaker in the post-crisis period ( $\rho = 0.35 - 0.28$ ), although an F-test reveals it is still significant ( $F=8.52$ ,  $\text{Prob}>F=0.0036$ ). After the onset of the financial crisis, the US no longer plays such an important role as “demander of last resort” for the exports of other economies. Its private and public sectors have had to undergo substantial adjustments, making them less able to absorb the world’s exports. The US private sector has had to

deleverage in response to the negative wealth effects of declining real estate and portfolio valuations. The more limited access of households to the credit market has raised private savings. The US public sector has contracted in response to the end of the federal fiscal stimulus, the drop of public investment and spending, and the negative stimulus stemming from declining tax revenues and mounting debts in the fifty US states. These private and public sector adjustments post-crisis have required the US to retreat from its role as “demander of last resort” for the world’s exports.

Table 3a reports results for the current accounts of surplus and non-surplus economies in the pre- and post-crisis periods. A surplus country is defined as one having a current account surplus greater than 1.5% of GDP in a given year and having experienced an increasing surplus in the previous two years. The current accounts of surplus economies are significantly correlated with fewer economic variables than the full sample of economies, and even these significant correlations do not generally carry over to the post-crisis period. Prior to the financial crisis, the current accounts of surplus economies are positively and significantly associated with the increase in international reserves, trade, and the increase in the US current account deficit.

**Table 3a: Surplus versus Non-Surplus Economies**

Dependent Variable = Current Account (%GDP)	Surplus: 1983–2006		Surplus: 2007–2012		Non-Surplus: 1983–2006		Non-Surplus: 2007– 2012	
	coeff.	(s.e.)	coeff.	(s.e.)	coeff.	(s.e.)	coeff.	(s.e.)
Lagged Current Account (%GDP)	-0.40	(0.11)***	-0.47	(0.14)***	-0.78	(0.03)***	-0.45	(0.06)***
Lagged Increase in International Reserves (%GDP)	0.42	(0.08)***	-0.00	(0.11)	-0.29	(0.03)***	0.17	(0.06)***
Lagged Increase in GDP per Head (\$1,000 at PPP)	1.00	(0.38)**	-0.15	(0.48)	-0.88	(0.15)***	0.66	(0.26)**
Lagged Exports of Natural Resources (%GDP)	-0.13	(0.03)***	-0.08	(0.08)	0.03	(0.01)***	0.02	(0.02)
Lagged Real GDP Growth (%)	-0.14	(0.14)	0.60	(0.27)**	-0.19	(0.03)***	-0.35	(0.07)***
Lagged Real Exchange Rate Appreciation	0.03	(0.04)	-0.19	(0.09)*	-0.02	(0.00)***	-0.01	(0.02)
Lagged Change in Stock of Public Debt (%GDP)	-0.11	(0.07)	0.10	(0.12)	-0.05	(0.01)***	-0.07	(0.04)*
Lagged Trade/GDP	7.28	(3.48)**	10.24	(11.02)	7.61	(1.25)***	-3.28	(2.67)
Lagged Increase in US Demand (CA Deficit %GDP)	1.14	(0.56)**	-2.34	(0.83)***	0.35	(0.07)***	-0.10	(0.28)
Constant	-13.67	(11.68)	1.25	(33.28)	1.49	(8.52)	4.62	(5.52)
Observations	127		63		868		397	
Economies	46		30		93		94	
Country Fixed-Effects	Yes		Yes		Yes		Yes	
R <sup>2</sup>	0.72		0.84		0.93		0.54	
F-Test: H0: All the coefficients from 1983–2006 regression are the same as all the coefficients from the 2007–2012 regression	F(20,124)=6.57; Prob>F=0.0000				F(20,1152)=31.44; Prob>F=0.0000			

GDP = gross domestic product, coeff. = coefficient, s.e. = standard error, PPP = purchasing power parity, CA = current account.

Notes: The panel estimation is carried out for the specified period and includes country fixed-effects. Economies running current account surplus have positive (>1.5%GDP) and increasing surplus in the past two years. The variables are first-differenced if they contain (panel) unit-roots (identified from panel non-stationary test). Standard errors, clustered by country, are in parentheses; \*\*\* (\*\*, \*) denotes statistical significance at the 1% (5%, 10%) level.

Source: Authors’ calculation.

After the financial crisis, the first two correlations are insignificant and the correlation with US demand reverses sign; it is now negative and significant. An F-test rejects the null of no structural break for surplus economies after the onset of the financial crisis.

An F-test also rejects the null of no structural break across the two periods for non-surplus economies. A number of correlations that are highly significant prior to the crisis lose their significance in the post-crisis period. The role of the US as a “demander of last resort,” for example, loses its significance after 2006.

To explore further the possible differences between the pre- and post-crisis periods for the two country groupings, we estimate separate regressions for the surplus and non-surplus economies, using the full sample period and including the time dummy and its interactions. The results are reported in Table 3b. F-tests reject the null of no structural break post-crisis for both the surplus and non-surplus economies.

**Table 3b: Surplus versus Non-Surplus Economies with Post-Crisis Dummy**

Dependent Variable = Current Account (%GDP)	Surplus: 1983–2012		Non-Surplus: 1983–2012	
	coeff.	(s.e.)	coeff.	(s.e.)
Lagged Current Account (%GDP)	-0.44	(0.10)***	-0.38	(0.03)***
Lagged Increase in International Reserves (%GDP)	0.38	(0.07)***	0.19	(0.03)***
Lagged Increase in GDP per Head (\$1,000 at PPP)	0.89	(0.31)***	-0.06	(0.18)
Lagged Exports of Natural Resources (%GDP)	-0.09	(0.03)***	0.01	(0.01)
Lagged Real GDP Growth (%)	-0.04	(0.10)	-0.22	(0.03)***
Lagged Real Exchange Rate Appreciation	-0.03	(0.03)	-0.02	(0.00)***
Lagged Change in Stock of Public Debt (%GDP)	-0.03	(0.05)	-0.02	(0.01)**
Lagged Trade/GDP	6.55	(2.30)***	0.29	(0.94)
Lagged Increase in US Demand (CA Deficit %GDP)	1.40	(0.56)**	0.15	(0.13)
DUM0712	-2.77	(2.38)	-1.36	(0.58)**
DUM0712 x Lagged Current Account (%GDP)	0.20	(0.11)*	-0.03	(0.03)
DUM0712 x Lagged Increase in International Reserves (%GDP)	-0.29	(0.10)***	0.01	(0.06)
DUM0712 x Lagged Increase in GDP per Head (\$1,000 at PPP)	-0.40	(0.33)	0.37	(0.22)*
DUM0712 x Lagged Exports of Natural Resources (%GDP)	0.01	(0.02)	0.00	(0.01)
DUM0712 x Lagged Real GDP Growth (%)	0.05	(0.15)	-0.06	(0.05)
DUM0712 x Lagged Real Exchange Rate Appreciation	0.03	(0.02)	0.00	(0.00)
DUM0712 x Lagged Change in Stock of Public Debt (%GDP)	-0.09	(0.08)	-0.05	(0.03)**
DUM0712 x Lagged Trade/GDP	0.17	(0.97)	0.61	(0.52)
DUM0712 x Lagged Increase in US Demand (CA Deficit %GDP)	-2.58	(0.82)***	-0.40	(0.25)
Constant	-5.90	(7.75)	1.67	(1.03)
Observations	190		1265	
Economies	47		94	
Country Fixed-Effects	Yes		Yes	
R <sup>2</sup>	0.78		0.38	
F-Test: H <sub>0</sub> : Dummy Variable for 2007–12 and the Interaction Terms are All = 0	F(10,124)=2.57; Prob>F=0.0073		F(10,1152)=7.52; Prob>F=0.0000	

GDP = gross domestic product, coeff. = coefficient, s.e. = standard error, PPP = purchasing power parity, CA = current account.

Notes: The panel estimation is carried out for the specified period and includes country fixed-effects. Economies running current account surplus have positive (>1.5%GDP) and increasing surplus in the past two years. The variables are first-differenced if they contain (panel) unit-roots (identified from panel non-stationary test). DUM0712=1 for years 2007–2012, =0 otherwise. Standard errors, clustered by country, are in parentheses; \*\*\* (\*\*, \*) denotes statistical significance at the 1% (5%, 10%) level.

Source: Authors' calculation.

The role of the US as a demander of last resort is not an important factor either before or after the crisis for non-surplus economies. For the surplus economies, it is a significant factor in each period.<sup>5</sup> Interestingly, the US role as demander of last resort is significantly different after the onset of the crisis for surplus economies.

The correlation between the current account surplus and the increase in international reserves is positive and significant for both surplus and non-surplus economies prior to the crisis. After the crisis, there is no significant change in the correlation for non-

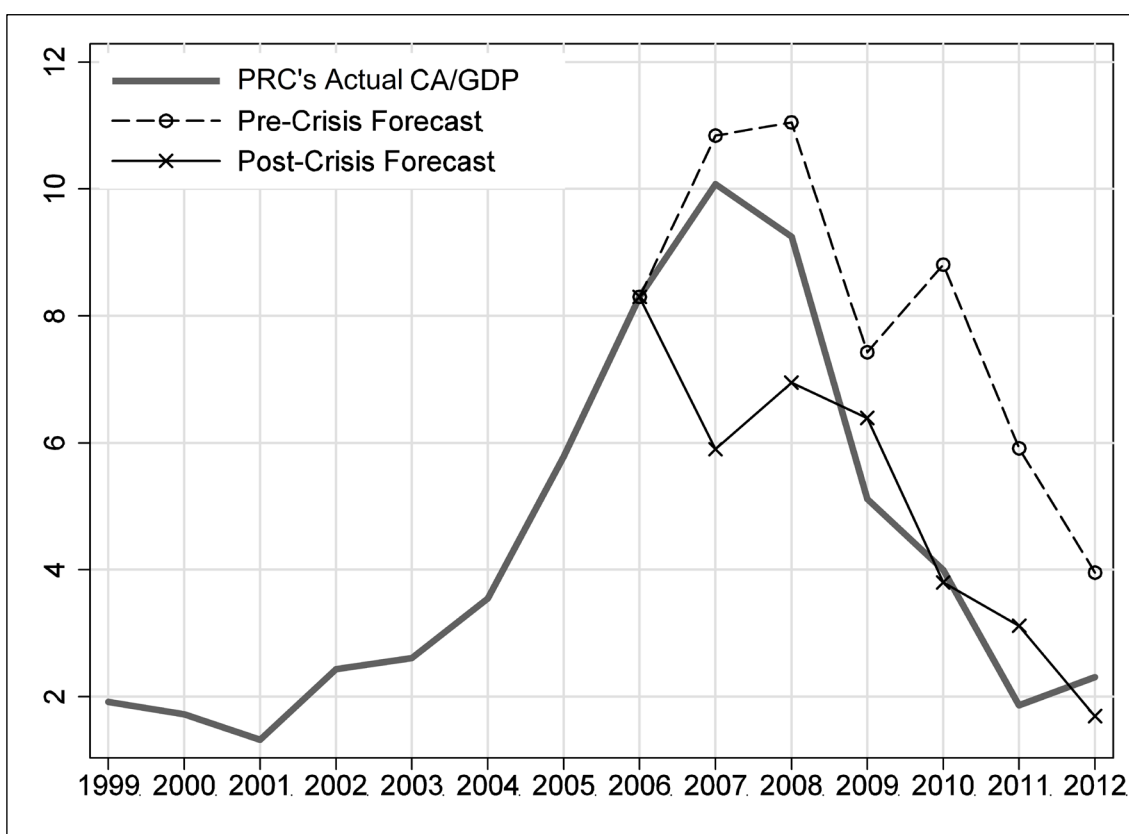
<sup>5</sup> An F-test reveals that the correlation in the post-crisis period is significant; F=9.80, Prob>F=0.0022.

surplus economies. For the economies in surplus, however, the correlation is significantly dampened after the crisis, although an F-test shows that it remains positive and significant.<sup>6</sup>

#### 4. THE PEOPLE'S REPUBLIC OF CHINA'S CURRENT ACCOUNT AND INTERNATIONAL RESERVES

Figure 6 illustrates the PRC's current account surplus over the period 1999–2012. It also depicts two forecasts of the PRC's current account for the post-2006 period. The pre-crisis forecast is based on the estimated regression coefficients of the pre-crisis regression in Table 2a, while the post-crisis forecast is based on coefficients from the 2007–2012 period regression in Table 2a.

**Figure 6: Forecast of the People's Republic of China's Current Account (%)**



CA = current account, GDP = gross domestic product, PRC = People's Republic of China.

Note: The pre-crisis (post-crisis) forecast is based on estimated regression coefficients for the period 1983–2006 (2007–2012).

Source: Authors' calculation.

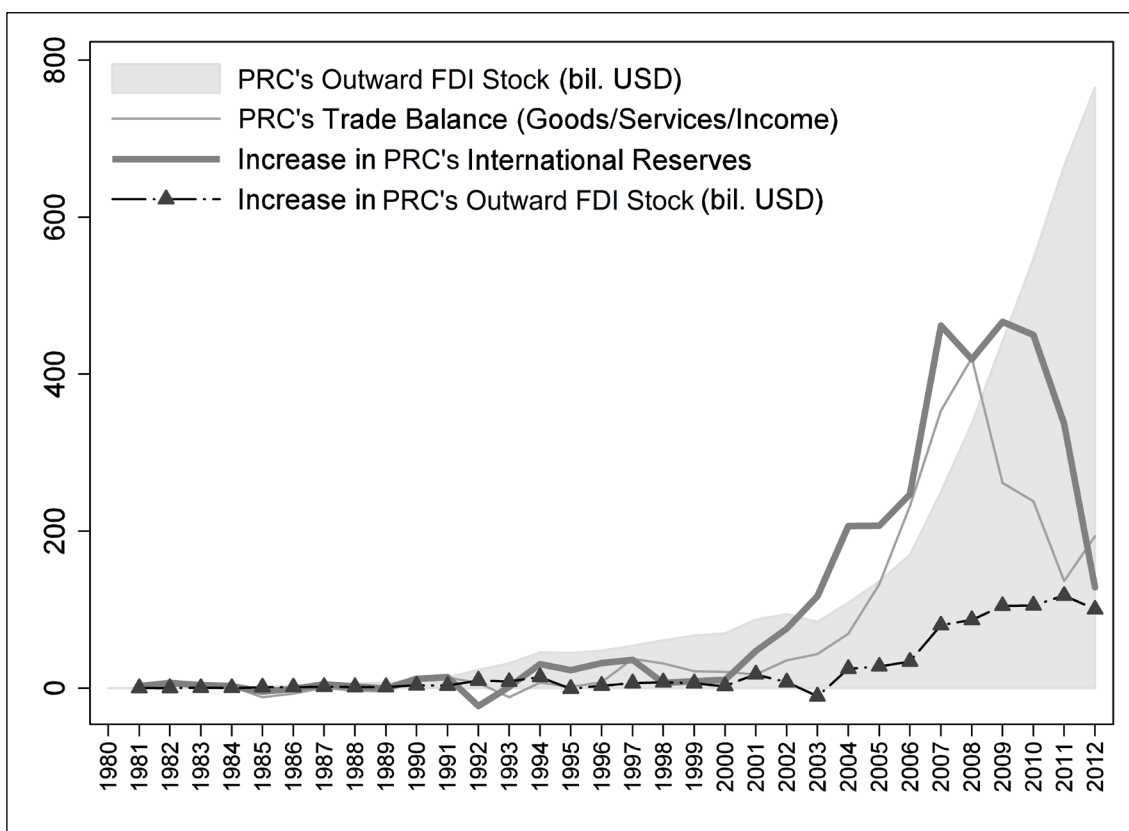
The pre-crisis forecast predicts a declining current account/GDP surplus for the PRC after 2008. This prediction is in line with the realized decrease in the PRC's current

<sup>6</sup> In one version we added the growth of domestic credit as a share of GDP as a regressor and interacted it with the time dummy. Including the domestic credit variable reduces the country sample from 95 to 83. The correlation of the current account surplus and the growth of domestic credit is positive and significant in the pre-crisis period only for the non-surplus economies and the correlation in the post-crisis period is not significantly different from the one in the pre-crisis period.

account surplus, but it under-predicts the magnitude of the decline in each of the post-crisis years. The post-crisis forecast predicts a sharp drop in the PRC's current account as early as 2007 and over-predicts the decline in the PRC's current account surplus in both 2007 and 2008. That said, from 2009 onwards, the post-crisis forecast and the PRC's actual current account match up quite nicely. The forecast predicts a 1% higher surplus in 2011 than was realized, possibly because it does not account for the fiscal package adopted by the PRC's government to stimulate the economy.

Finally, we examine the changes in the PRC's international reserves over the last thirty-three years (Figure 7). We quantify the sources of these changes. This exercise allows us to trace the changing impact of inward and outward FDI on international reserves, as well as the influence of the trade balance, domestic credit, and real exchange-rate appreciation. As there is no reason for the relationship between reserves and these factors to be stable over time, we examine separately the pre-crisis and post-crisis periods.

**Figure 7: The People's Republic of China's International Reserves and Outward FDI (\$ billion)**



FDI = foreign direct investment, PRC = People's Republic of China, US = United States.

Source: Authors' calculation.

Table 4 reports the results of regressing the change in the PRC's international reserves/GDP on trade/GDP, the flows of inward and outward FDI/GDP, the increase in domestic credit/GDP, and real exchange-rate appreciation. Columns I-V report estimated coefficients and their standard errors when each of the source variables enters the estimation individually. The results indicate reserve increases are positively and significantly correlated with the trade balance, inward and outward FDI flows, the increase in domestic credit, and the appreciation of the real exchange rate. Estimates

in Columns VI and VII show these correlations differ when the economic variables are considered jointly or when the time periods differ.

**Table 4: Estimation of the People's Republic of China's International Reserves Using Annual Data, 1980–2012**

Dependent Variable = $\Delta$ International Reserves/GDP	I	II	III	IV	V	VI	VII
	$\Delta IR_t / GDP_{t-1}$	$\Delta IR_t / GDP_{t-1}$	$\Delta IR_t / GDP_{t-1}$	$\Delta IR_t / GDP_{t-1}$	$\Delta IR_t / GDP_{t-1}$	$\Delta IR_t / GDP_{t-1}$	$\Delta IR_t / GDP_{t-1}$
Lagged Trade Balance/GDP	2.84 (0.77)***					2.14 (1.26)	
Lagged $\Delta$ Inward FDI/GDP		1.93 (0.84)**					
Lagged $\Delta$ Outward FDI/GDP			1.94 (0.99)*			0.28 (1.05)	
Lagged $\Delta$ Domestic Credit/GDP				2.43 (0.57)***		1.76 (0.69)**	
Lagged REER Appreciation					1.47 (0.67)**	-0.41 (0.69)	
Lagged Trade Balance/GDP 2000-06							6.99 (2.83)**
Lagged $\Delta$ Outward FDI/GDP 2000-06							-1.60 (2.55)
Lagged $\Delta$ Domestic Credit/GDP 2000-06							2.02 (0.90)**
Lagged Trade Balance/GDP 2007-12							6.68 (0.88)***
Lagged $\Delta$ Outward FDI/GDP 2007-12							-1.48 (0.68)**
Lagged $\Delta$ Domestic Credit/GDP 2007-12							1.83 (0.51)***
Constant	4.58 (0.99)***	4.14 (1.05)***	4.30 (1.05)***	4.99 (1.11)***	4.27 (1.11)***	4.79 (1.00)***	2.89 (1.23)**
Observations	28	32	31	26	31	26	26
R <sup>2</sup>	0.33	0.17	0.16	0.25	0.09	0.40	0.56

REER = real effective exchange rate, GDP = gross domestic product, coeff. = coefficient, s.e. = standard error, PPP = purchasing power parity, CA = current account.

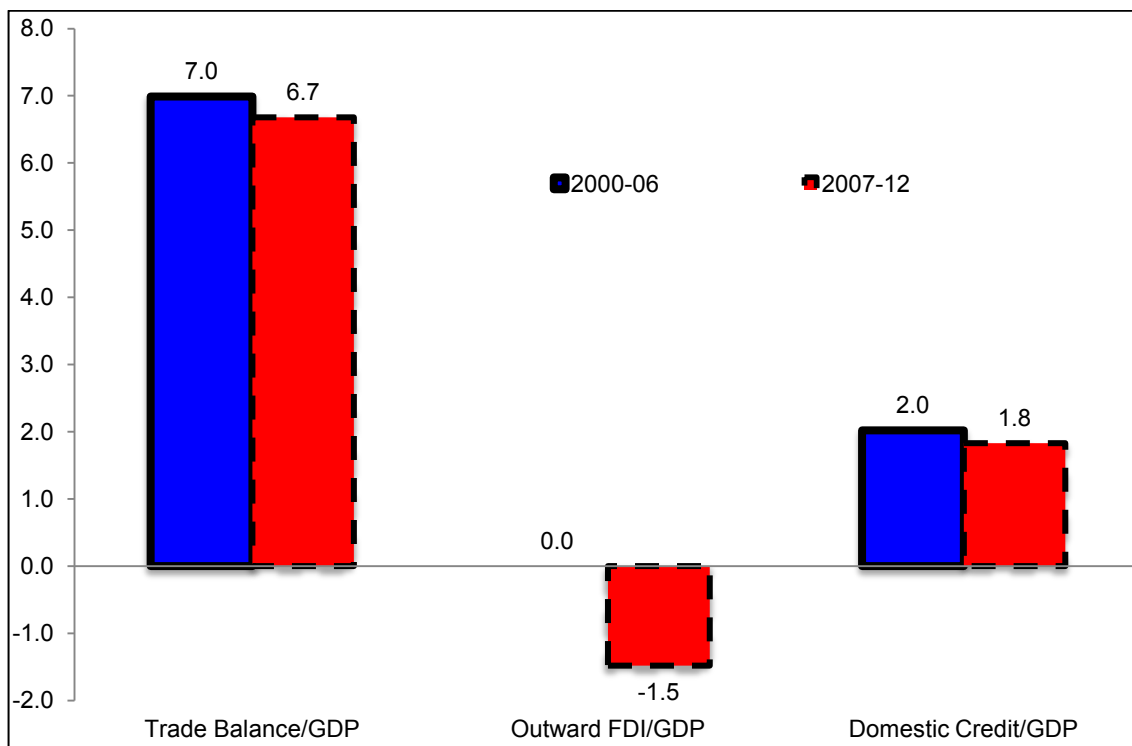
Notes: All variables are lagged and expressed as a share of GDP except for REER appreciation. Variables are expressed as changes. Newey-West standard errors are in parentheses; \*\*\* (\*\*, \*) denotes statistical significance at the 1% (5%, 10%) level.

Source: Authors' calculation.

We summarize the sources of changes in the PRC's international reserves in Figure 8. This figure plots the economic significance of a one-standard-deviation increase in the source variable on the change in the PRC's international reserves as a percentage of its GDP. The calculation is based on the regression reported in Table 4, Column VII. The figure reveals the role of the PRC's trade balance on its international reserves has been remarkably symmetric in the pre- and post-crisis periods, highlighting the

common impact of the financial crisis on the PRC’s current account and international reserves. Domestic credit also plays much the same role as a source of change in the pre- and post-crisis periods. The same cannot be said for FDI. Outward FDI played no significant role prior to the crisis, but it has become an important source of change in the PRC’s international reserves after the crisis.

**Figure 8: Sources of Changes in the People’s Republic of China’s International Reserves/GDP (%)**



GDP = gross domestic product, FDI = foreign direct investment.

Note: This figure plots economic significance of one-standard-deviation increase in the regressors for the People Republic of China’s international reserves/GDP (%), based on regression results in Table 4, VII.

Source: Authors’ calculation.

To put these results in a broader perspective, it is worth noting that in 2012, domestic investment in the PRC reached almost 50% of GDP and domestic credit grew to about 200% of GDP. In addition, the PRC’s saving rate is probably well above the “Golden Rule” rate. These considerations suggest a need to rebalance the economy. The PRC’s remarkable fiscal and monetary stimuli in the early stages of the financial crisis prevented a hard landing during the period 2008–2010. However, such policies do not substitute for a needed restructuring of the economy, a restructuring that reverses policies depressing PRC consumption and preventing faster real appreciation. This rebalancing may entail lower current account surpluses, faster growth of the non-traded sector, and reduced hoarding of reserves. Channeling international reserves into foreign equity and outward FDI may be part of this transformation.

## 5. CONCLUSION

Panel regressions show that standard variables adopted by the literature, measures capturing economic performance, economic structure, external wealth, debt, and the



exchange rate, are helpful in “explaining” the current account behavior of almost 100 economies over the period 1983–2012. The role of the US in sustaining current account surpluses elsewhere by running its own sizeable deficits has obviously diminished after the onset of the financial crisis. The role of the financial crisis in reducing global imbalances is also evident. Moreover, there is some evidence that the financial crisis—and the impact it has had on both economic indicators and policy actions—has brought about a structural change in the relationship between current accounts and these economic factors.

The rebalancing of current accounts in both the PRC and the US post-crisis will likely change the pattern of international reserve hoarding. While the precautionary motive for hoarding international reserves is consistent with the PRC holding a sizeable international reserve stockpile, it does not support the optimality of holding reserves in the form of low-yielding US government debt at levels of 40% to 50% of GDP (Jeanne 2007).

Hoarding reserves may delay the real appreciation associated with successful export-led growth, but the inevitable appreciation of the PRC’s currency will depress even further the real return on dollar-denominated assets held as international reserves. A more balanced strategy calls for diversifying out of liquid US government bonds and into less liquid but (ex-ante) higher-yielding real foreign assets. That diversification can take place through greater outward FDI that, in turn, mitigates reserve hoarding. Indeed, as Figure 7 illustrates, this diversification has already begun.<sup>7</sup>

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<sup>7</sup> See Yang (2012) for further discussion of possible adjustment modes in the PRC.

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## APPENDIX

### Data Description

Current Account/GDP:	Current account balance as a percentage of GDP. Source: Economist Intelligent Unit (EIU).
International Reserves/GDP:	Total reserves (excluding gold), including foreign exchange, reserve position with the International Monetary Fund (IMF) and Special drawing rights (SDRs) at end-period. Source: EIU.
Real GDP Growth:	Percentage change in real gross domestic product (GDP) (constant US\$), over previous year (based on GDP at constant market prices, rebased to 2005 constant prices and translated into US\$ using local currency: US\$ purchasing power parity (PPP) exchange rate in 2005). Source: EIU.
World GDP:	World's GDP at PPP in US\$. Source: EIU.
Inward FDI:	Stock of direct investment by non-residents into the country, as a percentage of GDP.
Outward FDI:	Stock of direct investment capital by domestic residents out of the country, as a percentage of GDP.
GDP per Head:	GDP at PPP, divided by population. Source: EIU.
Exports of Natural Resources:	Exports of fuel and minerals as percentage of GDP. Source: World Development Indicators (WDI).
Real Exchange Rate Appreciation:	Trade-weighted basket of currencies converted to an index (1997=100) and adjusted for relative price movements. Source: EIU.
Trade/GDP:	[Exports + Imports]/GDP ratio. Source: EIU.
Domestic Credit/GDP:	(Bank lending to public and private sectors)/GDP
Stock of Public Debt/GDP:	Total debt domestic, external owed by central government (both local and foreign currency) to domestic residents, foreign nationals and multilateral institutions such as the IMF, expressed as a percentage of GDP.
US Demand:	Current account deficit as percentage of GDP. Source: EIU.

### List of Economies

Economies included in the estimation (95):

Argentina (AR), Austria (AT), Australia (AU), Azerbaijan (AZ), Bangladesh (BD), Belgium (BE), Bahrain (BH), Burundi (BI), Bolivia (BO), Botswana (BW), Belize (BZ), Canada (CA), Switzerland (CH), Cote D'Ivoire (CI), Chile (CL), Cameroon (CM), People's Republic of China (CN), Colombia (CO), Costa Rica (CR), Cuba (CU), Germany (DE), Denmark (DK), Dominican Republic (DO), Algeria (DZ), Ecuador (EC), Estonia (EE), Egypt (EG), Spain (ES), Ethiopia (ET), Finland (FI), Fiji (FJ), France (FR),

Gabon (GA), United Kingdom (GB), Ghana (GH), Greece (GR), Guatemala (GT), Honduras (HN), Croatia (HR), Hungary (HU), Indonesia (ID), Ireland (IE), India (IN), Iceland (IS), Italy (IT), Jamaica (JM), Jordan (JO), Japan (JP), Kenya (KE), Republic of Korea (KR), Kuwait (KW), Kazakhstan (KZ), Sri Lanka (LK), Lithuania (LT), Luxembourg (LU), Latvia (LV), Morocco (MA), Moldova (MD), Macedonia (MK), Malawi (MW), Mexico (MX), Malaysia (MY), Namibia (NA), Nigeria (NG), Nicaragua (NI), Netherlands (NL), Norway (NO), New Zealand (NZ), Panama (PA), Peru (PE), Papua New Guinea (PG), Philippines (PH), Pakistan (PK), Portugal (PT), Paraguay (PY), Qatar (QA), Romania (RO), Russian Federation (RU), Saudi Arabia (SA), Sudan (SD), Sweden (SE), Singapore (SG), El Salvador (SV), Syrian Arab Republic (SY), Thailand (TH), Tunisia (TN), Turkey (TR), Trinidad & Tobago (TT), Tanzania (TZ), Ukraine (UA), United States (US), Venezuela (VE), Yemen (YE), South Africa (ZA), Zambia (ZM).

Economies excluded from the estimation due to lack of data availability (76):

Afghanistan (AF), Anguilla (AI), Antigua (AG), Aruba (AW), Bahamas (BS), Bermuda (BM), Bhutan (BT), Brunei Darussalam (BN), Bulgaria (BG), Burkina Faso (BF), Cambodia (KH), Cape Verde (CV), Cayman Islands (KY), Central African Republic (CF), Chad (TD), Comoros (KM), Congo, Democratic Republic Of (CD), Cook Islands (CK), Czech Republic (CZ), Djibouti (DJ), Dominica (DM), Eritrea (ER), Georgia (GE), Grenada (GD), Guinea (GN), Guinea-Bissau (GW), Guyana (GY), Haiti (HT), Iran (IR), Iraq (IQ), Kiribati (KI), Kyrgyz Republic (KG), Lao PDR (LA), Lesotho (LS), Liberia (LR), Macau, China (MO), Madagascar (MG), Marshall Islands (MH), Mauritania (MR), Micronesia, Fed. States Of (FM), Mongolia (MN), Montserrat (MS), Nauru (NR), Nepal (NP), Netherlands Antilles (AN), New Caledonia (NC), Niger (NE), North Korea (KP), Palau (PW), Palestinian Territory (PS), Puerto Rico (PR), Rwanda (RW), Saint Kitts And Nevis (KN), Saint Lucia (LC), Saint Vincent And The Grenadines (VC), Samoa (WS), Seychelles (SC), Slovakia (SK), Senegal (SN), Solomon Islands (SB), Somalia (SO), Suriname (SR), Swaziland (SZ), Taipei,China (TW), Tajikistan (TJ), The Gambia (GM), Timor-Leste (TL), Togo (TG), Tonga (TO), Turkmenistan (TM), Turks & Caicos Islands (TC), Tuvalu (TV), Uganda (UG), Uzbekistan (UZ), Vanuatu (VU), Virgin Islands, British (VG).

**Appendix Table A.1: Summary Statistics of the Data**

Variable	Obs	Mean	Std. Dev.	Min	Max
Current account balance%GDP	1,645	-0.4	8.1	-29.8	44.6
International reserves%GDP	1,645	14.3	16.3	0.0	112.1
Growth of GDP/head	1,645	0.6	1.0	-6.5	13.9
Natural-resource exports%GDP	1,645	26.1	29.2	0.0	99.7
Real GDP growth	1,645	3.8	4.2	-18.8	44.9
Real exchange rate index (1997=100)	1,645	104.7	49.7	19.7	660.4
Stock of Public Debt/GDP	1,645	57.4	38.4	0.0	445.7
Trade/GDP	1,645	0.6	0.4	0.0	3.5
US current account deficit %GDP	1,645	3.3	1.6	-0.2	6.0

GDP = gross domestic product, Obs = observations, Std. Dev. = standard deviation, Min = minimum, Max = maximum.

Source: Authors' calculation.