UC Santa Cruz
UC Santa Cruz Previously Published Works

Title
China's capital flight: Pre- and post-crisis experiences

Permalink
https://escholarship.org/uc/item/1bv0n7db

Journal
Journal of International Money and Finance, 66(5584)

ISSN
0261-5606

Authors
Cheung, Yin-Wong
Steinkamp, Sven
Westermann, Frank

Publication Date
2016-09-01

DOI
10.1016/j.jimonfin.2015.12.009

Peer reviewed

eScholarship.org Powered by the California Digital Library
University of California

Journal of International Money and Finance 66 (2016) 88–112

Contents lists available at ScienceDirect

Journal of International Money and Finance

journal homepage: www.elsevier.com/locate/jimf

China's capital flight: Pre- and post-crisis experiences

Yin-Wong Cheung [a], Sven Steinkamp [b], Frank Westermann [c,*]

[a] City University of Hong Kong, Hong Kong
[b] Osnabrück University, Germany
[c] Osnabrück University and CESifo, Germany

A R T I C L E I N F O

Article history:
Available online 18 December 2015

JEL Classification:
F3
F32
G15

Keywords:
World Bank residual method
Trade misinvoicing
Quantitative easing
Capital controls
Covered interest disparity

A B S T R A C T

We study China's illicit capital flow and document a change in its pattern. Specifically, we observe that China's capital flight, especially the one measured by trade misinvoicing, exhibits a weakened response in the post-2007 period to the covered interest disparity, which is a theoretical determinant of capital flight. Further analyses indicate that the post-2007 behavior is influenced by quantitative easing and other factors including exchange rate variability, capital control policy and trade frictions. Our study confirms that China's capital flight pattern and its determinants are affected by the crisis event. Further, both the canonical and additional explanatory variables have different effects on different measures of capital flight. These results highlight the challenges of managing China's capital flight, which requires information on the period and the type of capital flight that the policy authorities would like to target.
© 2015 Elsevier Ltd. All rights reserved.

1. Introduction

China is increasingly integrated with the global economy. The pace of integration, however, is uneven across the trade and financial sectors. Since its reform initiatives were launched in 1978, China has gradually evolved from a closed and isolated economy to the world's largest trading nation. While liberalizing trade activity, China is quite conscientious about the stability of its financial sector. Regulations

* Corresponding author. Tel.: +49-541-969 3508.
E-mail address: frank.westermann@uni-osnabrueck.de (F. Westermann).

http://dx.doi.org/10.1016/j.jimonfin.2015.12.009
0261-5606/© 2015 Elsevier Ltd. All rights reserved.

and capital control measures are in place to restrict and manage cross-border capital movements. Despite the fact that China is loosening its grip on its financial markets, it maintains explicit controls on capital account transactions to manage its underdeveloped financial sector and protect it from external financial volatility.[1]

China's capital control measures target both inflows and outflows. While excessive capital inflows overheat the domestic economy, massive outflows drain needed resources from development projects and impose pressure on monetary and exchange rate policies. One commonly discussed caveat of China's capital account liberalization policy is the capital outflow and its adverse economic impacts that may occur when China opens up its capital account (Bayoumi and Ohnsorge, 2013). Despite China's infamously tight grip on its capital account, it cannot perfectly regulate money movement across its border.

In the last few decades, China has been adjusting its capital control policy to maintain a stable economic environment for its reform initiatives. Hung (2008) and Prasad and Wei (2007), for instance, describe China's policy measures aimed at curbing illicit capital flows. Although these capital control measures are deemed effective, they do not eliminate all illicit flows. Cheung and Herrala (2014), and Ma and McCauley (2008), for example, show that China's control of cross-border capital movement is porous. While control measures deter money from moving across borders, people find ways to circumvent these barriers. The magnitude of China's capital flight could be quite large. For some years, inward or outward capital flight could be larger than the official foreign direct investment data or the change in external debts (Cheung and Qian, 2010).

Anecdotal evidence indicates that sizable capital flight – both inward and outward – has taken place in China. It is commonly believed that China's outward capital flight is driven by the desire to move money out of a tightly controlled regime. For different reasons, wealthy individuals and corrupted executives/officials choose to shelter their wealth overseas. The anticorruption campaign launched by the Xi Jinping regime reveals and reaffirms the widespread existence of corruption and the magnitude of capital flight related to the embezzlement of public funds. Inward capital flight sometimes is perceived to be hot money that takes advantage of the flourishing real estate sector, shadow banking, and equity market.

Financial crises in the last few decades have always reminded authorities of the detrimental impact of volatile cross-border capital flows on their economies. The 2007/8 Global Financial Crisis is no exception. One new phenomenon of the recent crisis and its aftermath is characterized by an ultra-loose monetary policy, dubbed quantitative easing pursued by the United States to revive its economy. A similar accommodative monetary policy has been subsequently pursued by other economies, including Great Britain, Japan and the European Monetary Union. The developing and emerging economies including China in general are quite concerned about the massive capital inflows triggered by excess global liquidity created by quantitative easing. Typically, these economies have tightened their policies on cross-border capital movements to alleviate destabilizing capital flows. Indeed, China was quite vigilant – it strengthened its management of capital flows in general, and in June 2008 explicitly reinstated its managed exchange rate policy in particular.

In this article, we empirically analyze China's capital flight. The choice of China is motivated by its growing importance on the global stage and the relative size of its capital flight. Kar and Spanjers (2014), for instance, assert that China is the leading source of illicit capital flows among developing countries, and it dominates the flows originating from Asia.[2]

Our exercise considers two approaches to generate a proxy for capital flight. The first, the commonly used World Bank residual approach, uses balance-of-payments statistics and generates the proxy from the difference between the sources and uses of funds (Cuddington, 1986, 1987; World Bank, 1985).

[1] Fernald and Babson (1999) and Yu (2009), for instance, attribute to capital controls China's ability to insulate itself from the massive external financial volatility in the recent global financial crises.

[2] Laws and rules restricting foreign purchases of assets instituted in the 2000s by, for example, Singapore and Australia were perceived to target capital inflows from China. The top five sources of outward capital flight from 2003 to 2012 are China, Russia, Mexico, India, and Malaysia.

The second approach is based on the notion of trade misinvoicing, which is believed to be a common business maneuver to bypass controls and move money across national borders. For instance, export underinvoicing and import overinvoicing facilitate outward capital flight. Kar and Freitas (2012) and Kar and Spanjers (2014) estimate trade misinvoicing to account for 77.8% of total capital flight. This is a significant source of China's capital flight, too. The asserted role of trade misinvoicing echoes China's repeated efforts to curtail trade misinvoicing by cracking down on forged, illegal, and reused trade documents.

Using these measures, we compare the patterns of China's capital flight before and after the 2007/8 global financial crisis in light of its dramatic impacts on the global market and related policy responses. In anticipation of the empirical results, we show that the World Bank residual and the trade misinvoicing measures of China's capital flight behave differently, and these measures exhibit different patterns before and after the eruption of the crisis. Further, the change in behavior could be related to the ultra-accommodative monetary policy adopted by, for example, the United States after the crisis, and to the responses to exchange rate variability and control policy measures.

The next section introduces the World Bank residual and trade misinvoicing measures of capital flight, presents the basic capital flight regression specifications, and lists the explanatory variables that comprise both canonical economic determinants and factors specific to China. Section 3 extends the basic specifications to accommodate different behaviors in the post-crisis period and explores several potential factors driving the behavior in the post-crisis period. Some robustness regressions are presented in Section 4. Section 5 concludes.

2. Basics

2.1. Two capital flight measures

There is little disagreement on the adverse effect of capital flight, which hinders the capital-formation and resource-allocation processes, and strains the financial system.[3] Its exact definition, however, is far from conclusive. One general interpretation equates capital flight to capital movement triggered by economic and political uncertainty. An obvious drawback of this interpretation is that accurately measuring it is difficult.[4] In the current study, we consider two operationally feasible notions of capital flight that are commonly used in the literature. They are the World Bank residual measure and the trade misinvoicing measure.

The World Bank residual measure of capital flight is quite routinely adopted in empirical studies. Using information from balance-of-payments statistics to determine the discrepancy of the uses and sources of funds, the measure provides an operational definition of capital flight. There is outward (inward) capital flight when the total source of funds is larger (less) than the total use of funds. Building on publicly available national accounting information, the World Bank residual measure covers a wide range of economic activities, including all foreign assets and liabilities incurred by both public and private sectors. This measure is also replicated easily.

The World Bank residual method (World Bank, 1985) computes capital flight according to:

$$WBR = \Delta ExD + NFDI - CAD - \Delta IR \tag{1}$$

where the sources of funds are given by the change in external debts (ΔExD) and the net foreign direct investment ($NFDI$), and the uses of funds are the current account deficit (CAD) and the change in international reserves (ΔIR). If all international transactions are properly reported, the double-entry accounting practice will ensure that the uses of funds equal the sources of funds and the World Bank residual (WBR) measure is zero.

3 Capital flight could be beneficial if it helps circumvent distortionary capital controls and trade barriers.

4 Discussions of various measures of capital flight and their limitations are given in, for example, Claessens and Naude (1993), Kant (1996), Kar and Cartwright-Smith (2009), Schneider (2003), and Zhao et al. (2013).

When the sources of funds are larger than the uses, the difference is interpreted as unreported illicit capital outflow. When capital is leaking from the economy, it reflects dislike of domestic assets and resources are leaving. When the sources of funds are less than the uses, foreign capital is infiltrating into the domestic economy, and there is a relative preference for domestic assets. The current study uses data from China's State Administration of Foreign Exchange to construct the *WBR* measure.

Trade misinvoicing is a well-documented way to circumvent regulations and move money illicitly across national borders (Bhagwati, 1964, 1981; Cardoso and Dornbusch, 1989). To quantify the level of trade misinvoicing, we compare the trade data reported by China and its trading partners. The trade data are from the *Directions of Trade Statistics*. One practical technical issue is that export data are reported at f.o.b. (*free on board*) prices and imports are at c.i.f. (*cost, insurance and freight*) prices. Even in the absence of misinvoicing behavior, the two price conventions create a wedge between trade data reported by importing and exporting countries. To allow for differences in reported prices, we incorporate a variable *CIF* to capture the c.i.f. effect in calculating China's export underinvoicing, *EUI*,

$$\mathrm{EUI} = \sum\nolimits_i^p [\mathrm{XW_{i,t}} - \mathrm{XC_{i,t}} * (1 + \mathrm{CIF})] \tag{2}$$

where $XW_{i,t}$ is economy *i*'s reported value of imports from China, $XC_{i,t}$ is China's reported value of exports to country *i, p* is the number of economies importing from China, and *CIF* facilitates a fair comparison of the reported values of exports and imports. In the current and next sections, *CIF* assumes the value of 10%, a value commonly adopted by recent studies on trade misinvoicing.[5] The results based on alternative fixed and time-varying values of *CIF* are discussed in Section 4. A positive *EUI* implies China underinvoiced or underreported the value of its exports, and capital has been illicitly transferred to its trading partners.[6] By the same token, we calculate China's import overinvoicing, *IOI*, as

$$IOI = \sum\nolimits_i^q [MC_{i,t} - MW_{i,t} * (1 + CIF)] \tag{3}$$

$MC_{i,t}$ is China's reported value of imports from country *i*, $MW_{i,t}$ is economy *i*'s reported value of exports to China, and *q* is the number of countries exported to China. Again, a positive *IOI* implies capital is leaking out of China.

The amount of China's capital flight via trade misinvoicing is the sum of export underinvoicing and import overinvoicing; that is, $TMI = EUI + IOI$. Henceforth, the sum is called the trade misinvoicing (*TMI*) measure of capital flight.

The *WBR* and the *TMI* measures normalized by the gross domestic product (GDP) are plotted in Fig. 1. The sample period ranges from 1998:Q1 to 2014:Q2. Apparently, the two measures evolve differently during the sample period, with a statistically insignificant sample correlation of –0.0398.

The *TMI* measure indicates money was moving out of China for most of the sample period until the post-crisis period. Starting roughly after 2009, the measure suggests that capital was moving into China via *TMI*. The *WBR* measure, to a lesser extent, also exhibits a different behavior after the 2007/8 global financial crisis. In contrast to the *TMI* measure, the *WBR* measure shows a strong (average) outward capital flight in the post-crisis period.

The weak correlation suggests the possibility that the two measures capture different aspects of China's capital flight phenomenon. The *WBR* measure is based on international transactions reported by China in its balance-of-payments statistics. The *TMI* measure focuses on misreporting of trade transactions. Data from China and its trade partners are used to infer the extent of misreporting. *TMI* could be carried out via price and quality misrepresentation, and faked, forged, or illegally reused trade documents. Both discrepancies in coverage and data source contribute to differences of these two measures. Further, these two types of illicit cross-border capital transfers are likely to be committed by different segments of the population.

[5] See, for example, Beja (2008) and Kar and Freitas (2012). The value of 10% corresponds to the IMFs estimate (International Monetary Fund, 1993, 2010, 2015).

[6] We implicitly assume that *EUI* is mainly driven by China's invoicing behavior.

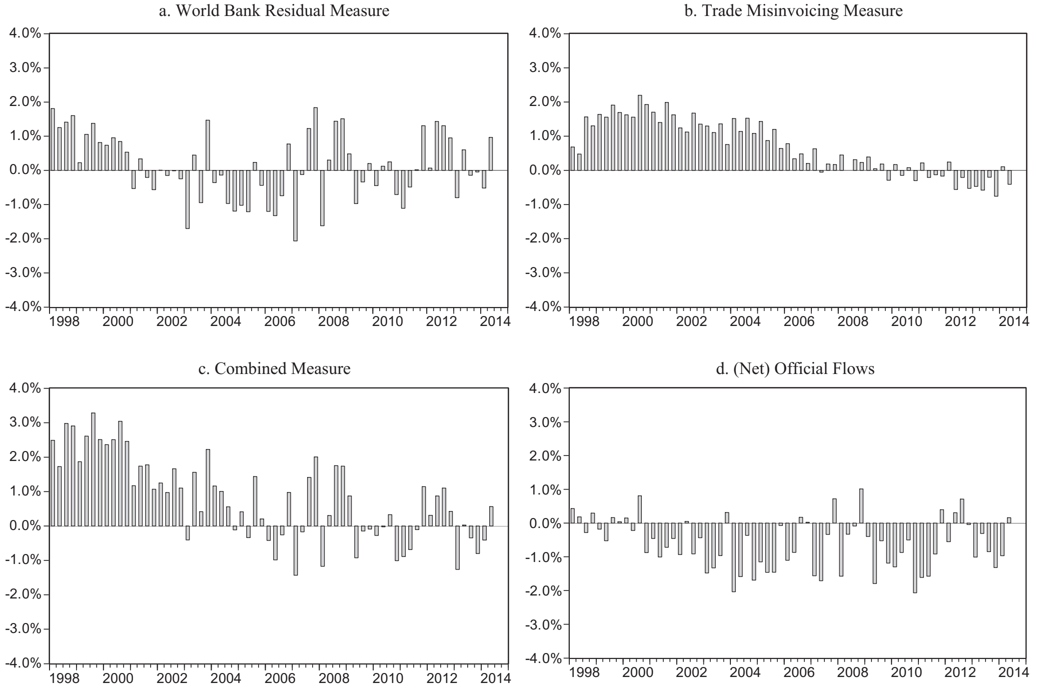

Fig. 1. Capital flight and official flows.
Notes: Different measures of capital flight based on (a) the World Bank residual method, (b) the trade misinvoicing method, and (c) a combined method are presented. Panel (d), for comparison purposes, shows the official capital flow based on the financial account data. All variables are normalized by GDP. See the text and Appendix for details on definitions and data sources.

The official capital flow based on financial account information is included in Fig. 1. For comparison purposes, the official data adopt the sign convention of the capital flight measure; that is, a positive (negative) number means outflow (inflow). During the sample period, there are on average substantial official capital inflows – an observation in line with China's large trade surplus and strong FDI performance. The sizes of the two capital flight measures, however, are at times comparable to that of the official flow, a phenomenon also noted in Cheung and Qian (2010).[7,8] Thus, China's capital flight seems to be non-negligible relative to the official flow.

Given that the *WBR* measure and the *TMI* measure have a weak correlation and can capture different facets of China's capital flight, we include the sum of the two measures as a third measure of capital flight in the subsequent analysis.[9] For brevity, we label the sum as the combined measure (*CM*) of capital flight. The combined measure is plotted in Fig. 1c. The correlation of the combined measure with its two components are, respectively, 0.7613 (*WBR* measure) and 0.6176 (*TMI* measure).

[7] The averages of the net official flows, the *WBR* measure, and the *TMI* measure are, respectively, –0.61, 0.12, and 0.72 during the sample period.

[8] The official flow and the *WBR* measure in fact have a quite high level of association, with an estimated sample correlation coefficient of 0.74. However, the official flow data have essentially zero correlation with the *TMI* measure; their sample correlation coefficient estimate is almost zero and insignificant.

[9] The combined estimate is considered in, for example, Boyce and Ndikumana (2001), Collier et al. (2001), Gunter (1996, 2004), and Kar and Spanjers (2014).

2.2. Preliminary results

A bivariate empirical specification of capital flight derived from the portfolio balance approach (Cuddington, 1986; Diwan, 1989; Dornbusch, 1984) is given by:

$$Y_t = \alpha + \lambda CID_t + \varepsilon_t \tag{4}$$

where Y_t is the capital flight normalized by GDP, and CID_t is the deviation from the covered interest parity between the Chinese and US currencies.[10] Money tends to flow out from an economy when its return on capital after adjusting for currency gains/losses is lower than in the rest of the world. Covered interest differentials are possible under capital controls. To take advantage of return differentials, illicit capital movements evade control measures on cross-border transfers and constitute capital flight. Since the CID_t variable represents an excess covered return on the Chinese currency, we expect it discourages outward capital flight, and thus has a negative coefficient. See the Appendix for the definition and construction of the covered interest disparity and other variables used in the regression exercise.

While equation (4) presents the essential spirit of the portfolio balance approach, it sidesteps the effects of other factors that influence capital movements. To properly assess the *CID* effect, we add control variables to equation (4) and consider the augmented regression:

$$Y_t = \alpha + \lambda CID_t + \theta' X_t + \varepsilon_t \tag{5}$$

where X_t is a vector containing control variables for the capital flight regression. We consider two types of control variables: economic factors and China-specific institutional factors. The economic factors include China's real GDP growth rate, China's government balance normalized by its GDP, the difference between the United States and China inflation rates, the change in China's openness, and the change in China's international reserves normalized by its GDP.

Besides these economic factors, we consider some institutional factors specific to China. The China-specific institutional factors include a political-risk index and dummy variables capturing the effects of China's exchange rate policy, the US–China Strategic and Economic Dialogue,[11] and the evolution of China's capital control policy.[12] It is assumed that capital flight responds to these institutional environments. Again, data on these economic and institutional factors are described in the Appendix.

The results of estimating equations (4) and (5) are presented in Table 1. For each of the three measures of capital flight, specification (1) gives the (gross) effect of covered interest disparity, specification (2) includes the economic factors, and specification (3) includes both economic and institutional factors.[13]

A relatively robust result is that the covered interest disparity variable, *CID*, always garners a negative coefficient estimate. It is statistically significant in all three cases of specification (1) and two cases of (2), but insignificant under (3). The insignificant results are likely due to the inclusion of other insignificant control variables.

The performance of the economic and institutional factors varies across capital flight measures and specifications.[14] In general, the number of significant control variables is relatively small. Indeed, as

[10] In the empirical literature, both capital flight and cumulative capital flight are examined. For instance, Boyce (1992), Cerra et al. (2008), Fedderke and Liu (2002), Le and Zak (2006), Lensink et al. (2000), Mikkelsen (1991), Ndikumana and Boyce (2003), and Pastor (1990) examined capital flight, while Cheung and Qian (2010), Collier et al. (2001), Cuddington (1987), Dooley (1988), and Rojas-Suarez (1990) considered cumulative capital flight. We consider the former, as it is the usual object of the policy debate.

[11] The first Strategic Economic Dialogue took place in December 2006. The Dialogue was renamed the U.S.–China Strategic and Economic Dialogue in July 2009 – see http://www.treasury.gov/initiatives/Pages/china.aspx.

[12] These dummy variables facilitate comparison with previous studies. More sophisticated variables capturing effects of exchange rate variability and policy measures are considered later in the exercise.

[13] Despite the GDP normalization of the capital flight measures, we labeled the results using the notations *WBR*, *TMI*, and *CM* for convenience. The variables used in these and subsequent regressions are tested to be $I(0)$ variables. The estimated residuals exhibit no significant serial correlation. Robust t-statistics are reported.

[14] Note that the *WBR* measure comprises international reserves; see equation (1). To avoid spurious interpretations, we excluded the international reserve variable from the *WBR* and *CM* regressions. Indeed, when the international reserve variable is included, it always has the expected negatively significant coefficient estimate.

Table 1
Basic capital flight specifications.

	WBR			TMI			CM		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
CID	–0.070***	–0.074***	–0.074**	–0.076***	–0.031	–0.002	–0.146***	–0.100**	–0.077**
	(4.11)	(3.05)	(2.51)	(3.00)	(1.18)	(0.15)	(4.98)	(2.65)	(2.17)
Real GDP Growth	–	–0.080	–0.075	–	0.039	0.110*	–	–0.028	0.036
		(1.33)	(0.81)		(0.98)	(1.80)		(0.38)	(0.36)
D(Gov. Balance)	–	–0.245	–0.238	–	–0.079	–0.132	–	–0.378*	–0.365
		(1.25)	(1.16)		(0.67)	(1.30)		(1.92)	(1.65)
Inflation Diff.	–	0.090	0.057	–	–0.202***	–0.143***	–	–0.126	–0.085
		(1.47)	(0.80)		(3.41)	(3.97)		(1.44)	(1.18)
D(Openness)	–	–0.176	–0.071	–	0.185*	0.157	–	0.036	0.083
		(1.00)	(0.37)		(1.80)	(1.39)		(0.17)	(0.37)
D(Reserves)	–	–	–	–	0.131**	–0.014	–	–	–
					(2.28)	(0.26)			
Exr. Regime	–	–	0.210	–	–	–0.854***	–	–	–0.641**
			(0.68)			(3.57)			(2.23)
Political Risk	–	–	–0.026	–	–	–0.035	–	–	–0.063
			(0.60)			(1.30)			(1.28)
SED	–	–	0.259	–	–	–0.105	–	–	0.156
			(0.94)			(0.66)			(0.47)
Capital Controls	–	–	–0.080	–	–	–0.231**	–	–	–0.310*
			(0.50)			(2.51)			(1.96)
Adj. R2	0.30	0.37	0.35	0.23	0.51	0.74	0.46	0.47	0.53

Notes: The results of estimating equations (4) and (5) for the *WBR* measure, *TMI* measure and combined measure of capital flight are presented. Column (1) gives results pertaining equation (4), column (2) includes economic control variables, and column (3) adds China-specific control variables. See the text and the Appendix for variable definitions. Robust *t*-statistics are in parentheses; *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. An intercept and quarterly dummies are included but not reported for brevity.

presented, the *WBR* measure is not affected by any of the control variables under consideration. The *TMI* measure, on the other hand, is influenced by real GDP growth, the inflation differential, the exchange rate regime, and the capital control policy. The results are in accord with the observation in the previous subsection that these two measures do not move in tandem. The group of significant control variables under the combined measure is a subset of those affecting the *TMI* measure. Thus, if we examine only, say, the *WBR* measure, we can misinterpret the economic and institutional factors that are relevant for understanding some other common notions of capital flight. The adjusted *R*-square estimates indicate that these variables explain the *TMI* measure better than they explain the *WBR* measure.

3. Pre- and post-crisis CID effects

Although not all the control variables are significant and some have unexpected signs, the effect of the return differential on capital presented in the previous subsection is largely in line with theory. Notably, the crisis did trigger some economic policy responses, and the effects of these policies are likely to stay on for a while. One example of these "new" norms is quantitative easing, which alters the pattern of international capital flow, and hence China's post-crisis capital flight behavior. Thus, in this section, we investigate if China's capital flight behavior and the CID effect are different before and after the 2007/8 global financial crisis.

3.1. *Post-crisis effects of return differentials*

The average (annualized) *CID* before and after the crisis are quite comparable; for example, the averages of the four-year periods before and after the crisis are, respectively, 3.14% and 4.13%. However, in those periods, the averages of the normalized *WBR* measure of capital flight are –0.52% and 0.19%, and the normalized *TMI* measure averages 0.88% and –0.24%. These simple averages indicate the dissimilarity of these two capital flight measures and the possible change in the *CID* effect after the crisis erupted. To assess the post-crisis *CID* effect, we estimate two modified equations:

$$Y_t = \alpha + \alpha_1 D_t + \lambda CID_t + \lambda_1 (D_t * CID_t) + \varepsilon_t \tag{6}$$

$$\mathrm{Y_t} = \alpha + \alpha_1 \mathrm{D_t} + \lambda \mathrm{CID_t} + \lambda_1 (\mathrm{D_t} * \mathrm{CID_t}) + \theta' \mathrm{X_t} + \varepsilon_t \tag{7}$$

where $D_t \equiv I(t >= 2007{:}Q1)$. At the risk of being imprecise, we call D_t the post-crisis dummy variable, although it covers the post-2007 period.

The results of estimating (6) and (7) presented in the format of Table 1 are given in Appendix Table B1 for brevity. Table 2 instead presents parsimonious versions of these specifications by sequentially dropping the insignificant economic and institutional control variables. By excluding insignificant variables, we mitigate the effect of including irrelevant variables on inferences. For the *WBR* measure, the institutional control factors have no significant impact, and thus only specifications (1) and (3) are presented.

The inclusion of the two post-crisis dummy variables discernibly enhances the explanatory power of the models. Consider the *TMI* measure, for instance, equation (4) (specification (1) Tables 1 and 2) has an adjusted *R*-square estimate of 23%, while equation (6) has a value of 83%. In general, the presence of the two post-crisis dummy variables increases the magnitude of the *CID* effect. Similar to the results in Table 1, the model specifications with post-crisis dummy variables offer a better explanatory power for capital flight captured by the *TMI* than captured by the *WBR* channel.

A striking result is that the marginal post-crisis effect of *CID*, as given by the coefficient estimate of the interaction variable $D_t{*}CID_t$, is positive and significant; its magnitude is at times comparable to the usual *CID* effect. That is, the *net* return-differential effect on capital flight in the post-crisis period (given by the combined effect of *CID* and $D_t{*}CID_t$) is noticeably smaller than the *CID* effect in the pre-crisis period. Even though we expect the capital flight behavior to be different before and after the crisis, it is puzzling to observe the prevalence of the marginally positive post-crisis effect of *CID*; it goes against the portfolio balance reasoning and weakens the general return-differential effect.

Table 2
Capital flight – parsimonious specifications of post-crisis CID effects.

	WBR		TMI			CM		
	(1)	(2)	(1)	(2)	(3)	(1)	(2)	(3)
CID	–0.157***	–0.149***	–0.074***	–0.116***	–0.100***	–0.232***	–0.225***	–0.214***
	(5.32)	(4.70)	(5.10)	(5.94)	(7.13)	(8.24)	(7.50)	(7.23)
CID × D	0.098***	0.105***	0.059***	0.097***	0.090***	0.158***	0.166***	0.167***
	(2.81)	(2.81)	(3.13)	(4.37)	(5.52)	(4.33)	(4.26)	(4.56)
D	0.452**	0.433**	–1.311***	–1.447***	–1.248***	–0.859***	–0.884***	–0.630***
	(2.49)	(2.54)	(14.48)	(13.66)	(11.08)	(4.22)	(4.82)	(2.89)
D(Gov. Balance)	–	–0.415**	–	–	–	–	–0.421**	–0.456***
		(2.60)					(2.67)	(2.73)
Inflation Diff.	–	–	–	0.071**	0.077***	–	–	–
				(2.36)	(3.22)			
D(Reserves)	–	–	–	0.130***	0.084**	–	–	–
				(3.26)	(2.29)			
Exr. Regime	–	–	–	–	–0.447***	–	–	–0.482**
					(4.88)			(2.04)
Adj. R2	0.43	0.46	0.83	0.85	0.90	0.62	0.63	0.65

Notes: The results of estimating equations (6) and (7) for the *WBR* measure, *TMI* measure and combined measure of capital flight are presented. Column (1) gives results pertaining equation (6), column (2) includes economic control variables, and column (3) adds China-specific control variables. Only the parsimonious specifications are presented. See the text and the Appendix for variable definitions. Robust *t*-statistics are in parentheses; *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. An intercept and quarterly dummies are included but not reported for brevity.

The economic and institutional control factors have the expected signs. An improving government balance situation discourages outward capital flight. At the same time, a worsening inflation induces outflows. During the sample period, China's holding of international reserves is a source of tension. The rapid growth of international reserves is viewed as a sign of predatory trade practice and an undervalued exchange rate. Our results indicate that reserve holdings have a positive impact on capital flight. Possibly, a high level of reserve holdings makes capital outflow less of a policy issue. Indeed, in recent years, China has encouraged its corporations to invest overseas. The negative sign of the exchange rate regime dummy variable indicates that a more liberal regime in China is associated with reduced capital flight.

Technically speaking, the results in Table 2 could be biased if return differentials are influenced by capital flight. To address this issue, we considered the two-stage least squares version of the Lewbel (2012) instrumental-variable technique. The approach exploits heteroscedasticity in our data and yields consistent instrumental-variable estimates. In sum, the results from the Lewbel procedure do not reject the null hypothesis of the *CID* being exogenous. For brevity, they are presented in Appendix Table B2.[15]

Thus, in the following, we examine the post-2007 behavior based on extensions and modifications of the specifications in Table 2.

3.2. The role of quantitative easing

In the previous subsection, we found that the marginal post-crisis effect of *CID*, as given by the coefficient estimate of $D_t{}^*CID_t$, is significantly positive. Is the counterintuitively positive effect caused by some extraordinary events that occurred during and after the crisis?

Quantitative easing is an aggressive monetary policy adopted by some developed countries to counter the adverse crisis effects on their economies. The United States has pursued three closely scrutinized rounds of quantitative easing since the advent of the global financial crisis. By aggressively purchasing designated financial instruments in the open market for a prolonged period, the US Federal Reserve dramatically expands the size of its balance sheet, increases the monetary base and money supply, and keeps interest rates low. Besides debasing the US dollar, developing countries are alert to implications of quantitative easing for global US dollar liquidity and international capital movement. Specially, there are concerns about the adverse effect of unduly massive inflow via proper and illicit channels. When the then-Fed Chairman Ben Bernanke remarked in June 2013 on the possibility of tapering the quantitative easing, the developing economies were jittered by capital flight and currency devaluation.

Did the surge in the global US dollar liquidity alter China's capital flight behavior? We investigate such a possibility using two sets of regression equations:

$$Y_t = \alpha + \alpha_1 D_t + \lambda CID_t + \lambda_1 (D_t * CID_t) + \beta M + \varepsilon_t \tag{8}$$

$$Y_t = \alpha + \alpha_1 D_t + \lambda CID_t + \lambda_1 (D_t * CID_t) + \beta M + \theta' X_t + \varepsilon_t \tag{9}$$

and

$$Y_t = \alpha + \alpha_1 D_t + \lambda CID_t + \lambda_1 (D_t * CID_t) + \beta M + \beta_1 (D_t * M) + \varepsilon_t \tag{10}$$

$$Y_t = \alpha + \alpha_1 D_t + \lambda CID_t + \lambda_1 (D_t * CID_t) + \beta M + \beta_1 (D_t * M) + \theta' X_t + \varepsilon_t \tag{11}$$

The liquidity effect is assessed using the variable *M*, which is the ratio of China's GDP-normalized money supply, M1, to the US normalized M1. The use of a ratio reflects that capital flight is a case of siphoning off money from the domestic economy. Equations (8) and (9) evaluate the monetary effect during the sample period, and (10) and (11) isolate the post-crisis effect.

[15] Further, the marginal post-crisis effect given by $D_t{}^*CID_t$ is qualitatively similar to the results in Table 2 when D_t is modified to $I(t >= 2008{:}Q1)$. The result is available upon request.

Table 3 presents the incremental explanatory power of the *M* variable relative to the parsimonious specifications in Table 2. *M* exhibits quite different effects on the *WBR* and *TMI* measures. It has a negative estimated coefficient for the former measure, but a positive coefficient estimate for the latter. The *M* effect on the combined measure of capital flight is similar to the one observed for the *WBR* measure. The relative money supply variable, *M*, is statistically significant in only one of the three *TMI* specifications. For the *WBR* specifications, the impact of the *CID* interaction term is weakened in the presence of *M*; indeed, it becomes statistically insignificant in one of the two cases.

The magnitudes of the covered interest disparity variable and its interaction term for the *TMI* specifications are strengthened in the presence of the relative money supply ratio. The adjusted *R*-square estimates show that, at best, the *M* variable marginally increases the explanatory powers of these specifications. One way to interpret the result is that the *M* variable reinforces the effects of the two *CID* related variables and should be part of the *TMI* specification. However, the interpretation does not help explain why the *CID* interaction term has a positive sign in the post-crisis period.

To focus on the post-crisis phenomenon, we turn to Table 4 for the results pertaining to equations (10) and (11). The inclusion of the *M* interaction term, which captures the marginal effect in the post-crisis period, yields a few observations. First, it reinforces the impression that *M* has a more prominent influence on *TMI* behavior than on the *WBR* measure and the combined measure of capital flight.

Second, *TMI* is mainly affected by the relative money supply after the beginning of the crisis, but not before it. The three coefficient estimates of the *M* interaction term are significantly positive and are larger than the *M* coefficient estimates in Table 3. That is, the relative money supply is not necessary a regular determinant of capital flight. Possibly, its effects after the crisis are related to the specific objective of quantitative easing.

Third, in the presence of the interaction variable, the magnitudes of the coefficient estimates of the *CID* related variables and of the economic and institutional factors are (marginally) reduced. The overall explanatory power is also marginally improved. The result indicates that at least a small part of the positive *CID* effect in Table 2 could be attributed to the relative money supply effect. The new normal represented by the relative money supply does not, nevertheless, fully explain the counterintuitively positive *CID* effect.

Table 3
Capital flight – relative monetary policy effects.

	WBR		TMI			CM		
	(1)	(2)	(1)	(2)	(3)	(1)	(2)	(3)
CID	–0.129***	–0.128***	–0.091***	–0.122***	–0.106***	–0.220***	–0.206***	–0.206***
	(3.84)	(3.59)	(5.77)	(6.26)	(7.51)	(7.05)	(5.99)	(5.99)
CID × D	0.069	0.083*	0.077***	0.104***	0.097***	0.146***	0.159***	0.159***
	(1.65)	(1.91)	(4.30)	(5.09)	(6.42)	(3.39)	(3.84)	(3.84)
D	0.417**	0.389**	–1.283***	–1.403***	–1.216***	–0.866***	–0.641***	–0.641***
	(2.10)	(2.14)	(16.26)	(14.18)	(9.60)	(4.03)	(2.93)	(2.93)
D(Gov. Balance)	–	–0.399**	–	–	–	–	–0.451***	–0.451***
		(2.62)					(2.76)	(2.76)
Inflation Diff.	–	–	–	0.059*	0.067**	–	–	–
				(1.79)	(2.61)			
D(Reserves)	–	–	–	0.113**	0.070*	–	–	–
				(2.65)	(1.90)			
Exr. Regime	–	–	–	–	–0.442***	–	–0.491**	–0.491**
					(4.36)		(2.07)	(2.07)
Rel. M1	–0.258	–0.234	0.169***	0.117	0.101	–0.089	–0.086	–0.086
	(1.52)	(1.39)	(2.86)	(1.67)	(1.60)	(0.50)	(0.49)	(0.49)
Adj. R2	0.42	0.47	0.84	0.86	0.90	0.59	0.65	0.65

Notes: The results of estimating equations (8) and (9) for the *WBR* measure, *TMI* measure and combined measure of capital flight are presented. Column (1) gives results pertaining equation (8), column (2) includes economic control variables, and column (3) adds China-specific control variables. Only the parsimonious specifications are presented. See the text and the Appendix for variable definitions. Robust *t*-statistics are in parentheses; *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. An intercept and quarterly dummies are included but not reported for brevity.

Table 4
Capital flight – post-crisis relative monetary policy effects.

	WBR		TMI			CM		
	(1)	(2)	(1)	(2)	(3)	(1)	(2)	(3)
CID	–0.141***	–0.152***	–0.066***	–0.096***	–0.086***	–0.207***	–0.218***	–0.211***
	(3.29)	(3.60)	(4.22)	(5.05)	(5.51)	(5.20)	(5.46)	(5.18)
CID × D	0.080	0.107**	0.054***	0.080***	0.078***	0.134**	0.159***	0.165***
	(1.59)	(2.09)	(3.21)	(4.07)	(4.67)	(2.65)	(3.10)	(3.33)
D	1.323	2.157	–3.098***	–3.034***	–2.570***	–1.775	–1.009	–0.207
	(0.90)	(1.50)	(5.19)	(5.04)	(5.02)	(1.10)	(0.64)	(0.14)
D(Gov. Balance)	–	–0.451***	–	–	–	–	–0.414***	–0.464***
		(3.08)					(2.81)	(3.01)
Inflation Diff.	–	–	–	0.057*	0.065***	–	–	–
				(1.89)	(2.79)			
D(Reserves)	–	–	–	0.091**	0.055	–	–	–
				(2.34)	(1.51)			
Exr. Regime	–	–	–	–	–0.413***	–	–	–0.504**
					(4.15)			(2.13)
Rel. M1	–0.096	0.087	–0.156	–0.168	–0.133	–0.252	–0.084	–0.009
	(0.31)	(0.29)	(1.18)	(1.35)	(1.32)	(0.69)	(0.24)	(0.03)
Rel. M1*D	–0.183	–0.358	0.367***	0.329***	0.271***	0.184	0.023	–0.087
	(0.63)	(1.26)	(3.07)	(2.88)	(2.84)	(0.57)	(0.07)	(0.29)
Adj. R2	0.42	0.48	0.86	0.87	0.92	0.59	0.62	0.64

Notes: The results of estimating equations (10) and (11) for the *WBR* measure, *TMI* measure and combined measure of capital flight are presented. Column (1) gives results pertaining equation (10), column (2) includes economic control variables, and column (3) adds China-specific control variables. Only the parsimonious specifications are presented. See the text and the Appendix for variable definitions. Robust *t*-statistics are in parentheses; *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. An intercept and quarterly dummies are included but not reported for brevity.

3.3. *New phenomena in China*

Since the global financial crisis, China has continued its reform efforts. Will the ongoing reform policies contribute to the observed capital flight behavior? In this subsection, we consider the implications of changes in exchange rate volatility and capital control policy.

3.3.1. *Exchange rate volatility*

In line with the official stance on gradual reform, China has softened its control in measured steps on the RMB since July 2005, the time at which the currency was allowed to float against an unspecific basket of currencies. In May 2007, the currency's trading band around its daily fixing was widened to ±0.5%, from ±0.3%. The daily trading band was further increased to ±1% on April 14, 2012, and to ±2% on March 15, 2014.

Although a 2% daily trading range could be deemed restrictive, the trend of widening the trading band is lauded as a commitment to giving market forces a role in determining the RMB value, and in facilitating the allocation of capital and resources. The increased trading range provides China a platform to promote its long sought "two-way" volatility in the currency, and to curb the market's belief that the RMB is a safe one-way bet against the US dollar. Drops in the RMB's value in early and late 2014 are examples of the downside volatility effect.

With increased two-way exchange rate volatility, will capital flight be affected? A priori, a high level of volatility is indicative of a high degree of uncertainty, which in turn encourages outflow. However, in the case of China, the higher RMB volatility could be a result of a less restrictive exchange rate regime, and thus may not encourage capital flight. To study the implications, we consider an augmented version of (11):

$$Y_t = \alpha + \alpha_1 D_t + \lambda CID_t + \lambda_1 (D_t * CID_t) + \beta M + \beta_1 (D_t * M) + \gamma V + \gamma_1 (D_t * V) + \theta' X_t + \varepsilon_t \tag{12}$$

Table 5
Capital flight – exchange rate volatility and relative money supply.

	WBR		TMI		CM	
	(3a)	(3b)	(3a)	(3b)	(3a)	(3b)
CID	–0.150***	–0.146***	–0.079***	–0.060***	–0.230***	–0.202***
	(4.77)	(4.77)	(5.05)	(5.14)	(8.29)	(6.98)
CID × D	0.106***	0.100**	0.079***	0.068***	0.171***	0.167***
	(2.86)	(2.66)	(5.02)	(5.69)	(4.62)	(4.86)
D	2.666*	2.877*	1.440**	1.143**	3.664**	4.847**
	(1.76)	(1.99)	(2.49)	(2.19)	(2.10)	(2.61)
D(Gov. Balance)	–0.365**	–0.404**	–	–	–0.348*	–0.351*
	(2.09)	(2.38)			(1.96)	(1.99)
Inflation Diff.	–	–	0.023	–0.015	–	–
			(1.07)	(0.67)		
D(Reserves)	–	–	0.072*	0.030	–	–
			(1.93)	(1.29)		
Exr. Regime	–	–	–0.576***	–0.679***	–	–0.928***
			(3.18)	(7.37)		(3.81)
Rel. M1*D	–	–0.267	–	0.219***	–	–0.044
		(1.62)		(5.45)		(0.31)
Exr. Volatility	–0.058	–	–0.031	–	–0.249***	–
	(0.80)		(0.54)		(2.69)	
Exr. Volatility*D	0.288	0.164	0.334***	0.432***	0.534**	0.703***
	(1.50)	(0.83)	(4.52)	(7.12)	(2.48)	(2.80)
Adj. R2	0.46	0.49	0.92	0.95	0.69	0.70

Notes: The results of estimating equation (12) for the *WBR* measure, *TMI* measure and combined measure of capital flight are presented. The specification under Column (3a) is the one of Column (3) in Table 2 with the two exchange rate variability variables. Column (3b) adds the relative money supply variable and drops the insignificant exchange rate variability variable. See the text and the Appendix for variable definitions. Robust *t*-statistics are in parentheses; *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. An intercept and quarterly dummies are included but not reported for brevity.

The variable *V* is the exchange rate variability measured by the standard error of daily returns in a quarter. Table 5 summarizes the results of estimating the exchange rate variability effect.

Specification (3a) in Table 5 is essentially specification (3) in Table 2 augmented with the exchange rate variability variables, and does not include relative money supply. It assesses the marginal contributions of exchange rate variability in the presence of the canonical capital flight explanatory variables. Specification (3b) adds the relative money supply interaction variable and drops the insignificant exchange rate variability term.

With the exception of (3b) for the *WBR* measure, the exchange rate variability exhibits a statistically significant positive effect on capital flight since the global financial crisis. The significance observed for the combined measure is likely attributable to the *TMI* component. Despite the significance of its interaction term, the exchange rate volatility itself is not statistically significant in the presence of the relative money supply variable. Notably, the exchange rate regime dummy variable retains its negative effect in the presence of the exchange rate variability variable. While a liberal exchange rate policy discourages capital flight, increased volatility induces it.

Controlling for the effect of exchange rate volatility in the post-crisis period reduces the estimated effects of the relative money supply and the return-differential interaction on the *TMI* measure. Nevertheless, these two variables still have significant impact on capital flight. The exchange rate volatility phenomenon does not completely alter the results noted in the previous subsection.

3.3.2. *Capital control policy*

While China is gradually loosening its grip on the domestic financial sector, it retains an effective set of capital control policies to manage its economy and mitigate external financial volatility. China manages cross-border capital movement in both directions. However, capital flight and capital outflow,

Table 6
Capital flight – capital outflow controls and relative money supply.

	WBR		TMI		CM	
	(3a)	(3b)	(3a)	(3b)	(3a)	(3b)
CID	−0.131**	−0.147***	−0.059***	−0.046***	−0.188***	−0.204***
	(2.59)	(4.75)	(3.18)	(2.71)	(4.07)	(6.79)
CID × D	0.080	0.095**	0.048**	0.038**	0.137**	0.155***
	(1.44)	(2.45)	(2.07)	(2.04)	(2.44)	(4.10)
D	−1.432**	0.064	−1.897***	−3.242***	−3.822***	−3.996***
	(2.02)	(0.04)	(6.24)	(8.68)	(4.88)	(2.84)
D(Gov. Balance)	−0.382**	−0.407**	–	–	−0.421***	−0.422**
	(2.37)	(2.53)			(2.70)	(2.66)
Inflation Diff.	–	–	0.056**	0.026	–	–
			(2.64)	(1.31)		
D(Reserves)	–	–	0.080**	0.046	–	–
			(2.23)	(1.39)		
Exr. Regime	–	–	−0.381***	−0.396***	−0.827***	−0.918***
			(3.62)	(4.09)	(3.25)	(4.05)
Rel. M1 × D	–	−0.226	–	0.211***	–	0.016
		(1.26)		(4.21)		(0.09)
Outflow Controls	0.097	–	0.196**	0.194**	0.100	–
	(0.57)		(2.19)	(2.32)	(0.53)	
Outflow Controls × D	−1.100**	−0.802	−0.508***	−0.735***	−1.937***	−1.948***
	(2.50)	(1.67)	(2.70)	(5.15)	(4.07)	(3.70)
Adj. R2	0.49	0.51	0.91	0.94	0.72	0.72

Notes: The results of estimating equation (13) for the *WBR* measure, *TMI* measure and combined measure of capital flight are presented. The specification under Column (3a) is the one of Column (3) in Table 2 with the two outflow control variables. Column (3b) adds the relative money supply variable and drops the insignificant outflow control variable. See the text and the Appendix for variable definitions. Robust *t*-statistics are in parentheses; *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. An intercept and quarterly dummies are included but not reported for brevity.

and their adverse economic impacts, are usually in the limelight when, for example, China's capital account liberalization policy is discussed (Bayoumi and Ohnsorge, 2013; Kar and Freitas, 2012).

The capital control dummy variable considered in the previous subsections was adopted to facilitate comparison with some previous studies. It is arguably coarse for measuring the precise effect of capital control. Recently, Chen and Qian (2015) constructed some elaborate measures of China's capital controls. These measures incorporate information from individual transaction categories and quantify the intensity of policy effects.

The incremental effect of controls on capital flight is examined using the specification:

$$Y_t = \alpha + \alpha_1 D_t + \lambda CID_t + \lambda_1 (D_t * CID_t) + \beta M + \beta_1 (D_t * M) + \gamma W + \gamma_1 (D_t * W) + \theta' X_t + \varepsilon_t \tag{13}$$

The variable *W* is the Chen and Qian (2015) *de jure* measure of control on capital outflows.[16] The capital control policy effect on capital flight presented in Table 6 is revealed by the enhanced measure. While the significance of the *W* variable varies across capital flight specifications, its effect during the post-crisis period is quite pronounced. Specifically, a strong control on capital outflow dampens capital flight in the post-crisis sample period. The marginal insignificance observed under the (3b) column of the *WBR* measure is mainly due to the inclusion of the relative money supply interaction variable (see also Table 7 later).

Compared with exchange rate variability, the inclusion of the two outflow control variables induces a larger dip in the coefficient estimates of the *CID* interaction term. That is, the refined control

[16] The original Chen and Qian series was extended to 2014 using ARIMA forecasts.

Table 7
Capital flight – relative money supply, exchange rate volatility, and capital controls.

	WBR		TMI		CM	
	(3a)	(3b)	(3a)	(3b)	(3a)	(3b)
CID	–0.115	–0.149***	–0.035	–0.059***	–0.151**	–0.204***
	(1.45)	(4.69)	(1.36)	(6.44)	(2.11)	(6.88)
CID × D	0.059	0.098**	0.036	0.065***	0.105	0.155***
	(0.72)	(2.57)	(1.38)	(6.26)	(1.39)	(4.12)
D	–0.675	–1.381*	–0.387	0.947*	–0.716	–3.898***
	(0.20)	(1.99)	(0.35)	(1.96)	(0.20)	(5.05)
D(Gov. Balance)	–0.474***	–0.382**	–	–	–0.414**	–0.424***
	(2.73)	(2.39)			(2.52)	(2.74)
Inflation Diff.	–	–	–0.008	–	–	–
			(0.31)			
D(Reserves)	–	–	0.037	–	–	–
			(1.42)			
Exr. Regime	–	–	–0.542***	–0.685***	–1.182**	–0.919***
			(4.16)	(7.57)	(2.33)	(4.09)
Rel. M1	0.338	–	0.005	–	0.283	–
	(0.86)		(0.05)		(0.74)	
Rel. M1 × D	–0.433	–	0.253***	0.221***	–0.051	–
	(1.38)		(3.22)	(5.60)	(0.16)	
Exr. Volatility	–0.013	–	–0.002	–	0.109	–
	(0.14)		(0.04)		(0.84)	
Exr. Volatility × D	–0.150	–	0.313***	0.413***	0.304	–
	(0.53)		(3.71)	(7.74)	(0.95)	
Outflow Controls	0.216	–	0.149	–	0.245	–
	(0.87)		(1.46)		(1.01)	
Outflow Controls × D	–1.269*	–1.003**	–0.308	–	–1.465*	–1.935***
	(1.72)	(2.48)	(1.47)		(1.79)	(4.01)
Adj. R2	0.48	0.49	0.95	0.95	0.72	0.72

Notes: The results of estimating the combined effects of relative money supply, exchange rate volatility, and capital controls for the *WBR* measure, *TMI* measure and combined measure of capital flight are presented. The specification under Column (3a) is the one of Column (3) in Table 2 with the relative money supply, exchange rate volatility, and capital control variables. Column (3b) presents only the significant variables. See the text and the Appendix for variable definitions. Robust *t*-statistics are in parentheses; *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. An intercept and quarterly dummies are included but not reported for brevity.

variable contributes more than exchange rate variability to the observed post-crisis *CID* effect in the previous regressions.[17]

Table 7 summarizes the joint effects of relative money supply, exchange rate variability and outflow controls. The parsimonious specification (3b) keeps only the significant terms. The results illustrate the different behaviors of the alternative measures of capital flight. It is relatively easy to explain capital flight via *TMI*: 95% of its variability is accounted for by the combined specification, and it is affected by – beyond the canonical factors – the relative money supply and the exchange rate variability since the beginning of the global financial crisis. The *WBR* measure is, on the other hand, not affected by these two variables, but is affected by the enhanced capital outflow control measure.

4. Additional discussions

In this section, we present additional results on China's capital flight behavior.

[17] We also examined the Chen and Qian (2015) measure of inflow controls. The results were not reported for brevity because the variable turns out to be insignificant in the subsequent analyses.

Table 8
Alternative measures of trade misinvoicing.

	(10%)	(CEPII10%)	(CEPII)	(Oil)	(8%)	(12%)
CID	−0.059***	−0.053***	−0.038***	−0.067***	−0.050***	−0.068***
	(6.44)	(6.06)	(4.10)	(5.95)	(5.30)	(7.54)
CID × D	0.065***	0.061***	0.047***	0.080***	0.055***	0.075***
	(6.26)	(5.66)	(4.21)	(5.15)	(5.32)	(7.09)
D	0.947*	0.828*	0.653	0.021	0.786*	1.109**
	(1.96)	(1.68)	(1.26)	(0.02)	(1.68)	(2.20)
Exr. Regime	−0.685***	−0.655***	−0.596***	−1.318***	−0.634***	−0.736***
	(7.57)	(7.44)	(6.78)	(10.34)	(7.17)	(7.89)
Rel. M1 × D	0.221***	0.197***	0.252***	0.278***	0.249***	0.194***
	(5.60)	(4.09)	(4.93)	(2.85)	(6.26)	(4.87)
Exr. Volatility × D	0.413***	0.377***	0.402***	0.414***	0.412***	0.413***
	(7.74)	(6.18)	(6.14)	(3.77)	(7.92)	(7.41)
Adj. R2	0.95	0.93	0.93	0.94	0.94	0.95

Notes: The results of estimating the parsimonious specification in Table 7 of the *TMI* measure of capital flight, constructed under various transaction cost assumptions, are presented. See the text and the Appendix for variable definitions. Robust *t*-statistics are in parentheses; *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. An intercept and quarterly dummies are included but not reported for brevity.

4.1. Alternative TMI measures

As noted in Section 2.1, we followed the usual practice and set the *CIF* term to 10% in calculating the *TMI* measure. This choice reflects the lack of c.i.f. data and facilitates comparison with other studies. However, a fixed *CIF* implies the wedge between the reported prices of imports and exports is constant over time, and the resulting capital flight measure does not capture the time-varying nature of transaction costs. To address the issue, we consider a few alternative proxies of the *CIF* term in (2) and (3).

First, in addition to the fixed 10% *CIF*, we consider the cases of fixed values of 8% and 12%. Second, we adopt the *CIF* estimates from the CEPII. In essence, the "raw" *CIF* estimates are derived from a gravity-equation model at the product and country-pair levels.[18] These estimates are product, trading-partner, and time specific. The country-pair *CIF* estimates are constructed using weights determined by trading volumes of individual products. We derived two versions of the *CIF* data from this approach. The first version contains the *CIF* data that are calculated directly from the CEPII estimates. We then rescaled the first-version data and normalized them to have their means equal to 10% to generate the second version. The rescaling facilitates comparison of results based on the fixed 10% *CIF* assumption. Third, we use the oil price to infer the time variability of the *CIF*. The choice of oil price is based on the assumption that fuel cost is a main time-varying component of the c.i.f. Again, to facilitate comparison, the time-varying *CIF* that tracks the variability of oil price is normalized to have a mean equal to 10%. The construction of these alternative *CIF* variables is presented in Appendix C.

Table 8 presents the results of estimating the parsimonious specification (3b) in Table 7 using alternative *TMI* measures. The column labeled 10% repeats the results from Table 7 for reference. In sum, during the post-2007 period, the effects of return differentials, the relative money supply and exchange rate variability are all positive. That is, the results in the previous section are quite robust to alternative *TMI* constructions – China's capital flight is subject to the effects of some "new" factors in the post-crisis period.

We repeated the exercise with alternative combined measures derived from alternative TMI measures. The results presented in the Appendix are similar to those in Table 8: *CID* and D_t*CID_t have significantly negative and positive coefficient estimates, respectively.

[18] See Gaulier and Zignago (2010) for a detailed description.

Table 9
The role of tariffs.

	TMI				WBR	CM
	(10%)	(CEPII10%)	(CEPII)	(Oil)		
CID	−0.030**	−0.024	−0.020	−0.034*	−0.130**	−0.183***
	(2.10)	(1.64)	(1.29)	(1.85)	(2.34)	(3.68)
CID × D	0.033**	0.028*	0.026	0.041*	0.079	0.133**
	(2.16)	(1.70)	(1.44)	(1.71)	(1.32)	(2.28)
D	0.720	1.095**	1.090**	1.038	−0.974	−3.367**
	(1.52)	(2.22)	(2.07)	(1.29)	(0.86)	(2.62)
D(Gov. Balance)	–	–	–	–	−0.390**	−0.428***
					(2.44)	(2.84)
Exr. Regime	−0.558***	−0.502***	−0.487***	−1.108***	–	−0.830***
	(5.90)	(5.12)	(4.79)	(6.97)		(3.44)
Rel. M1 × D	0.233***	0.199***	0.249***	0.267***	–	–
	(6.15)	(4.38)	(5.16)	(3.07)		
Exr. Volatility × D	0.357***	0.307***	0.350***	0.314***	–	–
	(7.02)	(4.79)	(5.01)	(2.81)		
Outflow Controls × D	–	–	–	–	−1.003**	−1.839***
					(2.42)	(3.82)
Tariffs	0.344**	0.342**	0.212	0.387**	0.195	0.235
	(2.43)	(2.54)	(1.53)	(2.16)	(0.49)	(0.61)
Tariffs × D	−0.157	−0.708*	−0.743*	−1.601**	−0.319	−0.303
	(0.45)	(1.81)	(1.74)	(2.23)	(0.31)	(0.28)
Adj. R2	0.95	0.94	0.93	0.94	0.47	0.71

Notes: The results of estimating the tariff revenue effect are presented. The three parsimonious specifications in Table 7 and those of the *TMI* measure allowing for time-varying transaction costs are considered. See the text and the Appendix for variable definitions. Robust *t*-statistics are in parentheses; *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. An intercept and quarterly dummies are included but not reported for brevity.

4.2. Tariffs

So far, we have assumed the motivation to misreport import and export values is to move money illicitly across borders. It is possible that *TMI* is a means to circumvent tariffs or distortions created by import and export taxes (see Dornbusch and Kuenzler, 1993, on different motives of *TMI*). To assess the tariff effect, we include a tariff variable in our analysis. Specifically, we augment the three parsimonious specifications in Table 7 and those of alternative *TMI* measures based on time-varying *CIF* factors in Table 8 with a tariff variable, which is the total tariff revenues received normalized by trade volume.[19]

The estimated general effect given by the tariff variable itself is in line with the common wisdom – the higher the tariff, the stronger the capital flight (Table 9). The tariff variable of all four *TMI* measures has a positive coefficient estimate, and three of them are statistically significant. The coefficient estimates of the *WBR* and the combined measures are positive but insignificant. The tariff effect is mainly found among the *TMI* measures.

The marginal effect of tariffs after 2007, however, is negative. The tariff interaction variable that captures its marginal post-crisis effect has a negative and significant coefficient estimate for the *TMI* measures derived from time-varying *CIF* data. For two of the four *TMI* measures, the negative post-2007 tariff effect is larger (in magnitude) than the tariff effect itself. That is, since the advent of the crisis, the tariff effect is weaker than that observed before the crisis, and the net effect depends on the way *TMI* is assessed.

[19] We also considered a "tariff" variable that includes the net value of the value-added, imports and related export rebate taxes. The results are similar to those reported in the text.

The inclusion of the two tariff variables does not qualitatively alter the effects of other explanatory variables. Nevertheless, it is noted that, compared with Table 8, the marginal positive post-2007 effect of return differentials is reduced.

4.3. Interest rates or exchange rates

There are two main components of the deviation from covered interest parity: the interest differential and the exchange rate premium. The interest rates and their differences are mainly determined by the US and Chinese policies. Further, the Chinese money and capital markets are not open to all market participants, especially not to nonresidents. The segmentation restricts the market response to interest rate differentials.

The exchange rate premium based on non-deliverable forwards, on the other hand, is a barometer of the market's expectation for RMB movement. While the RMB spot exchange rate is effectively managed by China, the non-deliverable forward rate is determined in offshore markets that are not officially under China's jurisdiction. That is, the premium could reflect the market view on the future value of the RMB. Indeed, the exchange rate premium displays a more variable pattern than the interest rate differential during the full and subsample periods. Given the structural differences between the two components, they may have different impacts on capital flight.

To assess their individual roles, we use the interest differential (*RDiff*) and exchange rate premium (*NDF*) in place of *CID* in the regression. Table 10 presents the results from the three parsimonious specifications in Table 7 and those of the *TMI* measures based on time-varying *CIF* factors. Breaking down the *CID* does not qualitatively change the effects of other explanatory variables. The general effects of interest differentials and exchange rate premiums on capital flight as captured by *RDiff* and *NDF* are in line with theoretical predictions – a high relative Chinese interest rate deters capital flight, and an expected RMB depreciation (US dollar appreciation) encourages capital flight.

Table 10
The individual roles of interest rate differential and exchange rate premium.

	TMI				WBR	CM
	(10%)	(CEPII10%)	(CEPII)	(Oil)		
RDiff	–0.065***	–0.070***	–0.066***	–0.044	–0.069	–0.129*
	(2.74)	(3.44)	(3.29)	(1.59)	(0.96)	(1.76)
NDF	0.059***	0.047***	0.027**	0.082***	0.184***	0.245***
	(5.16)	(4.27)	(2.56)	(5.55)	(6.39)	(7.99)
RDiff × D	0.065*	0.029	0.005	–0.073	0.044	0.048
	(1.79)	(0.91)	(0.16)	(1.36)	(0.43)	(0.44)
NDF × D	–0.066***	–0.059***	–0.040***	–0.097***	–0.130***	–0.193***
	(5.32)	(4.57)	(3.26)	(5.49)	(3.61)	(5.34)
D	1.051*	1.549**	1.746***	0.981	–1.518**	–3.586***
	(1.74)	(2.47)	(2.89)	(1.05)	(2.18)	(4.97)
D(Gov. Balance)	–0.694***	–0.685***	–0.652***	–1.186***	–	–0.664**
	(6.23)	(6.03)	(5.88)	(7.50)		(2.57)
Exr. Regime	0.210***	0.096*	0.107*	0.028	–	–
	(4.53)	(1.77)	(1.96)	(0.30)		
Rel. M1 × D	0.417***	0.391***	0.428***	0.355***	–	–
	(6.65)	(5.68)	(6.24)	(3.09)		
Exr. Volatility × D	–	–	–	–	–0.367**	–0.411**
					(2.26)	(2.59)
Outflow Controls × D	–	–	–	–	–0.998**	–1.674***
					(2.32)	(3.65)
Adj. R2	0.95	0.94	0.94	0.95	0.50	0.72

Notes: The results of estimating the individual roles of interest rate differential and exchange rate premium are presented. The specifications are those considered in Table 9. See the text and the Appendix for variable definitions. Robust *t*-statistics are in parentheses; *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. An intercept and quarterly dummies are included but not reported for brevity.

The perplexing observation is the behavior of the interaction variables. The coefficient estimates of both interest differential and exchange rate premium interaction variables, with only one exception, have their signs opposite to those expected. While the interest differential interaction is statistically significant in only one case, the exchange rate premium interaction is significant in all the six cases reported in the table. These results indicate that the unusual premium effect is a main force behind the marginally positive return differential (*CID*) effect observed in the post-2007 period. It is not surprising to observe that capital flight responds strongly to the premium, which reflects market expectations; the question is – why has the pattern changed since 2007?

4.4. Others

We did a few more robust checks. For instance, we explored if the *CID* exhibits threshold effects since capital movement may be triggered only by large *CID*s. We (a) re-estimated the regressions using stratified *CID* data, and (b) estimated models with endogenously determined thresholds. Neither of these efforts revealed any significant threshold effect.[20]

There are popular news stories on the implications of China's money for the real estate boom in Hong Kong, growing casino revenue in Macao, and hot money into China to fund the expanding shadow-banking sector. Unfortunately, relevant data exemplified by these news stories are hard to find. In one attempt, we included the Hong Kong housing price index in the regression specifications presented in Table 7: The housing price index turned out to be insignificant.

The errors and omissions (*EO*) of the balance-of-payments account is another measure of capital flight. The *EO* measure has a sample correlation coefficient of 0.58 with the *WBR* measure, and of –0.10 with the *TMI* measure. The regression results derived from the *EO* measure are quite similar to those based on the *WBR* measure. These results, and those described earlier in this subsection, are omitted brevity but are available upon request.

5. Concluding remarks

China's recent strong presence on the global stage is not a new phenomenon. In the eighteenth and early nineteenth centuries, China produced one-quarter or more of total world output. It was a major trading nation connected to the world via the Silk Road and marine routes and ran substantial trade surpluses.[21] In the last few decades, China has been resurrecting the global economic predominance it had a few centuries ago.

As the largest trading nation, China's influence in the arena of international trade is easily felt. Its role in the global financial market/architecture, however, is quite minor relative to the size of its economy and trade sector.[22] With its underdeveloped financial markets and capital control policy, China has a limited degree of integration with the global financial market. After the eruption of the global financial crisis, however, China is seen to be more assertive in advocating its roles in the global economy. When China is assuming a high-profile approach, the world has to prepare itself to embrace the challenges and opportunities associated with accepting China into the global financial market.

In this exercise, we study China's illicit capital flow, which is perceived to be a non-negligible channel through which Chinese capital interacts with the rest of the world. We document a change in the pattern of China's capital flight in the post-2007 period. Specifically, we observe that China's capital flight, especially that measured by *TMI*, behaved differently in the pre- and post-2007 periods. The covered return differential, which is a theoretical determinant of capital flight, displays a weakened effect in the post-2007 sample.

[20] For an analysis of threshold effects in China's covered interest differential, see also Chen (2013).

[21] See, for example, Maddison (2007), Sakakibara and Yamakawa (2003a, 2003b), and the references cited there. It is of interest to note the implications of the "One Belt, One Road" initiative launched by China in the early 2015.

[22] China surpassed the United States and became the largest trading nation in 2012. Making references to the PPP-based measure, IMF asserted that China was the largest world economy in 2014.

Further analyses indicated that the post-2007 behavior is influenced by quantitative easing and other factors including exchange rate variability, China's capital control policy, and trade frictions. These additional explanatory factors, however, could not completely explain the observed change in the covered return differential effect. Some changes in market perceptions and behavior remain uncaptured.

Even though we could not fully explain the new phenomenon, our exercise unravels some determinants that affect China's capital flight after, but not before, 2007. This finding should not be interpreted in isolation. In the literature, it is quite well documented that "new" theories have been proposed about crises that have occurred in the preceding few decades.[23] The international reserve hoarding behavior, for example, changes across crisis periods.[24] Apparently, the forces that triggered the global financial crisis also changed the global economic environment and the behavior of market participants, thus altering economic relationships.

Our study affirms that China's capital flight pattern and its determinants are affected by the crisis event. Our empirical results also show that both the canonical and additional explanatory variables have different effects on different capital flight measures. That is, there is uncertainty of understanding both China's capital flight and its underlying driving forces. Policy considerations have yet to face an extra layer of uncertainty. In addition to the relevant determining factors, the management of capital flight requires information on which type of capital flight the policy would like to target.

In Section 2.1, we note that the magnitudes of China's capital flight and official capital flow could be quite comparable. Will China's continuous effort to liberalize its financial sector diminish the incentive to move money across borders illicitly? It will take some time for China to have the free capital mobility that makes illicit capital movement irrelevant. Even for developed countries with limited controls, there is illicit capital activity. More importantly, both Zhou Xiaochuan and Pan Gongsheng (governor and deputy governor of China's central bank) consider controls on cross-border capital flows as consistent with convertibility; China's vision of convertibility is "managed convertibility," which is not the same as the notion of free convertibility. Thus, China's illicit capital flow is likely to be around for a while.

Despite its current low level of participation in the global capital market, many observers expect China to play an increasing role in the future.[25] Chinn (2013) for instance highlights the role of China for tackling the problem of global imbalances, which have implications for both illicit capital flows discussed in the current study and official flows that have experienced large swings, say, in 2015. Further studies of both the official and illicit flows are warranted.

Acknowledgments

We thank Joshua Aizenman, Bertrand Candelon, Steve Cecchetti, Valentina Corradi, Pierre-Olivier Gourinchas, Katharina Panopoulou, XingWang Qian, Eli Remolona, Matthew Yiu, and participants of the 2015 CityU-DNB-JIMF Conference on "The New Normal in the Post-Crisis Era," the 3rd Workshop on "New Financial Reality," and the 9th MIFN Conference. Also, we are grateful to Kenneth Chow, Charlotte Emlinger, MingMing Li, XingWang Qian, and Fengming Qin for providing some of the data used in our exercise. Cheung and Westermann gratefully thank The Hung Hing Ying and Leung Hau Ling Charitable Foundation, the Bundesbank Regional Office in Bremen, Lower Saxony and Saxony-Anhalt, and the Global Research Unit of CityU for their support.

[23] Consider, for instance, the "first generation" models focused on fiscal imbalances from the 1970s/1980s crises, the "second generation" models of self-fulfilling followed the crisis in the early 1990s, the "third generation" models of financial-market imperfections followed the 1997–98 crisis, and the recent crisis models on leveraging.

[24] See, for example, Aizenman et al. (2015) and Cheung and Qian (2009a, 2009b).

[25] China was ranked the most promising source of FDI (UNCTAD, 2013). Even back in the 2000s, China was expected to be among the top 5 leading FDI exporters (UNCTAD, 2004, 2005). See, for example, Cheung and Qian (2009a, 2009b) for China's ODI activity.

Appendix A. Variable definitions and data sources

Capital Flight	China's capital flight as percentage of nominal GDP (both in US dollar). Capital flight is measured either (i) by the World Bank residual method (*WBR*), (ii) by trade misinvoicing (*TMI*), or (iii) by a combined measure (*CM*). See below for the construction of these variables. A discussion is given in section 2.
WBR	China's capital flight measured by the World Bank residual method, i.e., $WBR = \Delta ExD + NFDI - CAD - \Delta IR$, where ΔExD is the change in external debts, *NFDI* is the net foreign direct investment, *CAD* is the current account deficit, and ΔIR is the change in international reserves. The *WBR* measure is expressed as percentage of nominal GDP. Positive values indicate outward capital flight. Data source: State Administration of Foreign Exchange (SAFE) of China.
TMI	China's capital flight measured by the net trade misinvoicing method given by the sum of export underinvoicing and import overinvoicing, i.e. $TMI = \sum_i^p [XW_{i,t} - XC_{i,t} * (1 + CIF)] + \sum_i^q [MC_{i,t} - MW_{i,t} * (1 + CIF)]$, where $XW_{i,t}$ is economy *i*'s reported value of imports from China, $XC_{i,t}$ is China's reported value of exports to country *i*, $MC_{i,t}$ is China's reported value of imports from country *i*, $MW_{i,t}$ is economy *i*'s reported value of exports to China, *p* is the number trading partners, and *CIF* is the c.i.f./f.o.b. ratio as discussed in Appendix C. *TMI* is expressed as percentage of nominal *GDP*. Positive values indicate outward capital flight. Data source: Directions of Trade Statistics (IMF).
CM	China's capital flight measured by the World Bank residual method adjusted for trade misinvoicing, i.e. $CM = WBR + TMI$. *CM* is expressed as percentage of nominal GDP. Positive values indicate outward capital flight. Data source: State Administration of Foreign Exchange (SAFE) of China, Directions of Trade Statistics (IMF).
Capital Controls	A categorical variable to capture the timing of China's capital control policy changes. It takes the value –1 in times of tightened capital controls (2001:Q1-2002:Q1, 2007:Q1-2009:Q1), a value of +1 when Chinese authorities step-wise liberalized controls and encouraged capital outflows (2000:Q1-2000Q4, 2006:Q1-2006Q4, 2009*), and it is zero otherwise.
CID	The covered interest differential. It is given by the nominal interest rate differential (*RDiff*) minus the non-deliverable forward premium (*NDF*), i.e. $CID = RDiff - NDF = (r-r^*)/(1+r^*) - (F-S)/S$, where *r* is the Chinese interbank offer rate (CHIBOR), r^* is the US$ LIBOR, *F* is the Renminbi non-deliverable forward rate (Yuan/$) and *S* is the spot exchange rate (Yuan/$). *r*, r^* and *F* are annualized one-month rates. Data sources: Datastream, CEIC.
D	A dummy variable, given by $I(t >= 2007{:}Q1)$, capturing the early crisis period.
Exr. Regime	Dummy variable capturing exchange rate regime changes. Variable is 0, whenever the Renminbi was pegged to the US dollar (1991Q1-2005Q2, 2008Q4-2010Q1), and 1 when it was under managed float (2005Q3-2008Q3; 2010Q2-now).
Exr. Volatility	(Logged) quarterly average of the empirical standard deviation of changes in the daily Y/USD spot exchange rate. Data source: Datastream.
Gov. Balance	China's government balance as percentage of nominal GDP, both in US dollar. Data source: Datastream.
Inflation Diff.	The difference between the Chinese and US inflation rate in percentage points. Data source: International Financial Statistics (IFS).
NDF	The renminbi nondeliverable forward premium given by *(F-S)/S*, where *F* and *S* are nondeliverable forward and spot rates (Y/$), respectively. An $NDF > 0$ indicates an expected $ appreciation. Data sources: Datastream, CEIC.
Oil price	Crude Oil-Brent Spot FOB U$/BBL. Data source: Datastream.
Openness	China's trade openness scaled by GDP. Openness is measured by the total value of (seasonally adjusted) imports and exports. Data source: International Financial Statistics (IFS).
Outflow Controls	Chen and Qian (2015) index of China's controls of capital outflows. A large score of the index represents a tight level of controls. Data source: Chen and Qian (2015).
Political Risk	China's Political Risk Index – a higher value means a lower level of political risk. Data source: ICRG.
RDiff	Interest rate differential given by $(r-r^*)/(1+r^*)$, where *r* is the Chinese interbank offer rate (CHIBOR), r^* is the US$ LIBOR (both in annualized one-month rates). Positive values of *RDiff* indicate a higher nominal return on investment in China. Data sources: Datastream, CEIC.
Real GDP Growth	Growth rate of China's real GDP. Data source: International Financial Statistics (IFS).
Rel. M1	China's Monetary Aggregate M1 relative to the US, both standardized by the countries nominal GDP. All variables in levels and national currency. Data sources: Federal Reserve Economic Data (FRED), Datastream.
Reserves	China's international reserve assets in percent of nominal GDP, both in US dollar. Data source: International Financial Statistics (IFS).
SED	A dummy variable for the semi-yearly Strategic Economic Dialogue (SED) between the US and Chinese governments, starting from December 2006 and its successor, the U.S.–China Strategic and Economic Dialogue (S&ED). The variable is set to 1 in each quarter when a meeting took place, 0 otherwise
Tariffs	Tariff revenue collected from imports and exports. Expressed as percentage of total trade volume. Data source: Ministry of Finance, People's Republic of China.

Notes: If necessary, the time series have been seasonally adjusted. The first difference of a variable is used in the regression when the series itself is $I(1)$.

Appendix B. Additional tables

Table B1 Capital flight with post-crisis dummy variables.

	WBR			TMI			CM		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
CID	–0.157***	–0.161***	–0.185***	–0.074***	–0.118***	–0.089***	–0.232***	–0.255***	–0.266***
	(5.32)	(4.14)	(3.40)	(5.10)	(5.72)	(4.73)	(8.24)	(6.59)	(5.76)
CID × D	0.098***	0.111***	0.127**	0.059***	0.096***	0.082***	0.158***	0.183***	0.202***
	(2.81)	(2.70)	(2.47)	(3.13)	(4.19)	(4.30)	(4.33)	(4.24)	(4.51)
D	0.452**	0.217	0.161	–1.311***	–1.476***	–1.165***	–0.859***	–1.282***	–0.990***
	(2.49)	(0.64)	(0.43)	(14.48)	(12.12)	(9.82)	(4.22)	(4.02)	(2.84)
Real GDP Growth	–	–0.030	–0.097	–	–0.014	0.019	–	–0.041	–0.078
		(0.45)	(0.95)		(0.50)	(0.74)		(0.58)	(0.88)
D(Gov. Balance)	–	–0.368**	–0.329	–	0.048	0.004	–	–0.351*	–0.338*
		(2.02)	(1.67)		(0.57)	(0.06)		(1.94)	(1.75)
Inflation Diff.	–	0.069	0.074	–	0.080**	0.052**	–	0.135	0.120
		(0.72)	(0.73)		(2.23)	(2.39)		(1.33)	(1.26)
D(Openness)	–	–0.037	0.027	–	0.000	0.068	–	–0.035	0.101
		(0.26)	(0.15)		(0.00)	(1.19)		(0.24)	(0.58)
D(Reserves)	–	–	–	–	0.134***	0.050	–	–	–
					(2.93)	(1.42)			
Exr. Regime	–	–	0.220	–	–	–0.434***	–	–	–0.232
			(0.74)			(5.50)			(0.82)
Political Risk	–	–	0.039	–	–	–0.014	–	–	0.027
			(0.73)			(0.99)			(0.58)
SED	–	–	0.146	–	–	0.044	–	–	0.185
			(0.54)			(0.43)			(0.67)
Capital Controls	–	–	–0.031	–	–	–0.178***	–	–	–0.218
			(0.20)			(3.36)			(1.59)
Adj. R2	0.43	0.44	0.40	0.83	0.85	0.92	0.62	0.63	0.66

Notes: The results of estimating equations (6) and (7) for the *WBR* measure, *TMI* measure and combined measure of capital flight are presented. Column (1) gives results pertaining equation (6), column (2) includes economic control variables, and column (3) adds China-specific control variables. See the text and the Appendix for variable definitions. Robust *t*-statistics are in parentheses; *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. An intercept and quarterly dummies are included but not reported for brevity.

Table B2 Capital flight – two-stage least squares estimation with Lewbel (2012) instrumental variables.

	WBR		TMI			CM		
	(1)	(2)	(1)	(2)	(3)	(1)	(2)	(3)
CID	−0.150***	−0.145***	−0.077***	−0.181***	−0.099***	−0.228***	−0.223***	−0.196***
	(4.61)	(4.72)	(5.05)	(5.70)	(3.99)	(6.68)	(6.89)	(6.14)
CID × D	0.092**	0.101***	0.062***	0.157***	0.089***	0.154***	0.164***	0.151***
	(2.38)	(2.76)	(3.43)	(5.04)	(3.73)	(3.81)	(4.25)	(4.02)
D	0.467**	0.433**	−1.316***	−1.594***	−1.248***	−0.849***	−0.884***	−0.619***
	(2.53)	(2.48)	(15.21)	(11.41)	(10.92)	(4.40)	(4.82)	(2.95)
D(Gov. Balance)	–	−0.415***	–	–	–	–	−0.422***	−0.460***
		(2.75)					(2.67)	(3.00)
D(Reserves)	–	–	–	0.131***	0.075**	–	–	–
				(3.17)	(2.41)			
Exr. Regime	–	–	–	0.193***	0.079*	–	–	–
				(3.56)	(1.85)			
Adj. R2	0.41	0.46	0.83	0.83	0.90	0.60	0.63	0.65
First Stage F-Stat >10	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
H0: Underidentified	60.985***	61.027***	60.985***	25.445***	24.123***	60.985***	61.027***	59.612***
H0: Not overidentified	3.319	4.528	6.322	1.935	4.633	2.688	3.732	3.299
H0: CID is exogenous	0.273	0.721	4.577**	1.202	2.556	0.212	0.024	0.131

Notes: The results are based on the two-stage-least squares instrumental variables regression with robust standards errors. As instrument, we choose the lagged value of the *CID* as well as internal instruments proposed by Lewbel (2012). In the presence of heteroscedasticity in the first stage regression, this IV technique yields consistent estimates (even when valid external instruments are unavailable or weak) by imposing higher moment restrictions. As identifying instruments $(Z-\bar{Z})\hat{\varepsilon}_1$ is used, where Z is the vector of the exogenous variables, $\bar{Z}$ the vector of means of the Z variables, and $\hat{\varepsilon}_1$ the residual of the first stage regression explaining the covered interest rate differential variable by the Z variables. A Breusch-Pagan test rejects homoscedasticity in the first stage regressions at the 1% level, indicating that the approach is appropriate. We do not find evidence for weak identification and overidentification at the 10% level of significance. Also, we reject possible underidentification at the 1% level. The F-statistics in all first stage regressions are far above 10 – a common rule-of-thumb requirement to exclude weak identification. Thus, our instruments seem to be statistically valid. Finally, as indicated by a Hausman-type test, we find little evidence for an efficiency gain when the *CID* is treated as being endogenous, and thus do not reject the null hypothesis of CID is exogenous (except for column (1) of the *TMI* regression). See the text and the Appendix for variable definitions. Robust *t*-statistics are in parentheses; *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. An intercept and quarterly dummies are included but not reported for brevity.

Table B3 Alternative versions of combined measures of capital flight.

	(10%)	(CEPII10%)	(CEPII)	(Oil)	(8%)	(12%)
CID	−0.204***	−0.262***	−0.247***	−0.278***	−0.257***	−0.275***
	(6.88)	(8.68)	(8.27)	(8.24)	(9.06)	(9.65)
CID × D	0.155***	0.211***	0.195***	0.231***	0.203***	0.224***
	(4.12)	(4.98)	(4.48)	(5.02)	(4.77)	(5.35)
D	−3.898***	−5.732***	−5.935***	−5.799***	−6.014***	−5.968***
	(5.05)	(6.12)	(6.27)	(5.10)	(6.42)	(6.37)
D(Gov. Balance)	−0.424***	−0.408**	−0.406**	−0.432**	−0.451**	−0.459***
	(2.74)	(2.35)	(2.31)	(2.09)	(2.62)	(2.68)
Exr. Regime	−0.919***	−1.486***	−1.438***	−2.062***	−1.491***	−1.580***
	(4.09)	(5.40)	(5.31)	(6.74)	(5.43)	(5.66)
Outflow Controls × D	−1.935***	−2.407***	−2.472***	−2.036***	−2.543***	−2.545***
	(4.01)	(4.09)	(4.17)	(2.97)	(4.30)	(4.30)
Adj. R2	0.72	0.84	0.84	0.88	0.85	0.86

Notes: The results of estimating the parsimonious specification in Table 7 of the combined measures of capital flight that are based on *TMI* measures are presented, with different (time-varying) transaction cost assumptions. See the text and the Appendix for variable definitions. Robust *t*-statistics are in parentheses; *, **, *** indicate significance at the 10%, 5%, and 1% levels, respectively. An intercept and quarterly dummies are included but not reported for brevity.

Appendix C. Alternative measures of trade misinvoicing

The main technical factor creating a wedge between the reported import and export values is transaction costs. Typically, exports are reported under the free-on-board format, which does not include insurance, freight costs, tariffs, etc. The reported values of imports, on the other hand, include these transaction costs.

In addition to the 10% fixed *CIF* factor commonly used in the literature,[26] we consider other *CIF* forms to assess the robustness of the exercise. For example, we consider two alternative fixed *CIF* values of 8% and 12%. We also consider two time-varying *CIF* factors. The first is based on the data from the French research center CEPII. Specifically, CEPII reports *CIF* factors at the country-pair level on a product-specific basis.[27] For a given year, the country-pair *CIF* is a weighted average of product-specific *CIF* with the weights given by trade-volume values of individual products,

$$CIF_{t,i} = \sum_{g=1}^{m} \widehat{CIF}_{t,i,g} \frac{v_{t,i,g}}{\frac{1}{m}\sum_{g=1}^{m} v_{t,i,g}}, \quad (14)$$

where $\widehat{CIF}_{t,i,g}$ is the product- and country-specific *CIF* estimate of CEPII, $i = [1, \ldots, p]$ is the trading-partner country index, $g = [1, \ldots, m]$ is the index of different OECD HS-96 product categories, and v is the trade volume. For comparison purposes, we consider a derivative of the country-pair *CIF* by scaling it to have its mean equal to 10%:

$$CIF_{t,i}^{10} = \frac{CIF_{t,i} * 0.1}{\frac{1}{n}\frac{1}{p}\sum_{t=1,i=1}^{n,p} CIF_{t,i}} \quad (15)$$

Note that both (14) and (15) allow *CIF* to vary over time and across countries (Hummels and Lugovskyy, 2006).

The second time-varying *CIF* factor is based on the oil price, assuming that fuel is a main time-varying component of transaction/transportation costs. The *CIF* factor that traces the oil price variability with a sample mean of 10% is given by:

$$CIF_{t} = \frac{Oil_t * 0.1}{\frac{1}{n}\sum_{t=1}^{n} Oil_t} \quad (16)$$

where Oil is the Crude Oil Brent Spot price in US dollar and $t = [1, \ldots, n]$ is a time index.

References

Aizenman, J., Cheung, Y.-W., Ito, H., 2015. International reserves before and after the global crisis: is there no end to hoarding? J. Int. Money Financ. 52, 102–126. doi:10.1016/j.jimonfin.2014.11.015.
Bayoumi, T., Ohnsorge, F., 2013. Do inflows or outflows dominate? Global Implications of Capital Account Liberalization in China, IMF Working Papers, No. 13/189. doi:10.5089/9781475532159.001.
Beja, E.L., 2008. Estimating trade mis-invoicing from China: 2000–2005. China World Econ. 16, 82–92. doi:10.1111/j.1749-124X.2008.00108.x.
Bhagwati, J.N., 1964. On the underinvoicing of imports. Bull. Oxford Univ. Inst. Econ. Stat. 27 (4), 389–397. doi:10.1111/j.1468-0084.1964.mp27004007.x.

[26] The International Monetary Fund (2015), for instance, suggests that "the 10 percent c.i.f./f.o.b. factor represents a simplified estimate of these costs, which vary widely across countries and transactions."

[27] The CIF estimates from CEPII are, in essence, from a gravity-type equation model. CEPII does not directly rely on the observed discrepancies between the data on corresponding imports and exports for their estimation. See Gaulier and Zignago (2010) for details.

Bhagwati, J.N., 1981. Alternative theories of illegal trade: economic consequences and statistical detection. Weltwirtsch. Arch. 117 (3), 409–427. doi:10.1007/BF02706100.

Boyce, J.K., 1992. The revolving door? External debt and capital flight: a Philippine case study. World Dev. 20 (3), 335–349. doi:10.1016/0305-750X(92)90028-T.

Boyce, J.K., Ndikumana, L., 2001. Is Africa a net creditor? New estimates of capital flight from severely indebted Sub-Saharan African countries, 1970-96. J. Dev. Stud. 38 (2), 27–56. doi:10.1080/00220380412331322261.

Cardoso, E.A., Dornbusch, R., 1989. Foreign private capital flows. In: Handbook of Development Economics. pp. 1387–1439. doi:10.1016/S1573-4471(89)02013-9.

Cerra, V., Rishi, M., Saxena, S.C., 2008. Robbing the riches: capital flight, institutions and debt. J. Dev. Stud. 44 (8), 1190–1213. doi:10.1080/00220380802242453.

Chen, J., 2013. Crisis, capital controls, and covered interest parity: evidence from China in transformation. In: Cheung, Y.-W., De Haan, J. (Eds.), The Evolving Role of China in the Global Economy. MIT Press, pp. 339–371. (Chapter 11).

Chen, J., Qian, X., 2015. Measuring the on-going changes in China's capital flow management: a de jure and a hybrid index data set, HKIMR Working Paper No.11/2015. doi:10.2139/ssrn.2605303.

Cheung, Y.-W., Herrala, R., 2014. China's capital controls: through the prism of covered interest differentials. Pacific Econ. Rev. 19 (1), 112–134. doi:10.1111/1468-0106.12054.

Cheung, Y.-W., Qian, X., 2009a. Empirics of China's outward direct investment. Pacific Econ. Rev. 14 (3), 312–341. doi:10.1111/j.1468-0106.2009.00451.x.

Cheung, Y.-W., Qian, X., 2009b. Hoarding of international reserves: Mrs Machlup's wardrobe and the Joneses. Rev. Int. Econ. 17 (4), 824–843. doi:10.1111/j.1467-9396.2009.00850.x.

Cheung, Y.-W., Qian, X., 2010. Capital flight: China's experience. Rev. Dev. Econ. 14 (2), 227–247. doi:10.1111/j.1467-9361.2010.00549.x.

Chinn, M.D., 2013. United States, China, and the rebalancing debate: misalignment, elasticities, and the saving-investment balance. In: Cheung, Y.-W., De Haan, J. (Eds.), The Evolving Role of China in the Global Economy. MIT Press, pp. 17–51. (Chapter 11).

Claessens, S., Naude, D., 1993. Recent estimates of capital flight, Policy Research Working Paper Series, No. 1186, World Bank.

Collier, P., Hoeffler, A., Pattillo, C., 2001. Flight capital as a portfolio choice. World Bank Econ. Rev. 15 (1), 55–80. doi:10.1093/wber/15.1.55.

Cuddington, J.T., 1986. Capital flight: estimates, issues, and explanations, Princeton Studies in International Finance, No. 58.

Cuddington, J.T., 1987. Capital flight. Eur. Econ. Rev. 31 (1–2), 382–388. doi:10.1016/0014-2921(87)90055-9.

Diwan, I., 1989. Foreign debt, crowding out and capital flight. J. Int. Money Financ. 8 (1), 121–136. doi:10.1016/0261-5606(89)90018-1.

Dooley, M.P., 1988. Capital flight: a response to differences in financial risks. Staff Pap. Monet. Fund 422–436.

Dornbusch, R., 1984. External debt, budget deficits and disequilibrium exchange rates, NBER Working Papers, No. 1336.

Dornbusch, R., Kuenzler, L.T., 1993. Exchange rate policy: options and issues. In: Policy Making in the Open Economy. Oxford University Press, World Bank.

Fedderke, J., Liu, W., 2002. Modelling the determinants of capital flows and capital flight: with an application to South African data from 1960 to 1995. Econ. Model. 19 (3), 419–444. doi:10.1016/S0264-9993(01)00071-2.

Fernald, J.G., Babson, O., 1999. Why has China survived the Asian crisis so well? What risks remain? International Finance Discussion Papers 633, Board of Governors of the Federal Reserve System (U.S.).

Gaulier, G., Zignago, S., 2010. BACI: international trade database at the product-level (the 1994-2007 version), CEPII Working Paper 2010-23. CEPII Working Paper 2010-23.

Gunter, F.R., 1996. Capital flight from the People's Republic of China: 1984–1994. China Econ. Rev. 7 (1), 77–96. doi:10.1016/S1043-951X(96)90020-6.

Gunter, F.R., 2004. Capital flight from China: 1984–2001. China Econ. Rev. 15 (1), 63–85. doi:10.1016/S1043-951X(03)00026-9.

Hummels, D., Lugovskyy, V., 2006. Are matched partner trade statistics a usable measure of transportation costs? Rev. Int. Econ. 14 (1), 69–86. doi:10.1111/j.1467-9396.2006.00561.x.

Hung, J.H., 2008. China's approach to capital flows since 1978: a brief overview. In: Cheung, Y.-W., Wong, K.-Y. (Eds.), China and Asia: Economic and Financial Interactions. Routledge, pp. 44–63.

International Monetary Fund, 1993. A guide to direction of trade statistics. Washington, DC.

International Monetary Fund, 2010. Direction of trade statistics yearbook. Washington, DC.

International Monetary Fund, 2015. Direction of trade statistics quarterly. Washington, DC.

Kant, C., 1996. Foreign direct investment and capital flight, Princeton Studies in International Finance, No. 80.

Kar, D., Cartwright-Smith, D., 2009. Illicit financial flows from developing countries: 2002-2006, Global Financial Integrity, Washington, DC.

Kar, D., Freitas, S., 2012. Illicit financial flows from China and the role of trade misinvoicing, Global Financial Integrity, Washington, DC.

Kar, D., Spanjers, J., 2014. Illicit financial flows from developing countries: 2003-2012, Global Financial Integrity, Washington, DC.

Le, Q.V., Zak, P.J., 2006. Political risk and capital flight. J. Int. Money Financ. 25 (2), 308–329. doi:10.1016/j.jimonfin.2005.11.001.

Lensink, R., Hermes, N., Murinde, V., 2000. Capital flight and political risk. J. Int. Money Financ. 19 (1), 73–92. doi:10.1016/S0261-5606(99)00034-0.

Lewbel, A., 2012. Using heteroscedasticity to identify and estimate mismeasured and endogenous regressor models. J. Bus. Econ. Stat. 30 (1), 67–80. doi:10.1080/07350015.2012.643126.

Ma, G., McCauley, R.N., 2008. Efficacy of China's capital controls: evidence from price and flow data. Pacific Econ. Rev. 13 (1), 104–123. doi:10.1111/j.1468-0106.2007.00392.x.

Maddison, A., 2007. Chinese Economic Performance in the Long Run, 2nd ed. Organization for Economic Cooperation and Development, Paris. doi:10.1787/9789264163553-en.

Mikkelsen, J.G., 1991. An econometric investigation of capital flight. Appl. Econ. 23 (1), 73–85. doi:10.1080/00036849108841050.

Ndikumana, L., Boyce, J.K., 2003. Public debts and private assets: explaining capital flight from Sub-Saharan African countries. World Dev. 31 (1), 107–130. doi:10.1016/S0305-750X(02)00181-X.

Pastor, M., 1990. Capital flight from Latin America. World Dev. 18 (1), 1–18. doi:10.1016/0305-750X(90)90099-J.
Prasad, E.S., Wei, S.-J., 2007. The Chinese approach to capital inflows: patterns and possible explanations. In: Edwards, S. (Ed.), Capital Controls and Capital Flows in Emerging Economies: Policies, Practices and Consequences. University of Chicago Press, pp. 421–480. doi:10.3386/w11306.
Rojas-Suarez, L., 1990. Risk and capital flight in developing countries, IMF Working Papers, No. 90/64.
Sakakibara, E., Yamakawa, S., 2003a. Regional integration in East Asia: challenges and opportunities-part I: history and institutions, World Bank Policy Research Working Paper Series No. 3078.
Sakakibara, E., Yamakawa, S., 2003b. Regional integration in East Asia: challenges and opportunities-part II: Trade, Finance, and Integration, World Bank Policy Research Working Paper No. 3079.
Schneider, B., 2003. Measuring capital flight: estimates and interpretations, Working Paper 194, Overseas Development Institute.
UNCTAD, 2004. Prospects for foreign direct investment and the strategies of transnational corporations, 2004-2007, United Nations, New York and Geneva.
UNCTAD, 2005. Prospects for foreign direct investment and the strategies of transnational corporations, 2005-2008, United Nations, New York and Geneva.
UNCTAD, 2013. World investment prospects survey, 2013-2015, United Nations, New York and Geneva.
World Bank, 1985. World Bank report, World Bank, Washington, DC.
Yu, Y., 2009. The management of cross-border capital flows and macroeconomic stability in China, TWN Global Economic Series 14, Third World Network.
Zhao, Y., de Haan, J., Scholtens, B., Yang, H., 2013. The dynamics of hot money in China, BOFIT and CityU HK Conference on "Renminbi and the Global Economy."