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Flexible Exchange Rates and Current Account Adjustment

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Current account imbalances should in theory be corrected by real exchange rate adjustments that stimulate exports and deter imports. Since pegging the exchange rate may inhibit real exchange rate adjustment, the correction of current account imbalances is likely to be slower when the exchange rate is less flexible. We re-investigate the puzzle that cross-country data lend little empirical support to this proposition. The current account can be disaggregated into the trade balance, which is likely to bear the burden of adjustment, and the other components (net property income and transfers), whose response to real exchange rate movements is complex. If we confine our attention to the trade balance, the puzzle disappears: unlike the current account balance, the trade balance is significantly less persistent when the exchange rate is more flexible. The trade balance responds only weakly, however, to the non-trade component of the current account. Estimation by robust regression suggests that the current account persistence puzzle is essentially a problem of distortion of the results by outliers. Under flexible exchange rates, real exchange rates respond in the expected direction to current account imbalances, and larger real exchange rate movements induce bigger corrections in the current account.

Keywords: current account; exchange rates; trade balance

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1 Introduction

The argument that current account adjustment would be smoother and more rapid under flexible exchange rates was first clearly articulated by Friedman (1953). Friedman's concern was that under a pegged exchange rate system, surplus countries would face little pressure to revalue, while for deficit countries nominal rigidities such as resistance to wage cuts would delay current account adjustment. In other words under a pegged regime nominal exchange rates would not respond very fast to current account disequilibria, and even if they did it might prove hard to convert nominal exchange rate changes into real exchange rate changes. Chinn and Wei (2013) [CW] find that the data do not support Friedman's contention about the rapidity of adjustment under different exchange rate regimes. Their test compares the persistence of the ratio of the current account balance to GDP under floating rates and under pegged rates; greater persistence is interpreted as a typically slower return to the long-run equilibrium value after a shock. They use a large data set of over 3,500 country-year observations for the period 1971-2005 to show that this ratio is as persistent under floating rates as under pegged rates. We call this the current account persistence puzzle. Chinn and Wei show that their finding is robust to an alternative choice of exchange rate regime classification, inclusion of control variables, different assumptions about the equilibrium current account balance, and allowing for non-linearities.

Why could this be? Gopinath (2017) argues that real exchange rate movements have little effect on the terms of trade, because trade prices tend to be sticky in US dollars (the main invoicing currency), which cuts off the expenditure-switching mechanism in the adjustment process (although it opens the door to other forms of adjustment such as production-switching, since exporting from countries with depreciated currencies becomes more profitable).

Subsequently, this negative conclusion has been challenged by some authors. Ghosh et al. (2014) point out that exchange rate regime classifications may be misleading: although country A may have a floating exchange rate against major currencies, it may also be an anchor for currency B's peg. In this case currency B follows the movements of currency A's float against third currencies, which implies that currency A is not 100% floating (an obvious example is the United States). To address this issue Ghosh et al. (2014) use bilateral trade data and construct a measure of bilateral exchange rate regimes based on the web of direct and indirect pegging relationships to show that the bilateral trade balance adjusts significantly faster when the bilateral exchange rate regime is more flexible.

Martin (2016) focuses on aggregate data, but splits industrial from non-industrial countries and also separates out episodes of "sudden stops" (sharp reversals of capital inflows). His findings are that in sudden stop episodes in non-industrial countries, the current account is far *more* persistent under floating rates than under fixed rates, but in "normal" times the current account is significantly *less* persistent under floating, as Friedman suggests. For industrial countries, and for non-industrial countries when sudden stop episodes are not separated out, Martin's results are similar to those of CW, so his paper is far from a general refutation of their point. Martin does not offer any theory of why sudden stop episodes should be so different as to deserve to be considered as a special case, however. One possibility is that, even if the peg is maintained after a sudden stop, there is usually a substantial devaluation, so there is faster real exchange rate adjustment than is normally the case under a peg.

In this paper our starting point is that the current account balance consists of several very different elements: the trade balance, which is the component that immediately springs to mind in relation to the adjustment process, and a mixture of non-trade components such as investment income and transfers of various kinds, where valuation effects are not only likely to be important in the short run but also to vary considerably across countries, depending on such factors as the balance, rates of return on and currency composition of net assets and the volume of aid flows and of workers' remittances (Bleaney and Tian, 2014; Gourinchas and Rey, 2007; Lane and Shambaugh, 2010). In particular the reaction of financial flows to real exchange rate movements is likely to differ between the advanced countries, where assets tend to be denominated in foreign currency and liabilities in domestic currency, and the vast majority of poorer countries, with substantial net liabilities mainly denominated in foreign currency. The potential for cross-country variation in the dynamics complicates the estimation of persistence. We show that there is no persistence puzzle in the trade balance: when the trade balance departs significantly from its country mean, it reverts towards that mean significantly faster under a more flexible exchange rate regime. Nevertheless, although the trade balance carries the burden of adjustment for the whole current account, it reacts only weakly to imbalances in the non-trade components of the current account balance rather than in the trade balance itself, and this seems to be the source of "the current account persistence puzzle".

We also examine the robustness of the current account persistence puzzle result. Various estimation methods have been proposed for dealing with outliers; we show that, when these are applied, the current account persistence puzzle disappears: the current account is significantly less persistent under floating.

Finally we address the persistence puzzle in a different way, by looking "inside the black box" to examine to what extent flexible real exchange rates function as an adjustment mechanism, by responding to and inducing corrections of current account imbalances, as theoretically expected.

The rest of the paper is structured as follows. Section Two outlines the econometric approach. The data are discussed in Section Three. Section Four presents the results of the persistence tests for the current account and the trade balance. In Section Five we investigate whether real exchange rates function as theoretically expected as an adjustment mechanism. Conclusions are presented in Section Six.

2 The Analytical Framework

To investigate current account persistence, we estimate an equation similar to that of CW:

$$\Delta CA_{it} = a + b_t + cFL_{it} - dCA_{it-1} - eFL_{it} * CA_{it-1} + u_{it} \quad (1)$$

where CA_{it} represents the current account balance as a ratio of total trade in country *i* in year *t*, *FL* is a dummy that is equal to one if the exchange rate regime is classified as a float and zero if it is classified as a peg, *Δ* is the first-difference operator, *a*, *b*, *c*, *d* and *e* are parameters to be estimated and *u* is a random error. The current account variable is demeaned by country. We use the current account balance as a ratio of total trade, rather than of GDP, because theoretically a given shift in the real effective exchange rate should have similar effects on this ratio across countries. Since the ratio of total trade to GDP can vary considerably across countries, the effect on the ratio of the current account balance to GDP should also be different (i.e. it is likely to be greater in small countries where the trade/GDP ratio tends to be higher).[1] The hypothesis to be tested is whether *e* is greater than zero, indicating that the current account is significantly less persistent under floating.

We use a number of different regime classifications to define the float dummy, and we also use two continuous measures of regime flexibility instead of a binary classification; these

[1] See Romelli et al. (2018) for evidence that a devaluation improves the ratio of the current account balance to GDP more in more open economies. In practice the results of our tests are similar using the ratio to GDP rather than to total trade, as we show below.

variables are described in the data section. We then re-estimate equation (1) for the trade balance and non-trade current account flows separately.

3 Data

Data on the current account and trade balance as a ratio of overall trade (exports plus imports) are taken from the World Bank World Development Indicators (WDI) dataset. We consider five different exchange rate classifications to identify pegs and floats: those of (1) Bleaney and Tian (2017) [BT], which uses regression methods to separate pegs from floats; (2) Reinhart and Rogoff (2004) [RR]; (3) Shambaugh (2004) [JS]; (4) Obstfeld et al. (2010) [OST]; and (5) the IMF (*de facto*). For each classification we use only two categories (pegs and floats), even when a finer breakdown is available. Floats are independent floats and managed floats; all other regimes are treated as a form of peg. We also consider two measures of exchange rate flexibility, derived from BT and OST.

To define the regime for a country-year, the BT method is based on the residuals from a 12-month regression as described in Bleaney and Tian (2017), but using the Japanese yen as the numeraire currency rather than the Swiss franc. In essence the method uses the degree to which exchange rate movements fail to track those of other currencies over the twelve months as a measure of flexibility, and a threshold is selected above which the currency is recorded as floating rather than pegged. The method allows for basket pegs and a crawling central rate, and also for one sizeable devaluation per year.

The RR method has been updated by Ilzetzki et al. (2017). Movements of the log of the exchange rate against various reference currencies are analysed, and the reference currency that yields the lowest volatility is used. Where available, the classification is based on the exchange rate in the parallel market rather than the official rate. If, over a five-year period from years $T–4$ to T, more than 80% of monthly changes in the log of the exchange rate against any of the reference currencies fall within the range ±0.01, the exchange rate regime in all of the years *T–4* to *T* is classified as some form of peg. Alternatively, even if this criterion is not met, if the change in the exchange rate is zero for four months or more, it is classified as a peg for those months. If fewer than 80% of monthly changes fall within the range ±0.01, but more than 80% fall within the range ±0.02, the regime is classified as a band. If the exchange rate moves by more than 40% in a year, that observation is placed in a separate "freely falling" category (these observations are omitted from the comparison with other schemes). Thus the scheme focuses on the upper tail of the distribution of monthly exchange rate movements, and specifically the proportion that exceed either 1% or 2% in absolute value.

The JS method is described in Shambaugh (2004). A potential anchor currency is identified, and the coding of a given country-year as a peg requires a fixed exchange rate for eleven out of twelve months, or no monthly change greater than ±2% to identify the country-year as a peg; The OST method includes all JS pegs but allows for more possibilities. Soft pegs allow a wider band of variation (±5%); for details see Obstfeld et al. (2010). The IMF *de facto* classification is based on IMF country desks' evaluation of the regime based on specified criteria. The classifications are available up to 2011 (IMF), 2014 (JS and OST), 2016 (RR) and 2017 (BT) respectively.[2]

Finally, the IMF de facto classification is based on IMF country desks' assessment of the regime following specified criteria, so it reflects informed judgement of qualified observers rather than a purely statistical analysis. The classification has a number of categories. We treat any sort of peg or band of permitted variation up to ±5%, including basket pegs and crawls, as a peg rather than a float.

[2] The RR data are available at http://www.carmenreinhart.com/data/browse-by-topic/topics/11/. The JS and OST data are available at https://www2.gwu.edu/~iiep/about/faculty/jshambaugh/data.cfm.

The two continuous flexibility measures are the root mean square error of the regression used in the BT classification (BTCON), and the standard deviation of the monthly percentage change in the nominal exchange rate (EVOL) against the identified anchor country in the JS/OST dataset. To prevent the analysis being too distorted by outliers, each of the continuous flexibility measures is trimmed at 2% at the top end.

The sample of countries in the analysis below excludes members of currency unions, and also a few countries with exceptionally large levels or year-to-year changes in the current account (Kuwait, Myanmar and Timor Leste).

4 Is There a Puzzle?

Table 1 shows some basic statistics. The top part of the table shows statistics for the current account balance, the trade balance and the non-trade component of the current account balance, all scaled by total trade and relative to the country mean for that variable, which we treat as an estimate of the equilibrium value, plus statistics for the first difference of these. It is clear that fluctuations in the non-trade component, with a standard deviation of 7.3% of total trade, are of the same order of magnitude as fluctuations in the trade balance, which has a standard deviation of 7.4% of total trade. Amongst the binary exchange rate regime classifications, the JS classification stands out as having a very high proportion of floats (61.1%), whereas the others range from 27.5% (RR) to 35.5% (IMF).[3]

Table 2 shows the correlations between the different measures of exchange rate flexibility. The two continuous measures of flexibility have a reasonably high correlation with

[3] This reflects the fact that the JS criteria for a peg are very stringent. We have argued elsewhere (Bleaney et al., 2017, p. 377) that the RR classification is somewhat miscalibrated, because it treats bilateral exchange rate volatility of currency pairs of countries that are rather distant from one another as typical of all independent floats, including those that are much less distant and have less volatility.

each other (0.596), and an even higher one with BT (0.753 for BTCON and 0.614 for EVOL) but a rather low correlation with RR (0.385 for BTCON and 0.282 for EVOL) and IMF (0.443 for BTCON and 0.219 for EVOL). The correlations between the different float dummies vary from 0.265 (RR & IMF) to 0.584 (JS & OST). The last row of Table 2 shows the average correlation of each classification with all the others. The classification with the lowest average correlation is RR (0.352), and the second lowest is IMF (0.365), whilst the highest is BT (0.569). These correlations are low enough that the different measures provide reasonably independent tests, but not so low as to totally undermine confidence in the measures, all of which are trying to measure approximately the same thing.

Our basic results for current account persistence (equation (1)) are shown in Table 3, using the five alternative binary exchange rate regime classifications. The estimation is by pooled ordinary least squares with time fixed effects, but with the current account balance (divided by total trade) calculated relative to the mean for that particular country over the entire sample period. Effectively, we are using the country mean as the estimate of the equilibrium value towards which the current account may revert. An alternative is to use country fixed effects estimation, which allows the model to estimate the country's equilibrium current account position from the data, but this risks making countries that have never switched exchange rate regime redundant to the estimation of the parameters of interest.

It can be seen from Table 3 that the current account balance is quite strongly mean-reverting even under pegging, with a coefficient of between -0.30 and -0.45. The effect of floating on this coefficient, as captured by the interaction term, is not statistically significant in most cases, nor is it consistently of the expected negative sign. Table 3 thus demonstrates CW's point for five different classification schemes: the insignificance of the interaction term indicates that the current account balance is no more strongly mean-reverting under floating than under pegging. The main exception is the RR classification, for which the interaction coefficient is significantly negative at the 1% level, but at the other extreme for the IMF classification the coefficient of the interaction term is *positive* and significant at the 5% level. For the other three classifications this coefficient is insignificant, just about reaching a *p*-value of 0.10 and with a negative coefficient in the case of BT.

Table 4 repeats this exercise for the trade balance. It can be seen that the results are substantially different from Table 3. Even under pegging, the trade balance is much more persistent than the current account as a whole, with a coefficient of between -0.19 and -0.25. This may possibly be an indication of significant unserially correlated measurement error in the non-trade portion of the current account. If measurement errors are less (more) persistent than the underlying series, they will bias the estimate of persistence downwards (upwards). It is striking that the interaction term in Table 4 is negative in all five cases, and significant at the 1% level in two cases (OST and RR) and at the 5% level in two more (BT and JS), which suggests that the trade balance is indeed significantly less persistent under floating than under pegging, as Friedman posited.

It is possible that high-leverage outlying observations are playing an important role here. By definition high-leverage observations have a particularly large impact on the vector of estimated coefficients, at least individually (but not necessarily collectively, because they may cancel each other out). Table 5 repeats the same exercise as Table 3 for the current account balance using robust regression methods (Parente and Santos Silva, 2016). In this procedure, observations with Cook's Distance greater than one are excluded altogether; this accounts for between 2 and 3 percent of the sample, as shown in Table 5. Then a weighted least squares procedure is applied iteratively with weights based on the absolute size of the remaining residuals, starting with an OLS regression to derive the initial weights. Between 2 percent and 3 percent of observations end up being effectively dropped (given a zero weight). A further four percent or so of observations end up with rather low weights (between zero and 0.3). The results in Table 5 are much more consistent with theory than those in Table 3, in that the interaction term between the float dummy and the lagged current account balance always has a negative coefficient and, although it is insignificant in the case of the IMF classification, it is significant at the 1% level in the other four cases, with a coefficient of between -0.06 and -0.12. Thus when robust regression methods are used, the results suggest significantly less current account persistence under floating than under pegs in four out of the five binary regime classifications.

In Table 6, robust regression methods are applied to the persistence tests for the trade balance. The number of observations that are severely down-weighted is similar to Table 5. Estimated persistence under pegging is increased when outliers are removed, with the coefficient of the lagged trade balance taking values between -0.12 and -0.19, compared with about -0.20 in Table 4. The interaction term between the float dummy and the lagged trade balance in Table 6 is significantly negative in all five cases, with estimated coefficients in the range -0.03 to -0.09, which is not markedly different to Table 4. Using estimation methods that are robust to outliers therefore confirms that the trade balance is less persistent under floating, as theory predicts.

The difference in results of persistence tests between the current account balance and the trade balance suggests that the financial flows component of the current account balance behaves rather differently to the trade balance. Tables 7 and 8 show the results of persistence tests for the financial flows component, using pooled OLS (Table 7) and robust regression methods (Table 8). In Table 7 the financial flows are shown to be less persistent than the trade balance under pegging, with a lagged financial flows coefficient of about -0.30, compared with about -0.15 for the trade balance in Table 4. The interaction term in Table 7 is mostly negative, but significantly so in only one case (RR). When robust regression methods are used, there is a very large drop in the root mean square error, from 0.65 or more in Table 7 to 0.29 in Table

8. This suggests that there are considerable outlier problems in the financial flows data. This is confirmed by the large number that are severely down-weighted: more than six percent have zero weight, and more than twelve percent have a weight of less than 0.3. Moreover, in Table 8 the interaction term has a positive coefficient in four cases out of five, instead of being mostly negative as in Table 7.

If the trade balance were to adjust more rapidly under more flexible exchange rate regimes and in a direction that would correct imbalances in the current account as a whole, that should feed through into the persistence tests for the whole current account. On the other hand, if the trade balance reacts relatively little to imbalances in the financial flows, this could explain why there is an apparent current account persistence puzzle but not a trade balance persistence puzzle. We next explore how the trade balance reacts to imbalances in itself and in the rest of the current account separately, by adding the lagged financial flows and its interaction with the float dummy to the trade balance persistence equation. Table 9 shows the results for this augmented version of equation (1), using pooled OLS regression. Even under pegged rates the trade balance reacts much less to imbalances in the rest of the current account (with a coefficient of about -0.07) than to imbalances in itself (with a coefficient of -0.22). Moreover the interaction term between the float dummy and lagged financial flows, although never significant, has a positive coefficient in four out of five cases.

Continuous measures of exchange rate flexibility

Do we get similar results with continuous measures of exchange rate flexibility to the ones that we have obtained with the binary classifications? Table 10 shows the outcome of this test. The first two columns show persistence tests for the current account balance, first with exchange rate flexibility measured by the root mean square error from the BT classification regression (BTCON - column 1), and then by nominal month-to-month exchange rate volatility against the identified anchor currency from the Shambaugh data set (EVOL - column 2). This exercise is then repeated for the trade balance in columns 3 and 4 of Table 10. In every case the interaction coefficient is negative, but not always significant. For the current account balance the coefficient is significant at the 10% level for BTCON, but not significant for EVOL. For the trade balance, the coefficient is not significant for BTCON, and significant at the 5% level for EVOL. Thus in neither case are the findings entirely clear. If we use robust regression methods, however, all four of these interaction coefficients become significantly negative at the 1% level.[4]

Scaling by GDP

What happens if we scale the variables by GDP instead of total trade? Table 11 summarises the results, showing only the interaction term from the persistence tests for the current account and the trade balance. For the trade balance, every single interaction coefficient is negative, and ten out of the fourteen are significant at the 5% level; of these ten, nine are significant at the 1% level. So for the trade balance the evidence once again favours the hypothesis of less persistence under floating. For the current account balance, the results from the pooled OLS regressions are mixed, and from the robust regressions they are much more mixed than when scaling by total trade. The coefficients for three binary classifications (BT, JS and OST) are significantly negative, but for both the continuous flexibility measures they are significantly positive, whereas when scaled by total trade the interaction coefficients are significantly negative at the 5% level in the robust regressions in six out of the seven cases (see Tables 5 and 10).

[4] For brevity we do not show the robust regression results in this case, but they show a consistent picture of significantly negative interaction coefficients. The interaction coefficients and *t*-statistics for the four columns respectively are=: -2.34*** (-3.29), -1.86*** (-4.32), -2.49*** (-7.29) and -0.891*** (-5.89).

Alternative robustness tests for the current account balance

In this sub-section we report some further estimates of equation (1) for the current account balance that are based on an alternative procedure for dealing with outliers: quantile (median) regression with standard errors clustered at the country level (Parente and Santos Silva, 2016). The results are shown in Table 12. The point estimates of the interaction coefficient are similar to those from the robust regression (Table 5), but the significance levels are lower because the standard errors of the coefficients are higher. The rate of mean-reversion in pegged regimes is estimated at somewhere between -0.25 and -0.30, and is highly statistically significant. The additional estimated impact of floating adds about -0.06 to this on average for the five classifications, although only in one case is it statistically significant.

Table 1. Basic Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Current account/trade #	-0.001	0.094	-0.843	1.234
Change in CA/trade #	0	0.081	-1.145	1.056
Trade balance/trade #	-0.003	0.111	-0.676	0.603
Change in TB/trade #	0	0.074	-0.980	0.539
Other CA flows/trade #	0.001	0.092	-0.966	1.140
Change in OCA/trade #	0	0.073	-1.419	1.114
Change in log real effective exchange rate ^	0	0.095	-0.398	0.345
Proportion of floats				
BT	0.313	0.464	0	1
JS	0.611	0.488	0	1
OST	0.349	0.477	0	1
RR	0.275	0.446	0	1
IMF	0.355	0.479	0	1
Continuous flexibility measures				
BTCON*	0.010	0.015	0	0.107
EVOL*	0.019	0.034	0	0.312

Notes. For details of variables see text. # Difference from country mean. * After trimming of top 2% of observations. ^ After trimming both top 2% and bottom 2% of observations.

Table 2. Correlations between alternative exchange rate flexibility measures

	BT	JS	OST	RR	IMF	BTCON	EVOL
BT	1						
JS	0.541	1					
OST	0.574	0.584	1				
RR	0.412	0.361	0.406	1			
IMF	0.521	0.419	0.325	0.265	1		
BTCON	0.753	0.475	0.566	0.385	0.443	1	
EVOL	0.614	0.372	0.499	0.282	0.219	0.596	1
Average	*0.569*	*0.459*	*0.492*	*0.352*	*0.365*	*0.553*	*0.430*

Notes. See notes to Table 1.

Table 3. Current Account Persistence
Pooled OLS Regressions

	(1)	(2)	(3)	(4)	(5)
Classification:	BT	JS	OST	RR	IMF
Dep. variable	ΔCA	ΔCA	ΔCA	ΔCA	ΔCA
Float	0.007***	0.003	0.004	0.004	0.006
	(3.23)	(1.40)	(1.20)	(1.60)	(1.61)
CA (-1)	-0.386***	-0.421***	-0.379***	-0.307***	-0.447***
	(-10.1)	(-6.90)	(-7.50)	(-11.2)	(-9.61)
Float * CA (-1)	-0.086	0.013	-0.076	-0.162***	0.107**
	(-1.65)	(0.21)	(-1.27)	(-2.98)	(2.46)
Constant	0.007***	-0.050***	-0.025***	-0.027**	-0.051***
	(9.30)	(-22.2)	(-7.33)	(-12.1)	(-31.4)
Year Dummies	Yes	Yes	Yes	Yes	Yes
No. Economies.	166	152	152	161	154
No. Obs.	4506	4007	4007	4065	3690
R2 Overall	0.24	0.22	0.24	0.21	0.24
RMSE	0.071	0.073	0.073	0.064	0.074

Notes. Asterisks, ***, **, *, denote the significance level at 1%, 5% and 10% respectively. Driscoll-Kray (1998) t-statistics are presented in parentheses. RMSE - the root mean square error of the regression. CA (current account balance) is divided by total trade (X+M) and demeaned by country. Δ is the first-difference operator.

Table 4. Trade Balance Persistence
Pooled OLS Regressions

	(1)	(2)	(3)	(4)	(5)
Classification:	BT	JS	OST	RR	IMF
Dep. variable	ΔTB	ΔTB	ΔTB	ΔTB	ΔTB
Float	0.005*	0.000	0.006**	0.001	0.002
	(1.87)	(0.26)	(2.41)	(0.42)	(0.61)
TB (-1)	-0.210***	-0.215***	-0.202***	-0.189***	-0.243***
	(-9.54)	(-10.5)	(-11.3)	(-9.49)	(-12.1)
Float * TB (-1)	-0.077**	-0.043**	-0.098***	-0.084***	-0.008
	(-2.06)	(-2.34)	(-4.18)	(-3.56)	(-0.39)
Constant	0.003***	-0.031***	-0.033***	-0.006***	0.013***
	(2.88)	(-22.4)	(-23.8)	(-6.12)	(15.2)
Year Dummies	Yes	Yes	Yes	Yes	Yes
No. Economies.	171	155	155	166	159
No. Obs.	5027	4424	4424	4512	4150
R2 Overall	0.15	0.16	0.16	0.14	0.16
RMSE	0.068	0.068	0.068	0.064	0.069

Notes. Asterisks, ***, **, *, denote the significance level at 1%, 5% and 10% respectively. Driscoll-Kray (1998) t-statistics are presented in parentheses. RMSE - the root mean square error of the regression. TB (trade balance) is divided by total trade (X+M) and demeaned by country. Δ is the first-difference operator.

Table 5. Current Account Persistence
Robust Regressions

	(1)	(2)	(3)	(4)	(5)
Classification:	BT	JS	OST	RR	IMF
Dep. variable	ΔCA	ΔCA	ΔCA	ΔCA	ΔCA
Float	0.005***	0.005***	0.005***	0.002	0.004**
	(3.60)	(3.60)	(3.36)	(1.36)	(2.39)
CA (-1)	-0.274***	-0.267***	-0.269***	-0.255***	-0.317***
	(-30.5)	(-20.1)	(-25.3)	(-27.2)	(-32.4)
Float * CA (-1)	-0.071***	-0.071***	-0.114***	-0.059***	-0.007
	(-4.44)	(-4.39)	(-7.20)	(-3.27)	(-0.38)
Constant	-0.026***	-0.028***	-0.027***	-0.025***	-0.027***
	(-5.55)	(-5.66)	(-5.67)	(-5.12)	(-5.52)
Year Dummies	Yes	Yes	Yes	Yes	Yes
No. Economies.	166	152	152	161	154
No. Obs.	4506	4007	4007	4065	3690
No. weight = 0	127	107	106	108	92
No. weight < 0.3	309	278	269	257	256
R2 Overall	0.28	0.21	0.32	0.32	0.30
RMSE	0.046	0.047	0.047	0.045	0.048

Notes. See notes to Table 3. Estimation method is Stata robust regression command (“rreg”).

Table 6. Trade Balance Persistence
Robust Regressions

	(1)	(2)	(3)	(4)	(5)
Classification:	BT	JS	OST	RR	IMF
Dep. variable	ΔTB	ΔTB	ΔTB	ΔTB	ΔTB
Float	0.001	-0.000	0.002	0.000	0.002
	(0.73)	(-0.20)	(1.45)	(0.10)	(1.05)
TB (-1)	-0.129***	-0.136***	-0.137***	-0.134***	-0.164***
	(-17.2)	(-13.2)	(-16.0)	(-17.8)	(-18.7)
Float * TB (-1)	-0.077***	-0.055***	-0.088***	-0.033**	-0.044***
	(-5.75)	(-4.04)	(-6.42)	(-2.33)	(-2.82)
Constant	0.003***	-0.014***	-0.015***	-0.013***	-0.015***
	(2.88)	(-3.06)	(-3.24)	(-2.90)	(-3.04)
Year Dummies	Yes	Yes	Yes	Yes	Yes
No. Economies.	171	155	155	166	159
No. Obs.	5027	4424	4424	4512	4150
No. weight = 0	111	99	100	100	84
No. weight < 0.3	307	284	284	281	260
R2 Overall	0.14	0.15	0.16	0.13	0.16
RMSE	0.048	0.049	0.049	0.046	0.051

Notes. See notes to Table 4. Estimation method is Stata robust regression command (“rreg”).

Table 7. Persistence of the Non-Trade Current Account
Pooled OLS Regressions

	(1)	(2)	(3)	(4)	(5)
Classification:	BT	JS	OST	RR	IMF
Dep. variable	ΔNTCA	ΔNTCA	ΔNTCA	ΔNTCA	ΔNTCA
Float	0.003*	0.002	-0.002	0.002	0.001
	(1.70)	(1.34)	(-1.00)	(1.01)	(1.14)
NTCA (-1)	-0.310***	-0.315***	-0.293***	-0.256***	-0.160***
	(-10.6)	(-7.57)	(-9.67)	(-9.44)	(-27.3)
Float * NTCA (-1)	-0.095	-0.055	-0.134	-0.152**	0.011
	(-0.094)	(-0.65)	(-1.48)	(-2.46)	(1.17)
Constant	0.001	-0.020***	-0.005***	-0.002***	-0.009***
	(0.38)	(-14.1)	(-5.77)	(-4.23)	(-2.98)
Year Dummies	Yes	Yes	Yes	Yes	Yes
No. Economies.	166	152	152	161	154
No. Obs.	4506	4007	4007	4065	3690
R2 Overall	0.20	0.19	0.20	0.19	0.20
RMSE	0.066	0.068	0.068	0.055	0.068

Notes. Asterisks, ***, **, *, denote the significance level at 1%, 5% and 10% respectively. Driscoll-Kray (1998) t-statistics are presented in parentheses. RMSE - the root mean square error of the regression. NTCA (current account balance minus trade balance) is divided by total trade (X+M) and demeaned by country. Δ is the first-difference operator.

Table 8. Persistence of the Non-Trade Current Account
Robust Regressions

	(1)	(2)	(3)	(4)	(5)
Classification:	BT	JS	OST	RR	IMF
Dep. variable	ΔNTCA	ΔNTCA	ΔNTCA	ΔNTCA	ΔNTCA
Float	0.001	0.003***	0.001	0.001	0.002**
	(1.70)	(3.11)	(0.83)	(0.84)	(12.32)
NTCA (-1)	-0 160***	-0.169***	-0.166***	-0.143***	-0.174***
	(-27.3)	(-21.8)	(-25.8)	(-24.2)	(-27.9)
Float * NTCA (-1)	0.011	0.012	0.021**	-0.021*	0.000
	(1.17)	(1.19)	(2.09)	(-1.75)	(0.03)
Constant	-0.009***	-0.009***	-0.008**	-0.008***	-0.009***
	(-2.98)	(-3.04)	(-2.56)	(-2.65)	(-2.79)
Year Dummies	Yes	Yes	Yes	Yes	Yes
No. Economies.	166	152	152	161	154
No. Obs.	4506	4007	4007	4065	3690
No. weight = 0	282	266	284	242	284
No. weight < 0.3	528	500	494	468	425
R2 Overall	0.21	0.22	0.21	0.19	0.24
RMSE	0.029	0.029	0.029	0.028	0.030

Notes. See notes to Table 7. Estimation method is Stata robust regression command (“rreg”).

Table 9. Trade Balance Response to Trade and Non-Trade Imbalances
Pooled OLS Regressions

	(1)	(2)	(3)	(4)	(5)
Classification:	BT	JS	OST	RR	IMF
Dep. variable	*Δ*TB	*Δ*TB	*Δ*TB	*Δ*TB	*Δ*TB
Float	0.004*	-0.000	0.005**	0.001	0.002
	(1.83)	(-0.23)	(2.09)	(0.53)	(0.67)
TB (-1)	-0.216***	-0.244***	-0.229***	-0.207***	-0.269***
	(-8.09)	(-9.30)	(-9.01)	(-8.27)	(-8.89)
Float * TB (-1)	-0.069	-0.025	-0.074*	-0.097***	0.009
	(-1.43)	(-0.89)	(-1.81)	(-3.08)	(0.30)
NTCA (-1)	-0.064***	-0.074**	-0.073***	-0.040**	-0.076
	(-3.29)	(-2.53)	(-2.83)	(-2.39)	(-1.54)
Float * NTCA (-1)	0.028	0.018	0.030	-0.045	0.036
	(0.43)	(0.42)	(0.61)	(-1.10)	(0.53)
Constant	0.003***	-0.011***	-0.028***	-0.017***	-0.015***
	(3.43)	(-4.94)	(-17.7)	(-9.64)	(-3.04)
Year Dummies	Yes	Yes	Yes	Yes	Yes
No. Economies.	166	152	152	161	154
No. Obs.	4552	4023	4023	4086	3706
R2 Overall	0.14	0.15	0.16	0.14	0.16
RMSE	0.063	0.064	0.063	0.060	0.064

Notes. Asterisks, ***, **, *, denote the significance level at 1%, 5% and 10% respectively. Driscoll-Kray (1998) t-statistics are presented in parentheses. RMSE - the root mean square error of the regression. CA (current account balance) is divided by total trade (X+M) and demeaned by country. *Δ* is the first-difference operator.

Table 10. Continuous measures of exchange rate flexibility
Pooled OLS regression

	(1)	(2)	(3)	(4)
	Current Account	Current Account	Trade Balance	Trade Balance
Flexibility index:	BTCON	EVOL	BTCON	EVOL
Dep. Variable:	*Δ*CA	*Δ*CA	*Δ*TB	*Δ*TB
Flexibility index	0.210***	0.039	0.247***	0.050
	(2.29)	(0.81)	(2.83)	(1.18)
CA (-1)	-0.373***	-0.394***		
	(-9.58)	(-7.79)		
Flexibility *CA(-1)	-1.66*	-0.352		
	(-1.81)	(-0.30)		
TB (-1)			-0.220***	-0.213***
			(-8.78)	(-10.6)
Flexibility *TB (-1)			-0.971	-0.667***
			(-1.20)	(-2.20)
Constant	-0.051***	-0.051***	-0.004***	0.004***
	(-32.5)	(-33.9)	(-3.30)	(3.61)
Year Dummies	Yes	Yes	Yes	Yes
No. Economies.	164	152	169	155
No. Obs.	4447	3947	4931	4330
R2 Overall	0.23	0.24	0.16	0.16
RMSE	0.069	0.069	0.067	0.066

Notes. Asterisks, ***, **, *, denote the significance level at 1%, 5% and 10% respectively. Driscoll-Kray (1998) t-statistics are presented in parentheses. RMSE - the root mean square error of the regression. CA (current account balance) and TB (trade balance) are divided by total trade (X+M) and demeaned by country. *Δ* is the first-difference operator.

Table 11. Scaling by GDP

	(1)	(2)
Dependent variable:	ΔCA	ΔTB
	Coefficient of exchange rate flexibility interacted with	
Flexibility measure	Lagged CA	Lagged TB
	Pooled OLS regressions	
BT	-0.070 (-1.63)	-0.114*** (-8.20)
JS	-0.032 (-0.65)	-0.212*** (-4.52)
OST	-0.116** (-2.09)	-0.185** (-2.56)
RR	-0.068** (-2.08)	-0.035 (-0.56)
IMF	0.011 (0.23)	-0.038 (-0.50)
RMSE	-0.698 (-1.54)	-0.796* (-1.82)
EVOL	3.40*** (7.14)	-0.020*** (-9.85)
	Robust regressions (rreg)	
BT	-0.042** (-2.42)	-0.098***(-8.48)
JS	-0.085*** (-5.70)	-0.091*** (-8.70)
OST	-0.124*** (-3.44)	-0.125*** (-10.5)
RR	-0.026 (-1.33)	-0.025* (-1.75)
IMF	0.093 (0.69)	-0.049*** (-4.22)
RMSE	0.030*** (2.66)	-1.16*** (-9.92)
EVOL	3.67*** (3.13)	-4.66*** (-9.14)

Notes. The table records the interaction coefficient with either a float dummy (BT, JS, OST, RR, IMF) or a continuous flexibility measure (BTCON, EVOL) in equation (1) for the lagged current account divided by GDP (column (1)) and the lagged trade balance divided by GDP (column (2)). The figures in parentheses are heteroscedasticity-robust *t*-statistics.

Table 12. Current Account Persistence
Median Regressions

	(1)	(2)	(3)	(4)	(5)
Classification:	BT	JS	OST	RR	IMF
Dep. variable	ΔCA	ΔCA	ΔCA	ΔCA	ΔCA
Float	0.002**	0.002*	0.001	-0.000	0.003**
	(2.51)	(1.91)	(1.39)	(-0.50)	(2.35)
CA (-1)	-0.284***	-0.252***	-0.264***	-0.264***	-0.298***
	(-10.4)	(-6.87)	(-12.7)	(-12.7)	(-10.8)
Float * CA (-1)	-0.056	-0.063	-0.112***	-0.033	0.008
	(-1.45)	(-1.58)	(-2.71)	(-0.74)	(0.16)
Constant	0.002	-0.004	-0.014***	-0.012**	-0.016***
	(1.01)	(-1.05)	(-3.64)	(-2.56)	(-3.94)
Year Dummies	Yes	Yes	Yes	Yes	Yes
No. Economies.	166	152	152	161	154
No. Obs.	4517	4077	4077	4138	3690
R2 Overall	0.19	0.18	0.18	0.17	0.30

Notes. See notes to Table 3. Estimation method is Stata median regression with standard errors clustered at the country level (“qreg2”) (Parente and Santos Silva, 2016).

5 Inside the Black Box

To the extent that there exists a current account persistence puzzle, the theoretically expected adjustment mechanisms under floating exchange rates must not be operating fully. On the assumption that adjustment of current account imbalances takes place mainly through real effective exchange rate movements, we can examine each stage in the adjustment process:

1) Does the real exchange rate move in the expected direction in response to an imbalance in trade or financial flows, particularly under floating?

2) Are real exchange rates more volatile under floating?

3) Do larger real exchange rate movements trigger larger corrections in the current account balance?

In this section, we examine each of these questions in turn. To address question (1), we estimate the following regression:

$$\Delta lnR_{it} = a - blnR_{it-1} + c\Delta lnR_{it-1} + eTB_{it-1} + fNTCA_{it-1} + u_t \qquad (2)$$

where R_{it} is the real effective exchange rate of country *i* in year *t* (an increase denoting an appreciation), *TB* is the trade balance and *NTCA* is the non-trade current account balance, both as a proportion of total trade and relative to their country means, and *u* is a random error. Equation (2) tests how the real exchange rate reacts to the trade and non-trade elements of the current account in the previous year.

Table 13 shows the results of estimating equation (2), first for the whole sample, and then separately for pegs and floats, as defined by the BT classification. In column (1), which is the whole sample, both parts of the current account balance have positive coefficients, as expected, and the coefficients are significant at the 5% level. In column (2), which is pegs, both are insignificant, largely because the coefficients are much smaller than in column (1). In column (3), which is floats, the coefficients are quite a bit larger than in column (1) and again similar for the two parts of the current account, and significant at the 5% level for the trade balance and at 10% for financial flows. What this indicates is that, as expected, under floating a positive (negative) current account imbalance tends to induce a real exchange rate appreciation (depreciation), whereas this effect is inhibited by an exchange rate peg.

To address the second question, we compare the standard deviation of the real effective exchange rate (in logs) under floats and under pegs. Table 14 shows the figures for each of the five binary classifications. Floats always have greater real exchange rate volatility, although the figures differ somewhat across the classifications.

To investigate the third question, whether larger real exchange rate movements will induce bigger shifts in the current account balance, we test whether the current account balance is more strongly mean-reverting when real exchange rate movements are larger. We estimate the following regression:

$$\Delta CA_{it} = a + b\Delta lnR_{it} - cCA_{it-1} - e(abs(\Delta lnR_{it}) * CA_{it-1}) + u_{it} \quad (3)$$

where *CA* and *R* are respectively the current account balance and the real effective exchange rate index for country *i* at time *t*, *Δ* is the first-difference operator, *u* is a random error and *a*, *b*, *c* and *e* are parameters to be estimated. For the current account balance to be more strongly mean-reverting when real exchange rate movements are larger requires $e>0$. Since the real exchange rate is expected to appreciate to correct a positive imbalance and to depreciate to correct a negative imbalance, but in each case a larger movement is expected to make the current account balance less persistent, the absolute value of the real exchange rate change has to appear in the interaction term.

The results of estimating equation (3) are shown in Table 15. The first column shows the pooled OLS results for the current account balance, and in the second column the estimation is by robust regression methods. The third and fourth columns repeat the exercise for the trade balance. In each case the interaction term between the absolute value of the change in the real exchange rate and the lagged current account or trade balance is negative and easily significant at the 1% level. This confirms that larger movements in the real exchange rate are associated with a swifter return of the current account or trade balance towards its equilibrium value, as predicted by theory.

The evidence suggests, therefore, that the adjustment process after a current account imbalance works. Real exchange rates tend to move in the expected direction, to the extent that they are not constrained from doing so, and larger real exchange rate movements induce quicker corrections of the imbalance.

Table 13. Real Exchange Rate Response to Trade and Non-Trade Imbalances
Pooled OLS Regressions

	(1)	(2)	(3)
Sample:	All	BT pegs	BT floats
Dep. variable	*Δ*lnR	*Δ*lnR	*Δ*lnR
*Δ*lnR (-1)	-0.077*	-0.106**	-0.048
	(-1.84)	(-2.04)	(-0.99)
lnR (-1)	-0.088***	-0.084**	-0.084***
	(-3.32)	(-2.29)	(-3.39)
TB (-1)	0.046**	0.019	0.085**
	(2.09)	(0.67)	(2.24)
NTCA (-1)	0.051**	0.031	0.082*
	(2.24)	(1.19)	(1.67)
Constant	-0.036***	-0.040***	0.002
	(-10.2)	(-9.75)	(0.59)
Year Dummies	No	No	No
No. Economies.	149	144	114
No. Obs.	3653	2314	1259
R2 Overall	0.07	0.12	0.09
RMSE	0.088	0.076	0.103

Notes. Asterisks, ***, **, *, denote the significance level at 1%, 5% and 10% respectively. Driscoll-Kray (1998) t-statistics are presented in parentheses. RMSE - the root mean square error of the regression. R is the real effective exchange rate (2% trimmed). TB (trade balance) and NTCA (non-trade current account balance) are divided by total trade (X+M) and demeaned by country. *Δ* is the first-difference operator.

Table 14. Real Exchange Rate Volatility under Floats and Pegs

	Standard deviation of change in log of real effective exchange rate*		
Classification	Floats	Pegs	Ratio Floats to Pegs
BT	0.113	0.084	1.35
JS	0..106	0.078	1.36
OST	0.124	0.079	1.57
RR	0.099	0.083	1.19
IMF	0.108	0.093	1.16

Note. * Trimmed 2% top and bottom.

Table 15. Size of Real Exchange Rate Movements and Current Account Adjustment

	(1)	(2)	(3)	(4)
	Current Account	Current Account	Trade Balance	Trade Balance
Estimation method:	Pooled OLS	Robust regression	Pooled OLS	Robust regression
Dep. Variable:	*Δ*CA	*Δ*CA	*Δ*TB	*Δ*TB
*Δ*lnR	-0.057***	-0.052***	-0.055***	-0.044***
	(-3.47)	(-6.98)	(-3.30)	(-6.07)
CA (-1)	-0.232***	-0.223***		
	(-7.25)	(-18.0)		
|*Δ*lnR| *CA(-1)	-1.34***	-0.911***		
	(-4.94)	(-9.17)		
TB (-1)			-0.153***	-0.117***
			(-6.21)	(-11.4)
|*Δ*lnR| *TB (-1)			-0.636***	-0.490***
			(-3.33)	(-5.82)
Constant	0.005***	-0.023***	-0.001	-0.015***
	(16.4)	(-4.70)	(-1.53)	(-3.19)
Year Dummies	Yes	Yes	Yes	Yes
No. Economies.	150	150	152	152
No. Obs.	3791	3791	4034	4034
R2 Overall	0.24	0.31	0.15	0.16
RMSE	0.060	0.042	0.059	0.043

Notes. Asterisks, ***, **, *, denote the significance level at 1%, 5% and 10% respectively. Driscoll-Kray (1998) t-statistics are presented in parentheses. RMSE - the root mean square error of the regression. CA (current account balance) and TB (trade balance) are divided by total trade (X+M) and demeaned by country. R is the real effective exchange rate (2% trimmed). *Δ* is the first-difference operator.

6 Conclusions

Year-to-year variations in the financial flows component of the current account are almost as great as in the trade component, but the financial flows component has very different dynamics, and responds differently to movements in the real exchange rate. The financial flows are subject to valuation effects similar to those that are familiar in relation to a country's net asset position. The observation that current account adjustment takes place through the trade balance rather than through the financial flows component of the current account forms the basis of our re-investigation of the so-called "persistence puzzle" (that the current account does not appear to adjust any more quickly under floating than under pegged regimes). Our conclusions are as follows.

1) In contrast to the case of the current account balance, there is no persistence puzzle in the trade balance, which is more strongly mean-reverting in more flexible exchange rate regimes, whether or not outlier-robust methods are used.
2) The financial component of the current account shows only slow mean reversion under any exchange rate regime.
3) The trade balance carries the burden of adjustment for the whole current account, but it does not respond in the same way to imbalances in financial flows as to trade imbalances, particularly under floats. This is the proximate cause of the current account persistence puzzle.
4) There is some evidence that the current account persistence puzzle is mainly a consequence of outliers in the regression; the puzzle tends to disappear when various alternative methods of dealing with outliers are applied.
5) The data confirm that real exchange rates are an important vehicle for current account adjustment. Real exchange rates seem to move in the expected manner in reaction to current account imbalances, particularly under floating, and larger real exchange rate movements stimulate faster current account adjustment.
6) These results are consistent across alternative binary exchange rate regime classifications and continuous measures of exchange rate flexibility, so they are unlikely to be just a consequence of weaknesses in a particular classification scheme.

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Appendix

Table A. Country List

Industrial

Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, United Kingdom, United States

Financial Offshore

Antigua and Barbuda, Bahamas, Belize, Cyprus, Grenada, Malta, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Samoa, Singapore

Oil Exporting

Algeria, Bahrain, Ecuador, Equatorial Guinea, Gabon, Iran, Nigeria, Saudi Arabia, Trinidad and Tobago, Venezuela

Emerging Markets

Bulgaria, Chile, China, Colombia, Czech Republic, Hungary, Israel, Malaysia, Mexico, Morocco, Pakistan, Philippines, Poland, Russia, South Africa, Ukraine, Uruguay

Other Developing

Armenia, Bolivia, Burundi, Cameroon, Central African Republic, Costa Rica, Cote d'Ivoire, Croatia, Dominica, Dominican Republic, Fiji, Gambia, Georgia, Ghana, Guyana, Lesotho, Macedonia, Malawi, Moldova, Nicaragua, Papua New Guinea, Paraguay, Sierra Leone, Slovak Republic, Solomon Islands, Togo, Tonga, Tunisia, Uganda, Zambia