Capital inflows, crisis and recovery in small open economies

Raza, Hamid; Zoega, Gylfi; Kinsella, Stephen

Publication date:
2017

Document Version
Publisher's PDF, also known as Version of record

Capital inflows, crisis and recovery in small open economies

Hamid Raza[a], Gylfi Zoega[b,c,],[1] Stephen Kinsella[d]

a Aalborg University, Denmark
b University of Iceland, Saemundargata, 101 Reykjavik, Iceland
c Birkbeck College, University of London, Malet Street, Bloomsbury,London WC1E 7HX
d Kemmy Business School, University of Limerick, Ireland

November 2017

Abstract

We compare two small open economics, Iceland and Ireland, that experienced a capital inflow through their banking systems in the period preceding the 2008 financial crises but differ in their currency arrangements. Both countries have mostly recovered from their respective crises, but the differences in the way their economies adjusted are interesting. The evidence suggests that changes in the real exchange rate served as the adjusting mechanism for Iceland's current account while in Ireland domestic demand compression served as the main adjustment mechanism. We also explore the adjustment to the crisis in three other Eurozone economies and find that they were similar to the one in Ireland.

Keywords: Sudden stop, real exchange rates, demand compression.
JEL Codes: F32

[1] Corresponding author: Gylfi Zoega, Department of Economics, University of Iceland, 107 Reykjavik, Iceland. Tel: +354 525 5239. Email: gz@hi.is. This work was supported by the Icelandic Research Fund (IRF – grant number 130551-052) and the University of Iceland Research Fund.

1. Introduction

In the years preceding the global financial crisis that started in 2008, capital moved from current-account surplus countries (such as China, Germany, Japan and the Netherlands) to deficit countries (such as the United States, Spain, the U.K., Ireland, Portugal, Greece and Iceland), and this development set the stage for the crisis by elevating asset prices and real exchange rates to unsustainable levels in the deficit countries. Subsequently, a sudden stop to capital flows entering the deficit countries caused financial distress in banks and the public sector, starting with the American subprime crisis in 2007.[2]

While the crisis is sometimes viewed as a debt crisis, requiring debt forgiveness or restructuring, the necessary adjustment of real exchange rates is also turning out to be difficult to implement, especially within the euro zone. The latter problem has made some economists and policy makers recommend that countries such as Greece, which find internal devaluation difficult, be allowed to leave the euro zone temporarily in order to enjoy the benefits of lower real exchange rates through lower imports and a greater demand for domestic products.[3]

The sudden stop of capital inflows into Iceland and Ireland in 2008 caused a banking crisis in both countries, as well as a currency crisis in Iceland and a government debt crisis in Ireland. While the economies of both countries have at the time of this writing mostly recovered from the slump that followed the financial crises, the current-account adjustment differed between the two countries.

Despite a large number of studies on currency regimes and current account dynamics, the adjustment process under different currency regimes is the least understood. In particular, the adjustment of deficit countries after the recent crisis has become highly controversial with no consensus emerging. In the case of currency union, the standard theoretical macro models imply adjustment by targeting real exchange rates along the use of an active fiscal policy (see, e.g., Allsopp and Vines (2008)).[4] The empirical studies on this issue have proposed varying degree of explanations. Some of the recent empirical studies, while relying on panel

[2] In 2007 the current account surplus of Germany was 263 billion dollars and that of the Netherlands 67 billion dollars. Austria, Belgium and Finland also had surpluses but they were much smaller in dollar terms. The counterpart to this surplus of 330 billion coming from Germany and the Netherlands there was a deficit in Spain of 144 billion, Italy of 51 billion, Greece with 45 billion, France with 26 billion, Portugal with 21 billion and Ireland with 14 billion dollars. Outside the euro zone Sweden had a surplus and the U.K. a big deficit. Source: IMF.

[3] See Krugman (2015) and Sinn (2014a, 2014b).

[4] Gali and Monacelli (2008) present detailed analyses of real exchange rate as an adjustment mechanism in a standard New Keynesian model for a small open economy with a fixed exchange rate. See, Carlin (2012) for a critique.

data, have found contrasting results regarding the role of currency regimes and current account adjustment (see, e.g., Chinn and Wei (2013) and Martin (2016)). Hence, the adjustment process in small open economies in general, and Eurozone in particular remains unclear.

This paper attempts to improve the understanding of the current account adjustment in small open economies with a focus on the role of currency regimes. Using Iceland and Ireland as the natural experiments, we analyse the macroeconomic adjustment to the sudden stops of capital inflows in order to explore differences in the adjustment mechanisms between the system of floating exchange rates and a currency union. In addition, we also explore the adjustment to the crisis in three other peripheral Eurozone countries – Italy, Spain and Portugal.

The paper is organised as follows. Section 2 highlights the destabilising nature – sudden stops - of international capital flows in small open economies. Section 3 presents a brief history of the recent credit booms and busts in Iceland and Ireland. Section 4 reviews the relevant literature on the current account adjustment while highlighting the role of currency regimes. Section 5 investigates the current account adjustment in Iceland and Ireland. Section 6 concludes this paper.

2. Sudden stops

Financial crises in emerging market economies are usually triggered by a sudden stop of capital inflows.[5] Capital inflows sometimes go through the banking system – as in East Asian countries in the years preceding their financial crises in 1997 – or through portfolio investments – as in Latin America in the 1998-99.[6] Sudden stops to capital inflows occur when the pace of the inflow falls or an inflow becomes an outflow. As described by Calvo and Talvi (2005) and Calvo et al. (2006), a sudden stop is usually triggered by a sudden and widespread increase in interest rates facing emerging economies. Sudden stops tend to be caused by external factors and the ensuing interruption to capital flows originating in international financial markets rather than by a coordinated reassessment of the fundamentals of individual countries. However, domestic vulnerabilities – such as foreign currency denominated loans and large current account deficits – determine which countries are affected. Both Iceland and Ireland had domestic financial vulnerabilities at the time of the

[5] See Calvo (1998) on sudden stops.
[6] Calvo and Talvi (2004) describe the sudden stop of capital flows to South American in the late 1990s.

crises in 2009. In Ireland house prices had reached unsustainable levels and the debt of businesses and households had risen. Stock prices in Iceland had increased by a factor of ten in the five years preceding the collapse in 2008, driven by increased leverage in the form of foreign currency loans.

A low risk premium in international capital markets contributed to the capital inflows in both countries, the increase in household debt in Ireland and the expansion of the financial sector and non-financial business sector debt in Iceland, the generation of a property bubble in Ireland and a stock-market bubble in Iceland. These financial fragilities, as well as the foreign-exchange rate denominated loans in Iceland and a large current account deficit made both countries vulnerable to a sudden stop of capital flows. When liquidity dried up in the global markets in 2008, this led to a sudden stop of capital inflows and a severe financial crisis in both the countries.

3. A brief history of two credit booms

Ireland experienced a credit-driven house price bubble from 2002 to 2007 following years of catching up with European living standards during its 'Celtic Tiger' period from 1994 to 2002. Higher house prices increased Irish consumption through a wealth effect while a stock market boom and a high real exchange rate reduced household savings in Iceland.[7,8]

Iceland privatised its banking system in 2002-2003 and the newly privatised banks borrowed heavily abroad in 2004-2007 to fund both foreign direct investment projects and a ballooning current account deficit.[9] The expansion of the banking system was mainly funded through borrowing from European banks. There was also demand for credit denominated in foreign currencies by domestic residents to fund stock market investments and corporate takeovers, often placed in limited-liability holding companies so that the owners would enjoy the profits without taking on the risk. The appreciation of the domestic currency from 2003 to 2007 further added to profits due to the FX debt. In addition, there was the carry trade involving foreign investors making portfolio investments to profit from the interest rate differential and the currency appreciation (value of assets in October 2008 was 37% of GDP).

[7] See Halldorsson and Zoega (2010), Benediktsdottir et al. (2011) and Johnsen (2014) on Iceland's financial crisis. Johnsen summarizes and extends the results of a parliamentary investigation. See Honohan (2010), Lane (2011, 2014), Bergin et al. (2011), Kinsella (2014) and Ó'Riain on the Irish crisis.

[8] The fall of national saving fell and the rise of investment made the current account deficit increase from 4.6% of GDP in 2003 to 23.8% in 2006 and 16.2% in 2007. A similar current account deficit increase from 0.6% of GDP in 2001 to 5.7% of GDP in 2008 happened in Ireland.

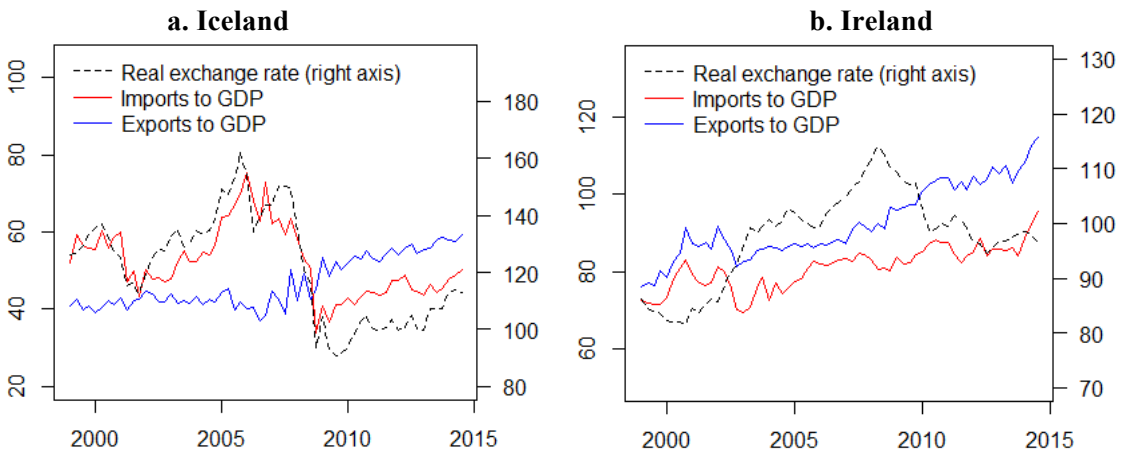
[9] The assets of the three largest banks in Iceland increased from being 174% of GDP in 2003 to becoming 744% at the end of 2007. See Benediktsdottir et al. (2011).

The freezing up of international credit markets changed the capital inflow in Iceland and Ireland into an outflow in the spring of 2008 and the collapse of Lehman Brothers made the Icelandic currency collapse in October of the same year while Ireland did not suffer a balance of payments crisis due to its membership of the Eurozone. All three main Icelandic banks went into receivership and a large part of the non-financial business sector became technically bankrupt because of foreign-currency denominated debt while the European Central Bank provided liquidity support to the Irish banking system.

Table A1 in the appendix shows the effect of the capital inflows on the real economy in the two countries. In both countries consumption and investment grew rapidly until 2007 and fell in subsequent years. Imports grew during the boom years and fell after the crisis. Credit grew rapidly up till the crisis and contracted in the crisis. The current account was in a deficit during the boom and then turned into a surplus. Comparing the two countries, the magnitude of the investment boom before 2008 and the investment slump in the years that followed is much greater in Iceland. Similarly, the real exchange rate is more volatile in Iceland and the current account deficit before the crisis was higher in Iceland than in Ireland. In contrast, unemployment increased much more in Ireland after 2007.

Figures 1a and 1b show a clear distinction in the dynamics of real exchange rates and trade flows in Iceland and Ireland. There is a clear co-movement in the import share and real exchange rate in Iceland, while the real exchange rate apparently does not seem to be related to trade flows in Ireland. The fall in the real exchange rate in Iceland in 2008 considerably reduced the demand for imported goods, thus improving the current account balance through the standard trade balance effect.

Figure 1. Real exchange rates and trade flows



Time period: 1999Q1-2014Q4. Real exchange rate measured as relative prices, imports as a share of GDP, exports as a share of GDP. Exports and imports include both goods and services. Real exchange rate is on the right axis.

4. Relevant lierature

There is sufficient empirical literature on current account adjustments and currency regimes, most of which is relatively recent. We review some of the main studies covering advanced economies, which also include European economies.

There are studies that find that a currency regime does not matter for the adjustment pattern. For example, Chinn and Wei (2013) compile data for a panel of more than 170 countries over the period 1971-2005 to investigate the relationship between exchange rate regimes and current account adjustments. They find that real exchange rate affects the current account adjustment but the nominal exchange rate does not matter. In explaining this result, they extend their analysis to the relationship between nominal and real exchange rate dynamics, finding that there is no strong monotonic relationship between nominal flexibility and the convergence speed of real exchange rate towards its long-run equilibrium. The authors conclude that the mean reversion (current account adjustment) takes place irrespective of the exchange rate regime. Their analyses rule out the benefits of a floating currency in the process of correcting external imbalances.

The analysis presented in Chinn and Wei is challenged in a recent study by Martin (2016). The author uses a panel of 180 countries covering the period 1960-2005, finding robust evidence for floating regimes delivering a faster current account adjustment than fixed regimes for non-industrial countries. However, the results in the case of industrial countries (which include European peripheral countries) are unclear, varying to a larger degree with model specifications. Algieri and Bracke (2011) analyse the current account dynamics in 23 industrial and 22 emerging market economies over the period 1973-2006. They identify 70 episodes of current account adjustments in 23 industrial and 22 emerging market economies. The authors divide these episodes into three main categories, differentiating the underlying factors behind current account adjustment. i) Internal adjustment, where the current account adjustment is the result of a slowdown in growth due to domestic demand compression without much movement in real exchange rate. This category of adjustment in their analyses constituted majority of the episodes. ii) External adjustment, where the current account adjustment was primarily due to real exchange rate depreciation. iii) Mixed category, where adjustment was the result of both real exchange rate and slowdown in economic growth. The authors finally conclude that the adjustment pattern cannot be explained by exchange rate regime but is explained by economic conditions and business cycle positions.

In general, most of the studies find that real exchange rate (proxy for competitiveness) amongst other factors is an important variable for the current account dynamics. Ghosh et al. (2013) investigate the dependence of current account dynamics on exchange rate flexibility. The authors construct a bilateral trade-weighted real exchange rate volatility measures for 159 countries using data sample 1980-2010, finding a significant impact of the exchange rate on the current account dynamics. The authors conclude that flexible exchange rates result in a rapid adjustment of the current account in all economies (advanced, EM, and developing), and the persistence of current account imbalance is lower under flexible regimes. Gnimassoun and Mignon (2013) investigate the link between exchange rate misalignments and current account imbalances for a panel of 22 industrialised countries over the period 1980-2011. The authors decompose the real exchange rate time series into episodes of overvaluations and undervaluations. They implement estimation of a panel smooth-transition regression model using nonlinear specification, finding that current account imbalances are affected by exchange rate misalignments in general. Their results for the euro area in particular suggest that overvaluations are associated with increased persistent imbalances as compared to undervaluations. Gosse and Serranito (2014) investigate the effect of the real exchange rate on the current account in a panel of 21 OECD countries over the period 1974-2009. Their findings regarding the Eurozone economies indicate that real effective exchange rate is one of the most important factors in explaining current account dynamics in the short-run. Belke and Dreger (2013) analyse the current account dynamics for a panel of 11 euro area members over the period 1982-2011. They find significant effects of the real exchange rate on the current account balance in the euro area. Furthermore, the authors propose adjustment in the deficit countries by increasing competitiveness while arguing against any adjustment in the surplus countries. The authors believe that adjustment in surplus countries would result in loss of wealth at the entire euro level.

In the case of euro area, there are also studies which do not find any significant relationship between real exchange rate and current account balance. For example, Gabrisch and Staehr (2013) implement a VAR model to investigate the causality between relative unit labour costs and current account balance to GDP for a panel for 27 EU countries, using a sample for the period 1995-2011. They find that current account balance affects relative unit labour costs, but find no evidence of relative unit labour costs affecting the current account. Atoyan et al. (2013) investigate the relationship between the current account and real effective exchange rates for a panel of EM economies for the sample 2000-2012. The authors introduce an interacting dummy in the model for the crisis. Their results indicate that the real

exchange rate does not play any significant role in explaining the current account dynamics in the boom years for advanced Europe (including peripheral countries). Furthermore, the authors find that the coefficient on interacting dummy is significant, concluding that the effects of the real exchange rate in the post-crisis period are significant. Lane and Milesi-Ferretti (2012) investigate the current account adjustment in advanced and emerging economies following the recent financial crisis. They find that the post-crisis contractions in current account balances were sharp in those countries whose current account balances exceeded levels explained by fundamentals. The authors find no evidence of real exchange rates affecting the post-crisis current account dynamics in the euro zone, but find evidence for domestic demand compression playing a crucial role in the current account adjustment. We now move to the formal testing of the adjustment mechanisms in a floating exchange rate and a currency union.

5. Empirical analysis

We first show how the external balance can be attained through either real exchange rate adjustment or demand compression before describing the data and presenting our empirical results.

5.1 Adjustment

Assuming a Cobb-Douglas utility function in non-traded goods (*N*) and traded goods (*T*)

$$U = N^{\alpha}T^{1-\alpha}, \tag{1}$$

one can show how a trade balance can be attained. Maximising utility with respect to a budget constraint with the real exchange rate *e* defined as the relative price of traded goods in terms of non-traded goods, we find that the first-order condition of utility maximisation is

$$(1-\alpha)N = \alpha e T. \tag{2}$$

We define the current account deficit *CAD* as the difference between the demand for tradable goods *T* and the output of tradable goods *Y*

$$CAD = T - Y. \tag{3}$$

A sudden stop will make the current account deficit disappear and in some cases become negative. Because in the short run the output of tradable goods is fixed, this implies that the fall in the demand for tradable goods equals (at least) the current account deficit:

$$-\Delta T = CAD \tag{4}$$

Taking the logarithm of equation (2), first differencing and inserting equation (4) gives

$$\frac{\Delta e}{e} = \frac{\Delta N}{N} + \frac{CAD}{T}. \tag{5}$$

It follows that the larger the current account deficit, measured as a share of total demand for tradable goods, the larger the domestic demand compression and/or the real exchange rate depreciation following a sudden stop of capital inflows.

The size of the sum of the relative change in domestic demand $\Delta N/N$ and the real exchange rate $\Delta e/e$ can then be written as

$$\frac{CAD}{T} = \frac{T-Y}{T} = 1 - \frac{Y}{T}, \tag{6}$$

which says simply that the larger the ratio of domestic output of tradable goods to the domestic demand of tradable goods, the smaller the adjustment. It follows that countries that import almost all of their tradable output suffer more severe changes in output and real exchange rates.

We now turn to exploring the effect of the sudden stop of capital flows into Ireland and Iceland in the fall of 2008 with the aim of testing for the two adjustment mechanisms.

5.2 Data and methodology

We analyse the current account adjustment to the sudden stop of capital inflows in the two economies. We will also include other peripheral countries (Portugal, Spain and Italy) for comparison.

The variables used in the empirical section are real domestic demand *(D),* real exchange rates *(REX),* and current account balance to GDP *(CAB).*The choice of variables in our empirical analysis is based on the recent experience of widening current account imbalances in Europe. Large capital inflows had the effects of appreciating real exchange rate and generating domestic demand booms in the deficit countries prior to the crisis. Hence, these two variables are considered the main determinants of the current account imbalances in Europe, as also described in Kang and Shambaugh (2013).[10]

[10] See a recent study by Kollmann et al. (2015) for a detailed discussion on the role of domestic demand in shaping the current account in the Eurozone.

Our data sample covers a time period from 1998Q2 to 2014Q3 for Iceland, and 1998Q2 to 2014Q1 for Ireland. Time series plots of all the variables are shown in Figures 2a and 2b, while the sources of the data are found in Table A2. We fit a Hodrick-Prescott (HP) trend in the current account and real exchange rate series to highlight the deviations from the trends. We note the larger domestic demand compression in Ireland following the crisis and the larger current account and real exchange rate fluctuations in Iceland.

Figure 2a. Iceland data

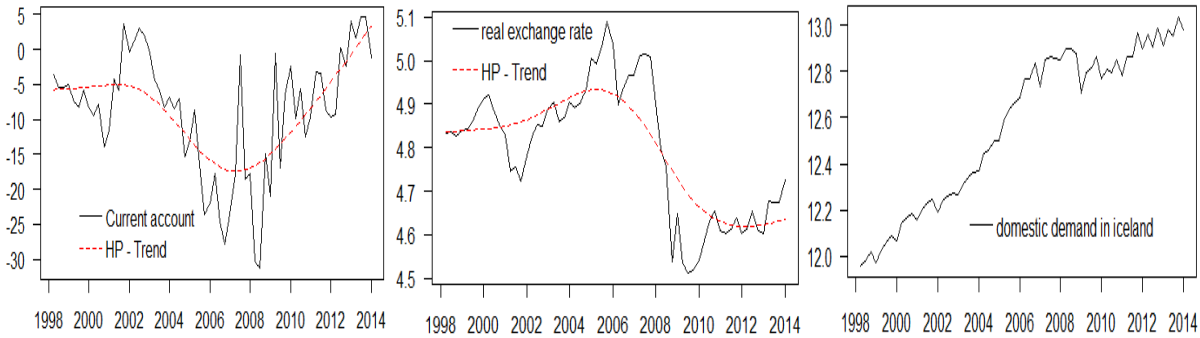
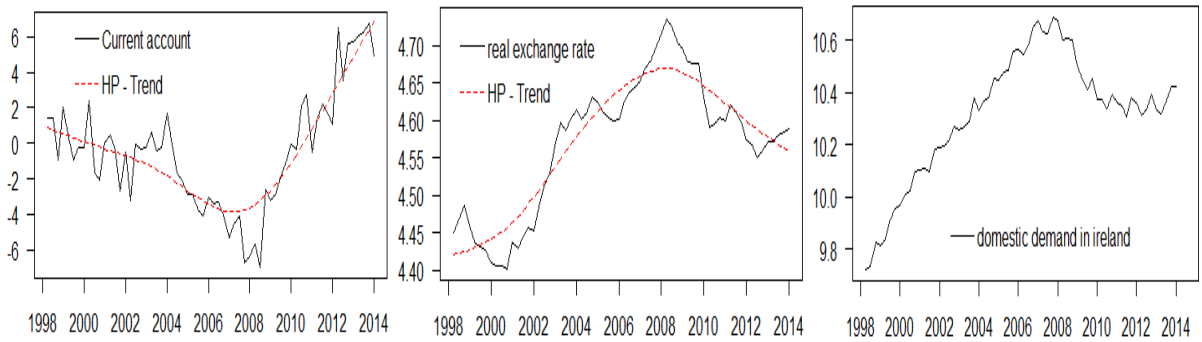


Figure 2b. Ireland data



We adjust all the variables for seasonal variations. We then test all the variables for a unit root using the Augmented Dicky-Fuller (ADF) and the Philips-Perron (PP) tests. The results of ADF and PP tests are sensitive to the presence of a structural break, therefore we extend our analysis to a unit-root structural break test, using the 'Innovational Outlier' (here after IO) test by Perron (1997). The IO model with a dummy for the shift in mean and trend is represented as follows

$$\Delta y_t = c + \alpha_1 y_{t-1} + \beta t + \theta_1 DU_t + \gamma_1 DT_t \sum_{j=1}^{k} d_j \Delta y_{t-j} + \varepsilon_t \qquad (7)$$

where Δ is the first-difference operator, ε_t is a white noise, *T* is the time index (t=1,...,T). DU_t in the model is a dummy for shift in mean at a potential break point *TB*, and DT_t is a dummy for the shift in trend; $DU_t = 1$, DT_t = *t- TB if t>TB,* and zero otherwise.

The results of the ADF and PP test indicate that domestic demand *(D)* and the real exchange rate *(REX)* exhibit a unit root while the current account balance to GDP *(CAB)* is stationary at levels in both countries. We compare these findings with the results of IO test in Table A3. While accounting for structural breaks, the IO test also suggests *(CAB)* is stationary while *(REX)* and *(D)* have unit roots. We then first-difference the log of domestic demand and the log of the real exchange rate to re-test for the presence of a unit root. We conclude that in both the countries, domestic demand *(D)* and the real exchange rate *(REX)* are *I(1),* whereas the current account balance *(CAB)* is *I(0).*

When we perform the unit testing procedure for other peripheral countries we find that domestic demand *(D)* and the real exchange rate *(REX)* are *I(1)* while the current account balance *(CAB)* is *I(0).*[11]

5.3 A model

We adopt VAR model to explore the relationship between the variables. The unrestricted VAR model in levels can be represented as:

$$x_t = \mu_0 + \prod_1 x_{t-1} + 1n\prod_p x_{t-k} + \phi Q + \varepsilon_t, \quad (t=1,2...T) \tag{8}$$

where μ_0 is a $p \times 1$ vector of constants, x_t is a $p \times 1$ vector of variables in the model, $\prod_i$ is a $p \times p$ matrix (*with i =1,..k*) of parameters, ε_t is a $p \times 1$ vector of error terms, and Q is a $p \times 1$ vector for the crisis dummy.[12]

We estimate a trivariate VAR model to investigate the role of the real exchange rate and domestic demand in the adjustment of current account balances. We initially set up a VAR model of the following order:

$$x_t = [\Delta REX, \Delta D, CAB] \tag{9a}$$

where ΔREX represents the log difference of the real exchange rate, ΔD represents the log difference of domestic demand, and *CAB* represents the current account balance to GDP.[13]

[11] The unit root tables for peripheral countries are not reported to conserve space.

[12] Q for Ireland takes the value of 1 during the crisis period of [2008Q2-2009Q1] and zero for the rest of the sample. Q for Iceland marks the regime shift due to the implementation of capital controls and this takes a value of 1 during the crisis and onwards, i.e. [2008Q2-2014Q3].

[13] We use four-period moving average of current account balance for Iceland and Ireland in order to reduce the effects of the crisis.

Consistent with the standard practice in VAR, all the variables in our analyses are stationary, aiming to generate a stationary vector, i.e., the variables (except current account to GDP) are first logged and then included in levels if stationary, or differenced if found to have a unit root. This strategy is widely adopted in the empirical literature. For example, a very similar approach can be found in Lee and Chinn (2006) where a bivariate VAR model of real exchange rates and current account balance is estimated. In their analyses, real exchange rate is expressed as first difference of the logged series while current account to GDP is in levels as it is found to be stationary. Similarly, Kano (2008) while investigating current account dynamics implements a trivariate VAR model with world real interest rates, net output, and current account to net output. After performing unit root tests, the author generates a stationary vector by including net output as a first difference of the logged series while interest rate and current account to net output are included in their levels.

After generating a stable VAR, we orthogonalize the innovations by imposing a Cholesky structure on the system and estimate a structural VAR (SVAR). For simplicity, the matrix with restrictions can be represented as follows,

$$\begin{array}{c} \\ \Delta REX \\ \Delta D \\ CAB \end{array} \begin{array}{c} \begin{array}{ccc} \varepsilon_{REX} & \varepsilon_{D} & \varepsilon_{CAB} \end{array} \\ \begin{bmatrix} * & 0 & 0 \\ * & * & 0 \\ * & * & * \end{bmatrix} \end{array}$$

where ε_{REX}, ε_{D}, ε_{CAB}, represents real exchange rate shock, domestic demand shock, and current account shock respectively. Zeros in the above lower triangular matrix represent the imposed restrictions, while * represents the estimated parameters.

The structure we impose on the model implies that the current account contemporaneously responds to real exchange rate. Our decision of real exchange rate preceding current account balance in the matrix is similar to several other studies (see, e.g., (Lee and Chinn, 2006; Narayan, 2013)), i.e., these studies argue that current account contemporaneously responds to the real exchange rate.[14] Finally, domestic demand precedes the current account in our first model. As discussed earlier, domestic demand boom - stemming from capital inflows - is considered a key determinant of the current account in the deficit countries.

The ordering of variables is crucial in a SVAR model. To overcome this issue, we extend our analyses to modelling all possible combinations of the three variables as follows,

[14] There are also studies which place current account before the real exchange rate (see, e.g., Kim and Roubini (2008); Ilzetzki et al. (2013)). Hence, there is no general consensus on the ordering of current account and real exchange rate in a VAR model.

$$x_t = [\Delta D, \Delta REX, CAB] \quad (9b)$$

$$x_t = [CAB, \Delta D, \Delta REX] \quad (9c)$$

$$x_t = [\Delta D, CAB, \Delta REX] \quad (9d)$$

$$x_t = [CAB, \Delta REX, \Delta D] \quad (9e)$$

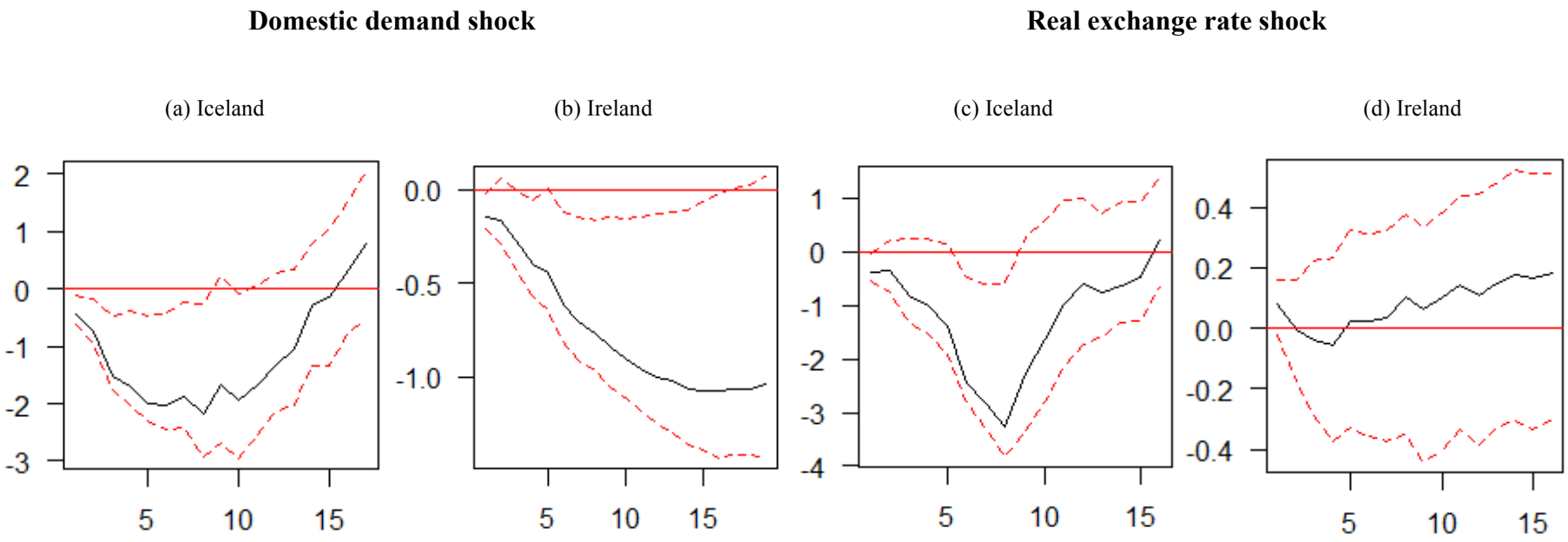
$$x_t = [\Delta REX, CAB, \Delta D] \quad (9f)$$

The above combinations are tested for the time series of all the individual countries in this paper. For all the combinations, we orthogonalise the innovations by imposing a Cholesky structure as discussed earlier. For robustness analyses, we also obtain generalised impulse responses by estimating a reduced form VAR and compare its results with different SVAR models. A reduced form VAR excludes contemporaneous effects, implying that the generalised impulse responses are not affected by the ordering of variables in the system. This comparison is a useful exercise to study how the underlying assumptions can affect our results.

5.4 Results and discussion

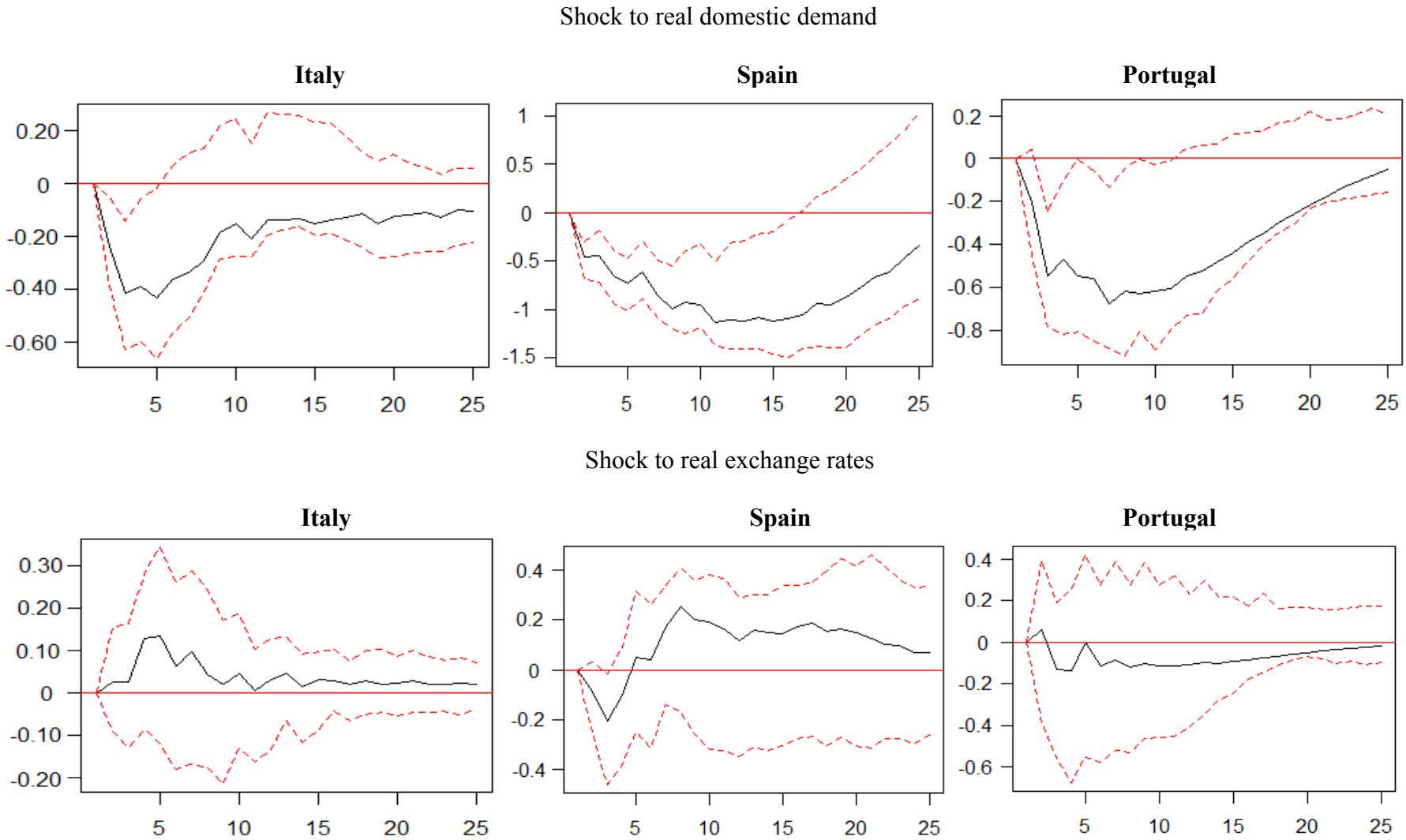
We estimate VAR(5) for Ireland and VAR(8) for Iceland based on the Hannan-Quinn information criterion (HQC) and final prediction error (FPE). Figures 3a and 3b show the orthogonalised impulse responses of CA balance to a domestic demand shock based on the ordering in equation (9a). The response of CA balance to a demand shock in both the countries is highly significant and follows a similar pattern. Figure 4 provides impulse responses for Portugal, Spain and Italy. The evidence clearly suggests that compression in domestic demand also significantly affects the current account balance in these euro zone countries.Figure 3c and 3d then show the orthogonalised impulse responses of the CA balance to a real appreciation in Iceland and Ireland. The CA goes into a deficit in Iceland, reaching its maximum after 2 years, while the effect is completely insignificant in Ireland. The same applies to other periphery countries as shown in Figure 4.

Figure 3. Impulse responses



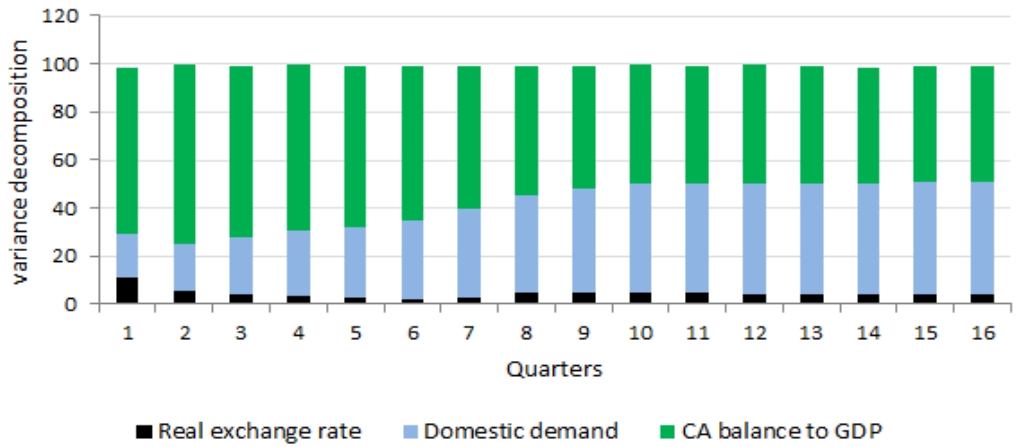
x-axis represents quarters, y-axis represents CAB (as a percentage of GDP). Red-dotted line represents 90% confidence band. Shock in (a) and (b) is 1% point change in the residual of domestic demand. Shock in (c) and (d) is a 1% point change in the residual of the real exchange rate.

Figure 4. Impulse responses for other peripheral countries



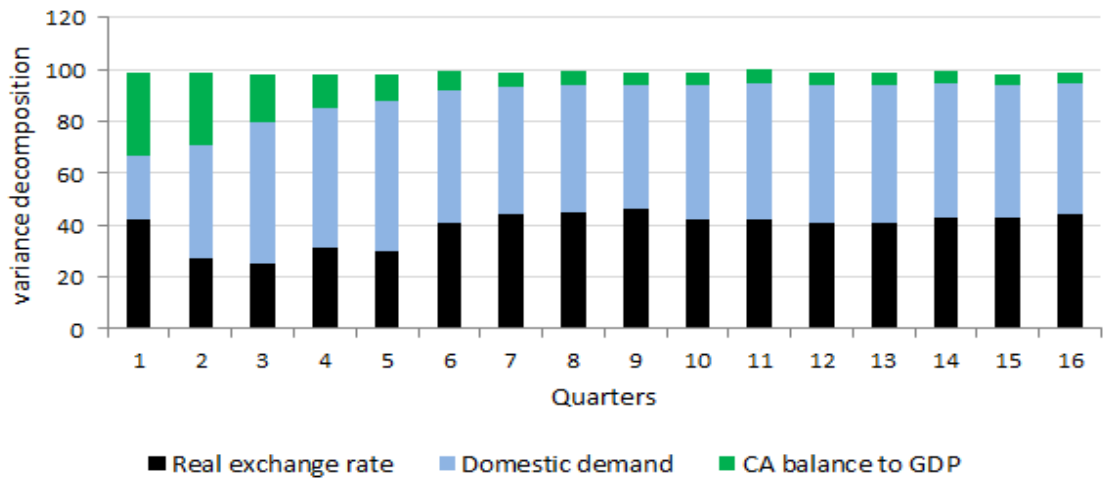
Data sample from 1999Q1 to 2015Q2.

Figure 5. Forecast error variance decomposition of CAB in Ireland



The x-axis represents quarters; y-axis represents the percentage of variation in current account balance explained by variables in the model.

6. Forecast error variance decomposition of CAB in Iceland



To further analyse the dynamics of the adjustment mechanism, we use the forecast error variance decomposition (FEVD) for the CA balance. Figure 5 shows that most of the variation in the Irish current account is explained by the domestic demand shocks and the current account balance shocks itself while the amount of current account adjustment attributed to the real exchange rate is almost negligible. In contrast, the results in Figure 6 strongly validate the argument that the adjustment mechanism in Iceland is strongly influenced by the real exchange rate in addition to domestic demand. Coming back to equation (5) above, we find that changes in the real exchange rate play a key role in the adjustment of the current account in Iceland while changes in domestic demand play that role in Ireland.

5.5 Comparing different VAR models

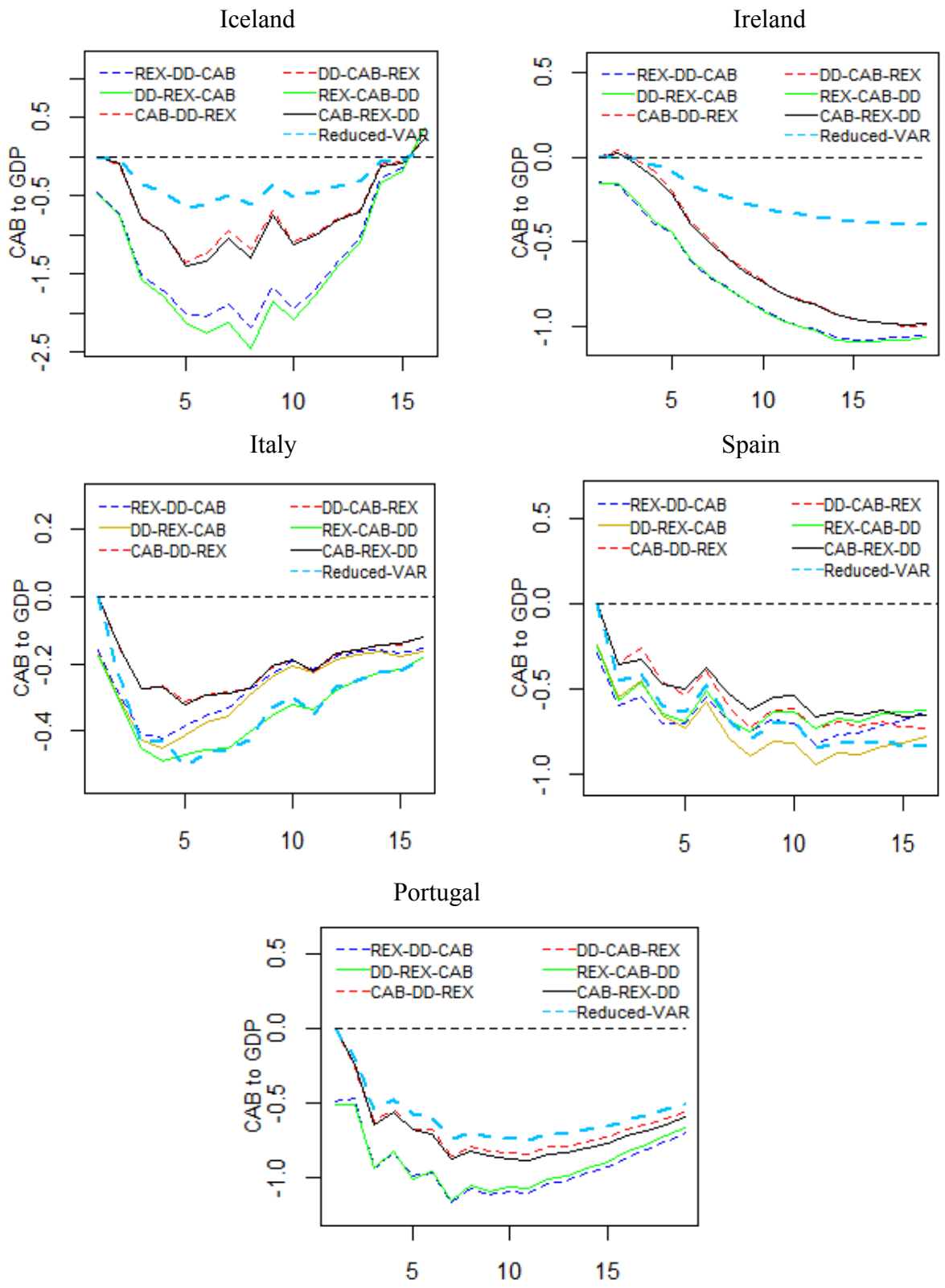
We pay considerable attention to the robustness of our results. In this regard, we compare the orthogonalised impulse responses of different SVAR models. We also compare the results of our SVAR models with a reduced form VAR.

Figure 7 reports the results of a domestic demand shock on the current account balance to GDP ratio for different models. For all specifications, we find that the effects of domestic demand shocks on current account balance are statistically significant and strong in magnitude for all countries. The effects of shocks in the case of reduced form VAR are smaller in magnitude in some cases as it excludes contemporaneous effects. However, the shapes of our impulse responses are not sensitive to the ordering of the model, which implies that choosing different variable combinations does not alter our interpretations in any fundamental way.

Figure 8 reports the effects of real exchange rate shocks on the current account balance to GDP ratio. Choosing different SVAR models, we find that the real exchange rate has a very strong and significant impact on the current account balance of Iceland. On the other hand, the effects of real exchange rate shocks on the current account balances of Eurozone countries are weak and insignificant in all specifications. Moreover, we test all these models for varying lag lengths, finding no major impact on their impulse responses.

Figure 7

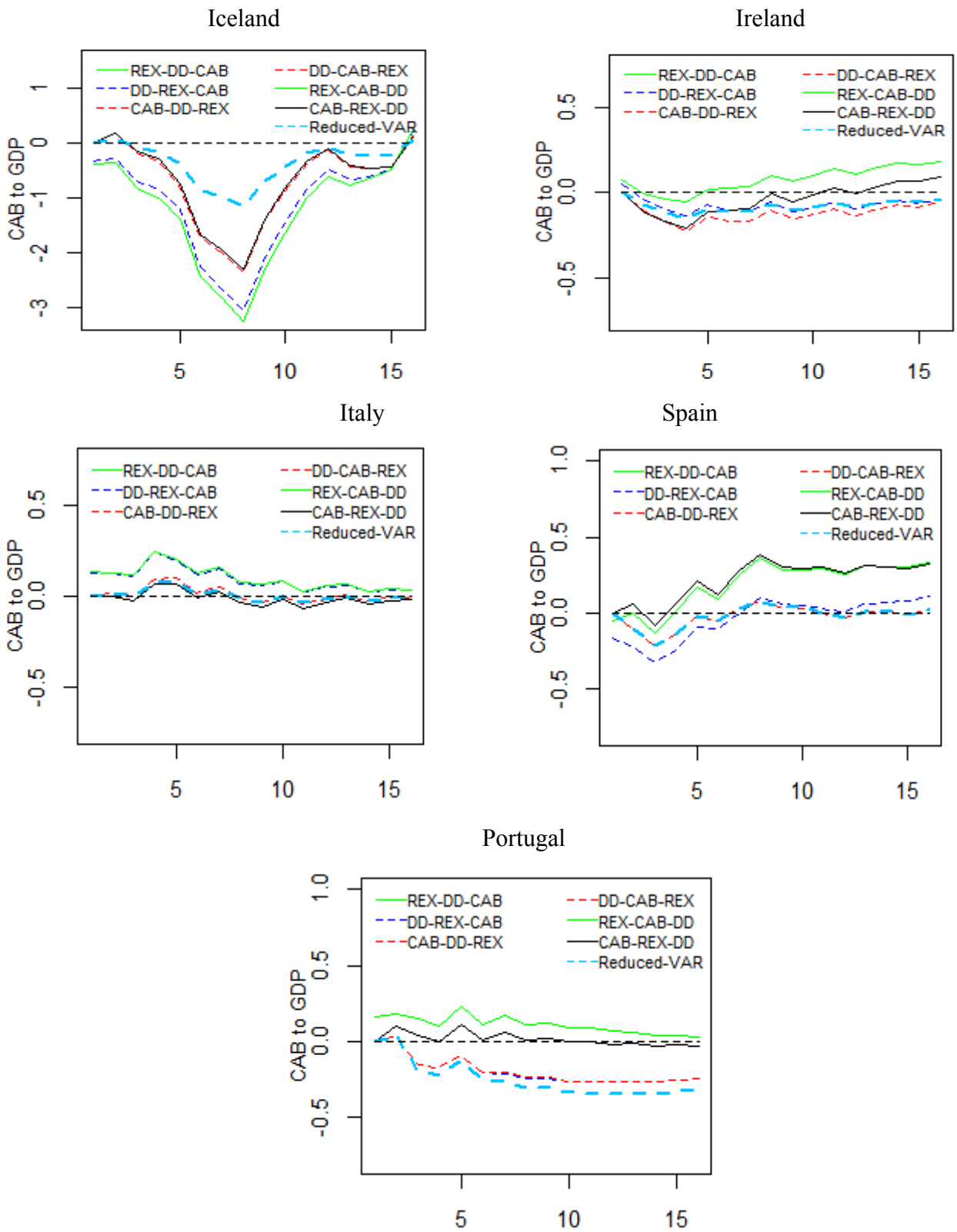
Domestic demand shock:



Note: In Figure 7, REX, is the log of real exchange rate (first differenced), DD is the log of real domestic demand (first differenced), CAB is current account balance to GDP (in levels). Reduced form VAR is the VAR model without contemporaneous effects.

Figure 8

Real exchange rate shock:



Note: In Figure 8, REX, is the log of real exchange rate (first differenced), DD is the log of real domestic demand (first differenced), CAB is current account balance to GDP (in levels). Reduced form VAR is the VAR model without contemporaneous effects.

6. Conclusions

This paper has investigated the mechanisms behind the current account adjustment following a sudden stop of capital inflows in small open economies differing in their currency arrangements. We found that the real exchange rate served as the main adjustment mechanism for Iceland's current account, while in Ireland and in other peripheral Eurozone countries – Italy, Spain and Portugal – domestic demand compression served as the main adjustment mechanism. Small open economies operating under fully sovereign currency regimes have the potential to adjust more rapidly following sudden stops to capital inflows due to real exchange rate adjustments. For Ireland and other members of the euro zone, the adjustment process is much slower. The compression in domestic demand, crucial for facilitating current account adjustments, has also resulted in long-lasting recessions, deflation and high unemployment in Ireland, as well as in Italy, Portugal and Spain.

However, an independent currency can come at a great cost. Iceland's banking system collapsed because of the lack of a lender of last resort in foreign currencies. Living standards fell due to the exchange rate depreciation, interest rates have been much higher than those facing Irish households and capital controls were imposed in 2008 because of a balance of payment crisis. Moreover, the volatility of the nominal exchange rate has skewed the real economy towards banking and retail during the high exchange rate years before the crisis and towards tourism during the low exchange rate years after the crisis.

The choice for the policy in a small, open economy is between having a safety valve in the form of a floating currency while enduring the volatility of real exchange rate and the current account, on the one hand, and giving up this safety valve hence risking periods of high unemployment and demand compression. In both systems a set of macro-prudential policies can be used to mitigate the costs by reducing exchange rate volatility in the floating regime and the risks of a crisis in the fixed exchange rate system.

References

Allsopp, C. and D. Vines (2008), "Fiscal Policy, Intercountry Adjustment and the Real Exchange Rate Within Europe", European Economy, Economic Papers 344, 1hin

Algieri, B. and Bracke, T. (2011), "Patterns of current account adjustment-insights from past experience," *Open Economies Review*, 22(3), 401-425.

Atoyan, R., Manning, J. and Rahman, J. (2013), "Rebalancing: evidence from current account adjustment in Europe," IMF Working Paper, No. 13/74.

Benediktsdottir, Sigridur, Danielsson, Zoega, Gylfi (2011). "Lessons from a collapse of a financial system," *Economic Policy*, 26 (66), 183–235.

Belke, A. and Dreger, C. (2013), "Current account imbalances in the Euro area: Does catching up explain the development?," Review of International Economics, 21(1), 6-17.

Bergin, Adele, John Fitz Gerald, Ide Kearney, and Cormac O'Sullivan (2011), "The Irish fiscal crisis," *National Institute Economic Review* 217 (1): R47–59.

Calvo, Guillermo A. (1998), "Capital flows and capital-market crises: The simple economics of sudden stops," *Journal of Applied Economics*, 1 (1), 35-54.

Calvo, Guillermo A., Alejandro Izquierdo and Luis-Fernando Mejía (2004), "On the empirics of sudden stops: The relevance of balance-sheet effects," NBER Working Paper 10520.

Calvo, Guillermo A. and Ernesto Talvi (2005), "Sudden stop, financial factors and economic collapse: A view from the Latin American frontlines." NBER Working Paper No. 11153.

Calvo, Guillermo A., Alejandro Izquierdo and Ernesto Talvi (2006), "Sudden stops and phoenix miracles in emerging markets," *American Economic Review*, *AEA Papers and Proceedings*, 405-410.

Carlin, Wendy (2012), "Real exchange rate adjustment, wage-setting institutions, and fiscal stabilization policy: Lessons of the Eurozone's first decade," *CESifo Economic Studies*, 59 (3): 489-519.

Chinn, M.D. and Wei, S.J. (2013), "A faith-based initiative meets the evidence: does a flexible exchange rate regime really facilitate current account adjustment?," *Review of Economics and Statistics*, *95*(1), pp.168-184.

Gabrisch, H. and Staehr, K. (2013), "The Euro Plus Pact: competitiveness and Cross-border capital flows in the EU countries," Tallin University of Technology, http://www.foreurope.eu/fileadmin/documents/pdf/Hubert_Gabrisch_Paper.pdf.

Gali, J. and T. Monacelli (2008), "Optimal monetary and fiscal policy in a currency union," *Journal of International Economics*, 76 (1), 116–132.

Gosse, J. and Serranito, F. (2014), "Long-run determinants of current accounts in OECD countries: Lessons for intra-European imbalances," *Economic Modelling*, 38, 451-462.

Ghosh, A. R., Qureshi, M. S. and Tsangarides, C. G. (2013), "Is the exchange rate regime really irrelevant for external adjustment?," *Economics Letters*, 118(1), 104-109.

Gnimassoun, B. and Mignon,V. (2013), "Current-account adjustments and exchange-rate misalignments," CEPII Working Paper, No. 2013-29.

Honohan Patrick (2010), "The Irish banking crisis, regulatory and financial stability policy 2003–2008," Report, *Central Bank of Ireland.* http://www.bankinginquiry.gov.ie/

IMF Report (2008) Iceland: Request for Stand-By Arrangement, available: http://www.sedlabanki.is/lisalib/getfile.aspx?itemid=6606.

Ireland's Department of Finance (2012). Ireland's Banking Report Card, available: http://www.oireachtas.ie/parliament/media/committees/pac/correspondence/2012-meeting410706/[PAC-R-521]-Correspondence-3.24E---May-2012.pdf.

Kang, J.S. and Shambaugh, J. C. (2013), "The Evolution of Current Account Deficits in the Euro Area Periphery and the Baltics: Many Paths to the Same Endpoint," IMF Working paper no. WP/13/169.

Kinsella, Stephen (2014), "Post-bailout Ireland as the poster child for austerity," *CESifo Forum* 15 (2), 20–25.

Kollmann, R., Ratto, M., Roeger, W. and Vogel, L. (2015), "What drives the German current account? And how does it affect other EU member states?," *Economic Policy*, *30*(81), pp.47 93.

Krugman, Paul (2015), "Ending Greece's bleeding," The New York Times, 5 July. http://www.nytimes.com/2015/07/06/opinion/paul-krugman-ending-greeces-bleeding.html?_r=0

Lane, P. R. (2011), "The Irish crisis," CEPR Discussion Paper No. DP8287.

Lane, P. R. (2014), "International financial flows and the Irish crisis," *CESifo Forum*, volume 15, pages 14–19. *Ifo Institute for Economic Research* at the University of Munich.

Lane, P. R. and Milesi-Ferretti, G. M. (2012), "External adjustment and the global crisis," *Journal of International Economics,* 88(2), 252-265.

Martin, F.E. (2016), Exchange rate regimes and current account adjustment: An empirical investigation, *Journal of International Money and Finance*, *65*, pp.69-93.

Ó'Riain Seán (2014), *The Rise and Fall of Ireland's Celtic Tiger: Liberalism, Boom and Bust*, Cambridge University Press.

Perron, Pierre (1997), "Further evidence on breaking trend functions in macroeconomic variables," *Journal of econometrics*, 80 (2), 355-385.

Sinn, Hans-Werner (2014a), "Why Greece should give up the euro," *The New York Times*, 25.07.2015, p. A21. http://www.cesifo-group.de/ifoHome/policy/Staff-Comments-in-the-Media/Press-articles-by-staff/Archive/Eigene-Artikel-2015/medienecho_ifostimme-nyt-25-07-2015.html

Sinn, Hans-Werner (2014b), *The Euro Trap: On bursting Bubbles, Budgets, and Beliefs*. Oxford: Oxford University Press.

Thorhallsson, Baldur, Kirby, Peadar, (2011), "Financial crises in Iceland and Ireland: Does EU and Euro membership matter?" *Institute of International Affairs Centre for Small State Studies, University of Iceland*.

Appendix

Table A1. Macroeconomic developments

Iceland	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**
Growth of GDP (%)	4.3	3.9	0.1	2.4	7.7	7.5	4.6	6.0	1.0	-6.8	-3.0
Consumption growth (%)	4.2	-2.8	-1.5	6.1	7.0	12.7	3.6	5.6	-7.9	-16.0	0.6
Investment growth (%)	11.8	-4.3	-14.0	11.1	28.1	35.7	22.4	-11.1	-20.9	-50.9	-8.9
Export growth (%)	4.2	7.4	3.8	1.6	8.4	7.5	-4.6	17.7	7.1	6.2	-0.6
Import growth (%)	8.6	-9.1	-2.6	10.7	14.5	29.3	10.4	-0.7	-18.2	-24.0	1.7
Unemployment rate (%)	1.3	1.4	2.5	3.4	3.1	2.1	1.2	1.0	1.6	8.0	8.6
Unit labour costs (% change)	-	5.6	6.2	2.3	5.1	5.6	9.6	9.4	3.5	-0.3	6.5
Real exchange rate (2010 = 100)	100.0	87.3	91.7	96.0	98.1	111.4	104.2	108.6	85.5	70.0	73.3
Interest rates (%)		14.4	12.2	8.6	8.3	11.0	13.9	16.0	17.8	14.1	7. 8
M3 growth (%)	11.2	14.9	15.3	17.5	15.0	23.2	19.6	56.5	38.3	-5.6	-5.3
Lending growth (%)	17.2	19.2	3.2	11.4	19.9	31.1	31.0	22.7	--	--	--
Current account (% of GDP)	-10.2	-4.3	1.5	-4.8	-9.8	-16.1	-23.8	-16.2	-17.5	4.5	2.7
Ireland	**00**	**01**	**02**	**03**	**04**	**05**	**06**	**07**	**08**	**09**	**10**
Growth of GDP (%)	10.2	5.8	5.9	3.8	4.4	6.3	6.3	5.5	-2.2	-5.6	0.4
Consumption growth (%)	9.9	6.1	4.5	2.9	3.1	6.4	6.3	6.7	0.4	-4.8	-1.2
Investment growth (%)	4.9	5.8	5.6	7.9	9.8	16.7	7.5	-0.2	-11.5	-16.9	-15.5
Export growth (%)	28.4	13.6	4.8	-4.5	6.7	6.0	6.2	8.3	-1.5	-2.5	7.8
Import growth (%)	30.6	11.3	1.2	-5.2	8.1	10.5	8.9	9.2	-0.8	-9.2	6.1
Unemployment rate (%)	4.3	3.9	4.5	4.6	4.5	4.4	4.5	4.7	6.4	12.0	13.9
Unit labour costs (% change)	9.5	5.2	2.0	6.1	4.2	5.6	3.9	3.9	5.3	-6.4	-7.4
Real exchange rate (2010 = 100)	80.9	83.7	88.4	97.4	99.8	99.8	101.7	107.5	112.5	107.2	100.0
Interest rates (%)	0.8	1.2	4.6	4.3	3.1	2.2	2.1	2.3	3.3	4.3	4.4
M3 growth (%)	17.0	15.6	12.8	-20.5	-7.0	44.4	26.1	27.9	-4.6	-5.4	-5.7
Lending growth (%)	27.4	16.5	12.2	10.4	-2.0	55.4	26.8	19.5	13.0	-1.9	-9.1
Current account (% of GDP)	-0.4	-0.6	-1.0	-0.2	-0.6	-3.4	-3.5	-5.4	-5.7	-3.0	0.6

Source: Benediktsdottir et al. (2011).

Table A2. Description and source of data

Symbol	**Variable**	**description**	**Source**
REX	Real exchange rate	Based on relative prices	OECD database
CAB	Current account balance	Current account balance to GDP	Statistics Iceland, Eurostats
D	Real domestic demand		Statistics Iceland, Eurostats

Table A3. Unit root structural break test (IO test)

	Iceland			Ireland		
Variables	CAB	D	REX	CAB	D	REX
TB(break point)	2008Q3	2005Q1	2008Q1	2012Q1	2006Q2	2002Q1
θ_1		-0.04 (0.03)	0.06 (0.05)	-1.59*** (0.55)	-0.06** (0.02)	-0.01 (0.01)
γ_1	0.57*** (0.13)	-0.004*** (0.001)	0.001 (0.001)		-0.01*** (0.003)	-0.004*** (0.001)
Test-statistics	-4.53(9)	-4.77(8)	-4.49(0)	-4.82(11)	-4.54(5)	-4.79(6)
Critical values						
1% 5% 10%	-5.06 -4.52 -4.26	-5.71 -5.17 -4.89	-5.71 -5.17 -4.89	-5.34 -4.85 -4.60	-5.71 -5.17 -4.89	-5.71 -5.17 -4.89