



Capital Flows and the Real Economy

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Abstract The effects of capital inflows on the real exchange rate and the growth of output, consumption and investment were explored using data from Iceland from the first quarter of 1997 to the last quarter of 2018. The objective was to explore whether capital inflows, caused by domestic interest rates being higher than foreign interest rates, were expansionary indicating the presence of an international financial cycle in contrast to the predictions of the Mundell-Fleming model. The statistical analysis consisted of the estimation of a vector autoregression system, which is used to generate impulse response functions for the variables of interest. We found that an increase in the capital inflow into a currency area increased output, consumption and investment. It follows that higher domestic interest rates under free capital mobility can have an expansionary effect by encouraging capital inflows that cause real exchange rates to increase as well as output and private expenditures. These findings call for the use of two policy instruments in small, open economies. In addition to interest rates, there is a need for some restrictions on portfolio investments by foreign investors. The restrictions will weaken the exchange rate effects of changes in domestic and foreign interest rates, leaving the interest rate channel of monetary policy to respond to the real economy.

Keywords Sudden stop · Real exchange rates · Demand compression

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Introduction

Policy makers and academic economists see the world through models that simplify reality, hopefully without distorting it, and depict the relationships between macroeconomic aggregates. These models can help predict the effect of changes in policy variables, such as fiscal variables and central bank interest rates, on different macroeconomic variables. One model that often frames policy debates is the Mundell-Fleming model. Without explicitly mentioning this model, commentators and policy makers often have it in mind when discussing issues, in spite of the model not being emphasized in the curricula offered by economics departments and relegated to a few weeks of undergraduate studies.

The objective of this paper is to explore the implications of the Mundell-Fleming model that may lead policy makers astray. The implications are all too familiar. Independent monetary policy is possible when exchange rates are floating and capital mobile. In a system of floating rates, an increase in the foreign rate of interest causes an instant capital outflow, which makes the currency depreciate and raises domestic demand and output. Similarly, a decrease in domestic interest rates makes the currency depreciate due to a capital outflow and increases output demand. The latter is often referred to as the exchange-rate channel of foreign policy. These implications apply to both larger, “small, open economies” such as the United Kingdom, as well as very small open economies, such as Iceland.

The conventional view, embodied in the Mundell-Fleming model, contrasts with the view of Rey (2018) about a monetary policy dilemma, instead of the usual trilemma, according to which independent monetary policy can only be conducted when there are capital controls or when exchange rates are flexible. Instead of thinking of each small, open economy as having monetary independence, Rey discusses an international financial cycle wherein low central bank interest rates in a financial center, i.e. the U.S., cause capital inflows as asset prices increase in other countries, thus explaining the correlation in housing prices across countries as well as stock prices. Moreover, the findings can explain the presence of asset price bubbles and excess credit creation in many countries at the same time and the sudden stop of capital inflows in these countries when interest rates are increased in the financial center.¹ While in the Mundell-Fleming model lower foreign interest rates are contractionary through the exchange rate channel, they become expansionary in the framework of Rey (2018). There is also the thesis by Aliber (2019) in this volume of the *Atlantic Economic Journal* that investors in countries with current-account surpluses demand securities in other countries, raising asset prices in these countries and through a wealth effect creating current-account deficits. Here it is the current-account surpluses of China, Japan, Germany and the oil-exporting countries, and not U.S. interest rates that are causing the capital flows to other currencies.

While standard theoretical open-economy models predict capital inflows to be contractionary, the practical experience of many economies, such as Iceland (and

¹ The presence of a global financial cycle has been mentioned by numerous authors, such as Díaz-Alejandro (1985), Calvo et al. (1996), Eichengreen and Portes (1987), Reinhart and Reinhart (2008), and Lane and McQuade (2013).

several others in the past), suggests that capital inflows may sometimes turn out to be expansionary.² This paper contributes to this literature by exploring Iceland's experience with perfect capital mobility during the period 1994 to 2008 to test whether inflows were associated with economic contractions.

A Brief History of Iceland's Boom and Bust

The government of Iceland privatized the country's banking system in 2002–2003.³ This was the last stage in a policy of liberalizing what used to be a mostly state-run moribund economy. Earlier, Iceland joined the European Economic Area in 1994 and became a part of the EU single market. Though liberalization of the economy and privatization of non-financial firms brought rewards in terms of output growth and living standards, privatization of the banking system started a sequence of events that ended in a financial disaster in October 2008, unparalleled in the history of the island economy. The combination of abundant liquidity and low interest rates made it possible for the owners of privatized banks to borrow from foreign banks to finance both a domestic credit expansion as well as the acquisition of foreign businesses.

The banks lent money to limited-liability holding companies that then invested in the domestic stock market or bought businesses in other countries, such as the U.K. and Denmark. The balance sheet of the banking system expanded rapidly (from 1.74 gross domestic product (GDP) in 2004 to 7.44 GDP at the end of 2007) and the banks eventually became too big to save, while the country's net investment position deteriorated. In addition, gross foreign debt skyrocketed. Though the size of the banking system had initially instilled confidence with foreign creditors since the banks were definitely too big to fail, the banks gradually became also too big to save. Surprisingly, it took foreign creditors, most of whom were European banks, a long time to realize that the banks were too big for the domestic authorities to save and even too big for foreign central banks to stop offering credit lines. In the summer of 2008 foreign central banks, one after another, declined a request by Iceland's authorities for a credit swap line because they saw that it was beyond the ability of the central bank and the government to repay the huge loans required to save the banks.

The assets of the three largest banks grew by between 50% and 60% annually during 2003–2008. The net investment position became negative, amounting to one GDP, but this statistic concealed vastly larger gross debt accumulation, gross debt being six times the country's GDP in 2008. The credit creation fueled a stock market bubble that raised stock prices by a factor of ten. Household and business debt increased rapidly (private business debt mostly in foreign-currency-denominated debt) and consumption boomed creating a current-account deficit of around 20% of GDP.

The capital inflows into Iceland during this period mostly took the form of domestic banks borrowing from foreign banks while the government gradually reduced its debt. Figure 1 shows that a large portion of inflows into Iceland was in the form of portfolio

² This disconnect between practical experience and theoretical models was recently addressed by Blanchard (2015).

³ For an account of the boom and bust of the Icelandic economy, see Special Investigation Commission (2010) and Benediktssdóttir et al. (2011, 2017).

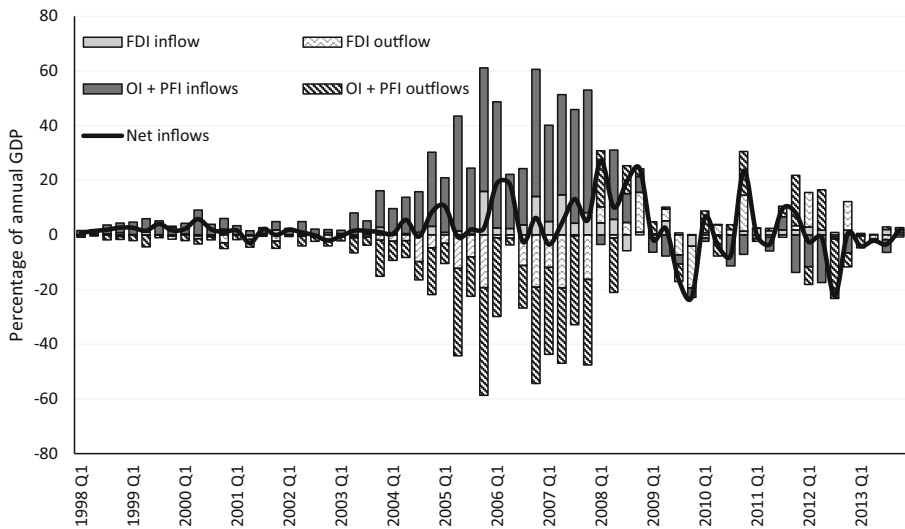


Fig. 1 Gross capital inflows and outflows (1998Q1-2013Q4). Source: Authors calculation based on data from Central Bank of Iceland (2018) and Statistics Iceland (2018). Note: All variables are represented as a percentage of annual GDP

investments (PFI) and bank borrowing (OI), while the proportion of foreign direct investment (FDI) was modest.

The figure shows that during 2004–2008 there was an increase in both inflows and outflows, i.e. most of the money borrowed in foreign banks was used to finance foreign investments. Outflows took the form of FDI as well as portfolio investments. As a result, both foreign debt and foreign assets increased during this period. Figure 2 shows both external assets and liabilities from 1998 to 2013. Most of the external liabilities took the form of bank borrowing (OI) and portfolio investment (PFI) while FDI and lending to foreign financial companies increased on the asset side.

While foreign investment expanded the balance sheet of the economy, net inflow (inflow minus outflow) financed the current-account deficit and profoundly affected the national economy.⁴ The real economy expanded during 2003–08, mostly driven by the expansion of credit in the banking system. Investment grew in excess of 20% per annum in 2004–2006, before collapsing in 2008 and 2009.⁵ In contrast, consumption only grew slightly more rapidly than real GDP in 2003, less rapidly in 2004 and 2006 and more rapidly in 2005. Imports grew much more rapidly than exports, leaving a gaping current-account deficit. Unemployment declined from 3.4% in 2003 to 1% in 2007. There was solid real wage growth and real exchange rates reached record levels in 2007, only to collapse in 2008 and 2009. The credit-driven economic boom was further increased through a fiscal expansion.

The government lowered the corporate tax rate from 30% to 18% at the end of 2001 and further to 15% in February 2008. The government also lowered the personal

⁴ See Raza et al. (2016) on the transmission channels of financialisation in the macroeconomy in Iceland. Also, see Raza et al. (2018a) on the interaction amongst current-account balance, real exchange rate and domestic demand in Iceland.

⁵ See Raza et al. (2018b) on the evolution of investment and savings in different regimes in Iceland.

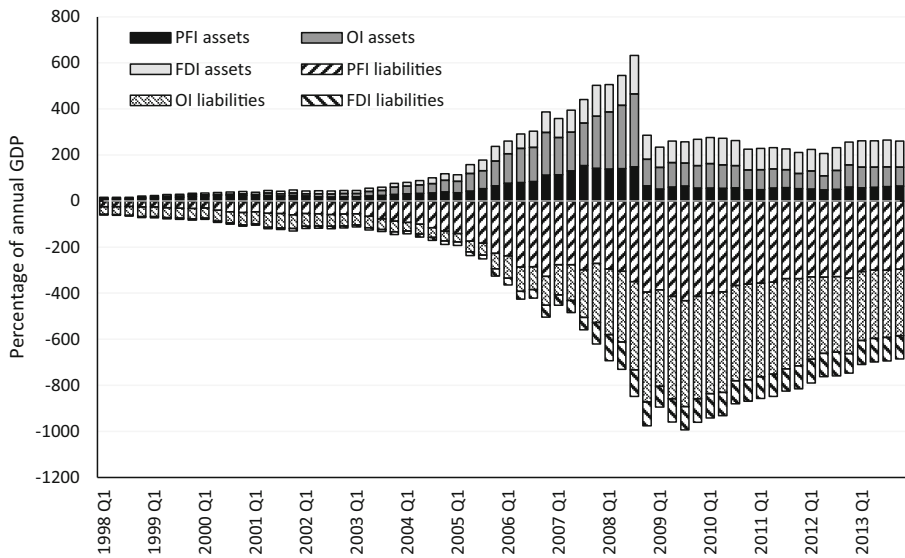


Fig. 2 External assets and liabilities (1998Q1-2013Q4). Source: Authors calculation based on data from Central Bank of Iceland (2018) and Statistics Iceland (2018). Note: All variables are represented as a percentage of annual GDP

income tax rate by 1% in each of the three years 2005, 2006 and 2007, abolished wealth taxes and lowered the value-added tax in 2007. It was left to monetary policy to curb the economic boom. The central bank's policy rate was gradually raised to 15.5% in the summer of 2008. High interest rates attracted the carry trade, the volume of which was 37% of GDP in October 2008, as well as induced local businesses to borrow in foreign currencies from domestic banks. This appeared to remove currency risk from the bank's books and instead place it with borrowers.

The seizing up of international capital markets in late 2007 and 2008 prevented the Icelandic banks from rolling over their debt. One of the banks faced an anticipated default in October 2008, but before that happened, the carry trade unwound and the currency lost value, which increased the debt of domestic businesses and households measured in the local currency. The technical bankruptcy of much of the economy made the banks insolvent and their demise was guaranteed by the refusal of central banks in the large economies to come to the rescue. It was left to the International Monetary Fund (IMF) to pick up the pieces, which it did with the domestic authorities taking full ownership of the economic program.⁶

Empirical Analysis

Data and Methodology

This study investigated the effects of capital inflows on the real economy in Iceland, particularly the contractionary and expansionary effects. First, the interaction between

⁶ See Zoega (2018) on the policy response to the crisis.

capital inflows, the real exchange rate, and output in Iceland was explored using quarterly data from 1997Q1 – 2017Q4.⁷ Second, the impact of capital inflows on all components of output were analysed, including consumption, investment, government spending and the trade balance. The variables were the gross capital inflow to GDP (F), real exchange rates (R), and real GDP (Y) along with its respective components.

Model

To explore the aforementioned interactions, a vector autoregression (VAR) model was used.⁸ The model is as follows. The reduced form VAR model in levels can be represented as

$$x_t = \mu_0 + A_1x_{t-1} + A_2x_{t-2} + \dots + A_px_{t-p} + e_t, \quad (t = 1, 2, \dots, T) \quad (1)$$

where μ_0 is an $n \times 1$ vector of constants, x_t is an $n \times 1$ vector of variables in the model, A_p is an $n \times n$ matrix (with $i = 1, \dots, p$) of parameters, and e_t is an $n \times 1$ vector of error terms.

Since, the model was estimated in first differences, the vector of our endogenous variables takes the following form:

$$x_t = [\Delta F, \Delta \ln R, \Delta \ln Y]'$$

F represents gross capital inflows to GDP.⁹ R represents the real exchange rate and Y represents the real output. Different variants of the above model were also considered by replacing output with its components (one at a time) namely, private consumption C , gross fixed capital formation I , government spending G , and trade balance TB .¹⁰

The structural-VAR (SVAR) model in its general form can be written as

$$Bx_t = \mu_0 + B_1x_{t-1} + B_2x_{t-2} + \dots + B_px_{t-p} + \varepsilon_t, \quad (t = 1, 2, \dots, T) \quad (2)$$

where B is a contemporaneous matrix. Multiplying Eq. (2) with the inverse of B will result in a reduced form VAR as represented in Eq. (1), i.e., $A_i = B^{-1}B_i$ (for $i = 1, \dots, p$). Cholesky decomposition was used to identify shocks by imposing restrictions on the contemporaneous matrix. The ordering of the variables implied that capital inflow shocks contemporaneously affected real exchange rates and output growth while shocks to real exchange rates and output growth affected gross capital inflows with a lagged effect. The structure of the model was in line with the experience of Iceland as discussed previously.

⁷ All the data used in our analysis are publicly available on the website of Central Bank of Iceland (2018) and Statistics Iceland (2018).

⁸ Before estimating the model, all the variables were adjusted for seasonal variations and tested for a unit root finding of non-stationarity.

⁹ Trend of annual GDP was used in order to normalize the measure of capital inflows.

¹⁰ All variables were measured as a percentage of GDP.

First, the model was estimated for the whole period 1997Q1 to 2018Q1. Then the model was estimated for the period of free capital mobility from 1997Q1 to 2008Q3. Finally, within the free capital mobility regime, different variants of the model were considered where the model was estimated for different components of output.

Results

Figure 3 shows the impulse response functions for the whole period from the first quarter of 1997 to the first quarter of 2018. One can see that a shock to the capital inflow makes the real exchange rate appreciate and also output increase. Moreover, a shock to the real exchange rate reduces output growth but has an insignificant effect on

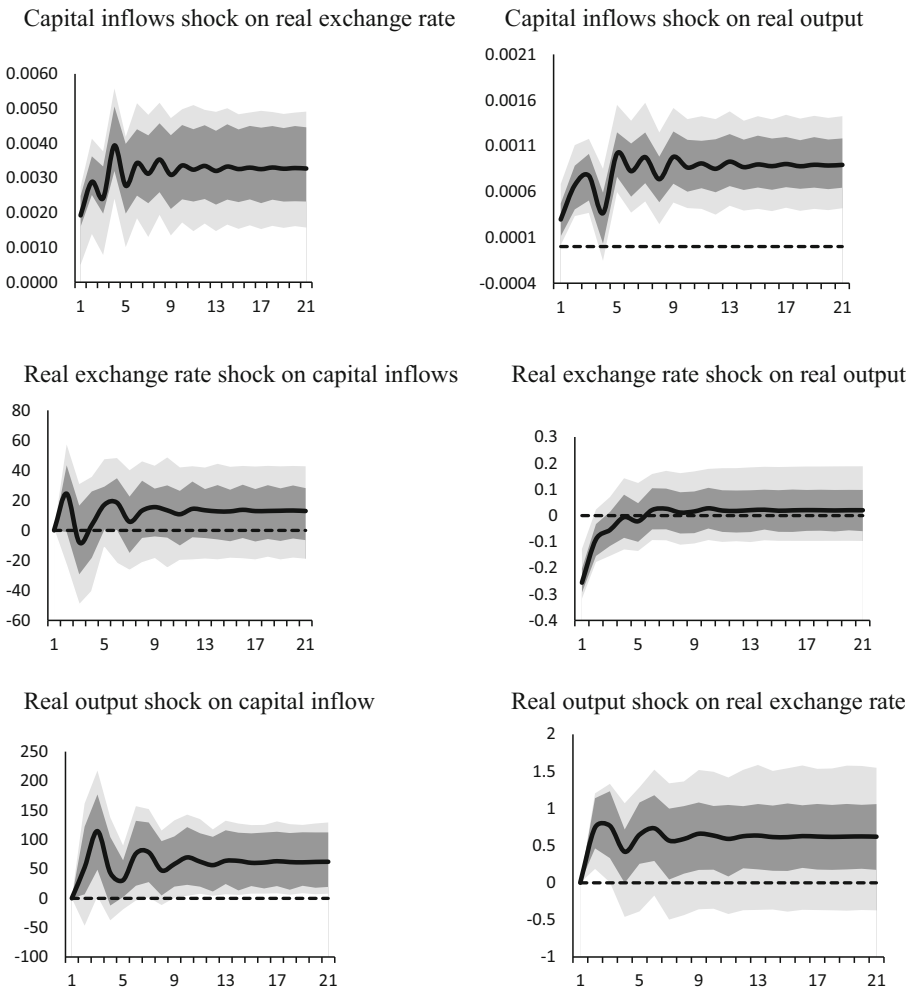


Fig. 3 Cumulated impulse responses based on sample 1997Q1-2018Q1. Note: the wider bands represent 90% confidence interval (CI) while the inner bands represent 66% CI. The horizontal axis represents quarters whereas the vertical axis represents the units of response variables. Source: Authors calculation based on data from Central Bank of Iceland (2018) and Statistics Iceland (2018)

capital inflows. Lastly, output shocks increase subsequent capital inflows and make the real exchange rate appreciate. These results suggest that capital inflows are expansionary and that higher output growth has the effect of raising inflows and the real exchange rate.

Figure 4 depicts the analogous impulse response functions for the period before the imposition of the capital controls in the last quarter of 2008. The impulse response functions were quite similar. However, they turned out not to be significantly different from zero in the capital control period.

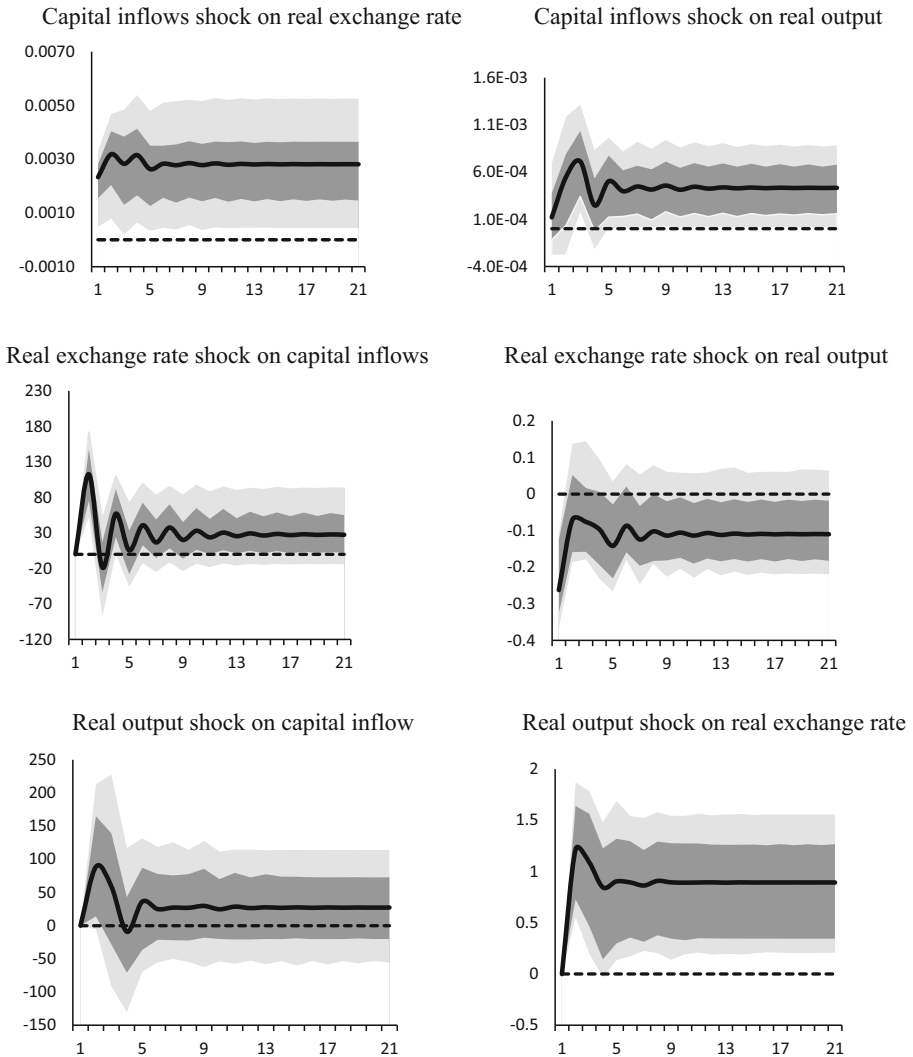


Fig. 4 Cumulated impulse responses based on sample 1997Q1-2008Q2. Note: the wider bands represent 90% confidence interval (CI) while the inner bands represent 66% CI. The horizontal axis represents quarters whereas the vertical axis represents the units of response variables. Source: Authors calculation based on data from Central Bank of Iceland (2018) and Statistics Iceland (2018)

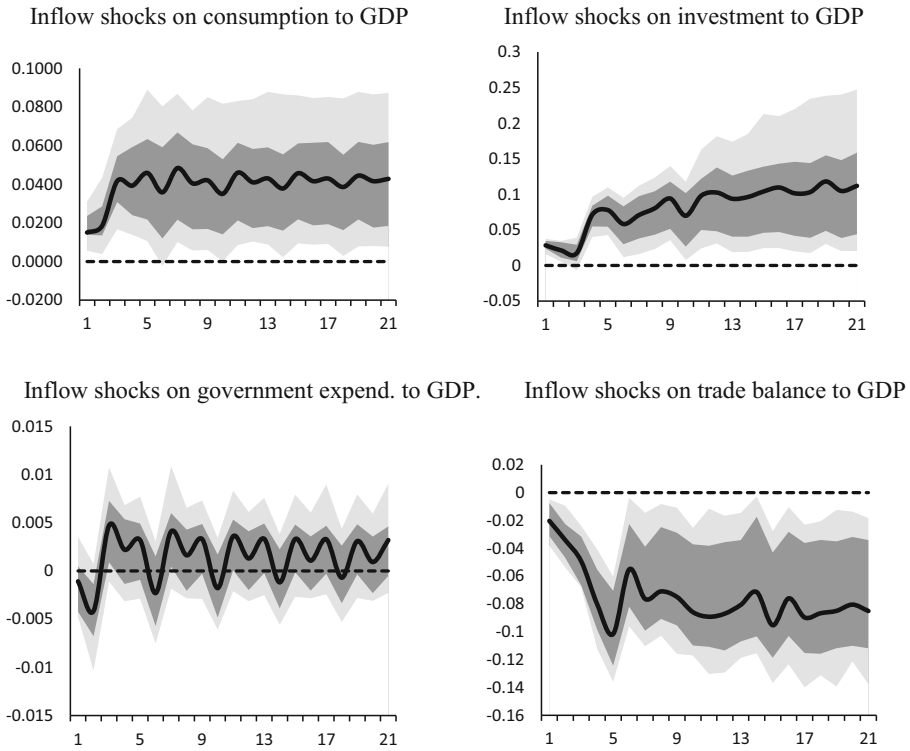


Fig. 5 Cumulated impulse responses on GDP components based on sample 1997Q1-2017Q3. Note: the wider bands represent 90% confidence interval (CI) while the inner bands represent 66% CI. The horizontal axis represents quarters whereas the vertical axis represents the units of response variables. Source: Authors calculation based on data from Central Bank of Iceland (2018) and Statistics Iceland (2018)

Figure 5 highlights the impulse response function when output growth was replaced with the growth of consumption, investment, government spending and the trade balance. A shock to inflows increased the growth of consumption and investment and reduced the trade balance, but had no significant effect on government spending. As expected, the effect of an inflow shock on investment was much stronger than on consumption. Overall, the positive effects on investment and consumption dominated the negative effects of an inflow shock on the trade balance, which caused the inflow shock to have an expansionary effect on the economy.

We found that capital inflows were expansionary, not contractionary as implied by the Mundell-Fleming model. The capital inflow made the real exchange rate appreciate and output grow. Behind the higher growth of output was a higher growth rate of consumption and investment and also a smaller trade balance, the net effect being increased output growth.

Conclusion

Using data from Iceland covering the period before and after its financial crisis, we found that an inflow of capital was expansionary for the domestic economy. The capital

inflow made the output of the country relatively more expensive and the growth rates of output, investment and consumption rise. This occurred in contrast to the predictions of the Mundell-Fleming model and more supportive of the thesis of Rey (2018) and Aliber (2019), the latter described in this volume of the *Atlantic Economic Journal*, that low foreign interest rates have an expansionary effect on the domestic economy.

It follows that raising central bank interest rates in a small, open economy to curb domestic demand can be expansionary by enticing foreign investors into the domestic bond market, which makes the real exchange rate increase and domestic asset prices rise. These findings call for the use of two policy instruments. In addition to interest rates, there is a need for some restrictions on portfolio investments by foreign investors. These restrictions will weaken the exchange rate effects of changes in domestic and foreign interest rates, leaving the interest rate channel of monetary policy for the real economy. Thus, there are two tools. First there are central bank interest rates intended to affect domestic demand. The second tool consists of a tax or reserve requirement on portfolio investments by foreign residents to curb the capital account surplus when needed, hence the ensuing output growth and current-account deficit. In this way the interest rate channel of monetary policy will be made effective while the expansionary effect of higher interest rates through capital inflows will be reduced.

Further research is needed on the relationship between the capital inflow and appreciation of the real exchange rate, on the one hand, and the growth of output, consumption and investment, on the other hand. Consumers and investors may be taking advantage of the low price of imports when deciding to buy consumer durables and start investment projects. Alternatively, there may be a wealth effect on consumption and an effect of the economic boom on investment.

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References

- Aliber, R. Z. (2019). Financial crises and bank capital. *Atlantic Economic Journal*, 47(1).
- Benediktsdóttir, S., Danielsson, J., & Zoega, G. (2011). Lessons from a collapse of a financial system. *Economic Policy*, 26(66), 183–235.
- Benediktsdóttir, S., Eggertsson, G. B., & Þórarinnsson, E. (2017). The rise, the fall, and the resurrection of Iceland. No. w24005. National Bureau of Economic Research. <https://www.nber.org/papers/w24005>
- Blanchard, O. (2015). Ten takeaways from the “rethinking macro policy, progress or confusion?”. VOX CEPR Policy Portal <https://voxeu.org/article/rethinking-macro-policy-ten-takeaways>
- Calvo, G. A., Leiderman, L., & Reinhart, C. (1996). Capital flows to developing countries in the 1990s: Causes and effects. *Journal of Economic Perspectives*, 10, 123–139.
- Central Bank of Iceland (2018). Statistics. Available at: <https://www.cb.is/statistics/>
- Díaz-Alejandro, C. F. (1985). Good-bye financial repression, hello financial crash. *Journal of Development Economics*, 19, 1–24.
- Eichengreen, B., & Portes, R. (1987). The anatomy of financial crises. In R. Portes & A. Swoboda (Eds.), *Threats to international financial stability*. Cambridge: Cambridge University Press.

- Lane, P., & McQuade, P. (2013). Domestic credit growth and international capital flows. *Scandinavian Journal of Economics*, 116(1), 218–252.
- Raza, H., Gudmundsson, B., Zoega, G., & Kinsella, S. (2016). Two thorns of experience: Financialisation in Iceland and Ireland. *International Review of Applied Economics*, 30(6), 771–789.
- Raza, H., Zoega, G., & Kinsella, S. (2018a). Capital inflows, crisis and recovery in small open economies. *Finance Research Letters*, 27, 273–282.
- Raza, H., Zoega, G., & Kinsella, S. (2018b). Exploring the effects of capital mobility on the investment saving nexus: Evidence from Icelandic historical data. *Scandinavian Economic History Review (Forthcoming)*, 1–15. <https://doi.org/10.1080/03585522.2018.1529615>.
- Reinhart, C. M., & Reinhart, V. R. (2008). Capital flow bonanzas: An encompassing view of the past and present. In J. A. Frankel & C. Pissarides (Eds.), *International seminar on macroeconomics 2008* (p. 2009). Chicago: University of Chicago Press.
- Rey, H. (2018). Dilemma not trilemma: The global financial cycle and monetary policy independence. National Bureau of Economic Research Working Paper No. 21162. Available at: <https://www.nber.org/papers/w21162>
- Special Investigation Commission. (2010). Páll Hreinsson, Tryggvi Gunnarsson and Sigríður Benediktsdóttir. “Aðdragandi og orsakir falls íslensku bankanna 2008 og tengdir atburðir”. (Antecedents and Causes of the Collapse of the Icelandic Banks in 2008 and Related Events) Available at: https://everipedia.org/wiki/lang_en/The_Report_of_the_Investigation_Commission_of_Althing/
- Statistics Iceland (2018). About Statistics Iceland. Available at: <https://www.statice.is/about-statistics-iceland/>
- Zoega, G. (2018). Restoring confidence in the aftermath of Iceland’s financial crisis. In T. Sigurjonsson, D. Schwarzkopf, & M. Bryant (Eds.), *The return of trust?: Institutions and the public after the Icelandic financial crisis*. Bingley, U.K., Emerald Publishing Ltd.

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