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ICELAND

SELECTED ISSUES

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June 6, 2016

Approved By
The European Department

Prepared by Marco Arena (EUR), Jimmy McHugh and Mark Albertson (both FAD), and Tahsin Saadi Sedik (MCM), assisted by Vizhdan Boranova (EUR).

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EXPENDITURE POLICY IN ICELAND: MOVING BEYOND THE CRISIS[1]

This chapter examines Iceland's medium-term public expenditure challenges. The post crisis fiscal adjustment demanded painful choices, with spending on healthcare, education, and investment suffering cuts in real terms. While expenditures in these areas have rebounded more recently, there is room for further decompression. Disability and pension spending also pose challenges, although these are related to longer-term demographic and labor market issues. With the public debt ratio falling rapidly, the budget will record significant interest savings going forward. This will permit a reconsideration of expenditure priorities.

A. Context

1. Iceland's financial crisis severely disrupted its public finances. On the expenditure side, the human impact demanded a substantial increase in social benefits even as the state incurred large debts recapitalizing the central bank and various financial institutions; interest costs rose accordingly. On the revenue side, all main revenue categories suffered significant declines.

2. The fiscal consolidation that had to follow achieved results. The general government's overall deficit was cut from more than 12 percent of GDP in 2008 to ½ percent in 2015. The gross debt ratio has fallen by almost 30 percentage points from its peak of 95 percent of GDP in 2011.

3. There was a mix of revenue and expenditure measures, some of which were painful and unpopular. On the revenue side, the authorities introduced a series of temporary tax measures including a wealth tax and a levy on bank liabilities as well as permanent increases in corporate and value added tax rates. On the expenditure side, spending on healthcare, education, and investment were reduced in real terms, while spending on social benefits increased.

4. Iceland is now in the latter stages of unwinding its fiscal response to the crisis. Some temporary revenue measures, such as the wealth tax, have been removed. The improving economic situation has allowed important tax reforms to go ahead, including steps to improve the efficiency of the value added tax system and simplify the personal income tax regime. Expenditures on social benefits have receded as the economy has returned to growth and job creation. Temporary government programs to reduce household indebtedness are drawing to a close.

5. The prospect of significant interest savings opens up an opportunity for Iceland to reconsider its spending priorities. Thanks to the windfall receipts from the old bank estates and continued prudent fiscal policies, Iceland is on track to achieve its statutory objective of reducing the net debt ratio to 30 percent of GDP or less. The lighter debt load will generate interest savings of some 2 percent of GDP. At the same time, the recently passed Organic Budget Law requires the

[1] Prepared by Jimmy McHugh and Mark Albertson (both FAD).

government to submit to parliament a Statement of Fiscal Policies outlining its medium-term strategy. This provides a rallying point for the requisite public dialogue.

B. Five Expenditure Pressure Points

6. This chapter examines five expenditure pressure points that Iceland needs to address over the medium term. The first three of these are health, education, and public investment, which bore the brunt of the post crisis consolidation; there is a need to transition them out of crisis mode and arrive at medium-term expenditure plans more consistent with a stable resource envelope. The fourth pressure point is disability spending, which did not experience any step change with the crisis; it has been increasing steadily for a number of decades. The fifth pressure point is pensions.

Healthcare

7. Public expenditure in the healthcare system has become a charged topic. There is concern about growing waiting lists, the centralization of care facilities, and recruitment difficulties. Industrial relations in the sector have been turbulent, with a pay dispute in 2015 leading to strikes by medical staff followed by a wage agreement that spilled over into large nationwide awards. The European Social Survey suggests people's subjective assessment of their own health and mobility as of 2012 had deteriorated relative to 2004. Over the same period, subjective assessments of happiness also deteriorated, marginally, suggesting deteriorating perceptions on health could be linked to wider dissatisfaction.

Table 1. Subjective Assessment of Happiness and Wellbeing 1/
(Index)

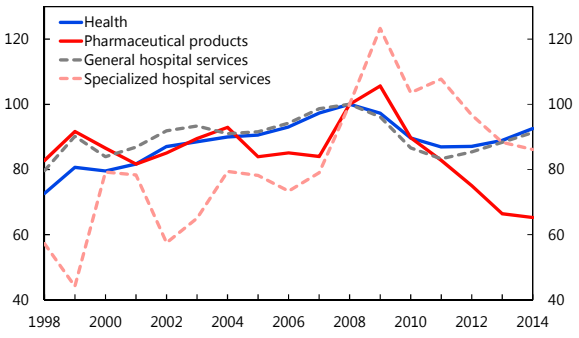
	2004	2012
Happiness	8.5	8.3
Health 2/	36	27
Mobility 2/	56	40

Source: European Social Survey.
1/ Higher scores = better.
2/ Scores are normalized on 100.

8. Grumblings are rooted in the fiscal consolidation. The national hospital was a major target for cost containment. Efforts were made to shift patient volumes from inpatient to outpatient care. The number of doctors on call was reduced, which limited overtime payments. Diagnostic testing was scaled back, the number of hospital beds cut, and some support services downsized. Iceland also introduced measures to increase copayments while ensuring that low income and vulnerable households were exempt. Between 2009 and 2011, health expenditures fell by around 8 percent in real terms. The reductions in pharmaceuticals and specialized hospital services were particularly significant. More recently, health spending has recovered somewhat in real terms.

Figure 1. Government Health Expenditure

Real Health Expenditure Indices
(Index, 2008 = 100)



Source: Statistics Iceland.

9. Notwithstanding the dissatisfaction, Iceland continues to have one of the most impressive public healthcare systems in the world. The legislative framework guarantees universal access to mental, physical, and social healthcare irrespective of ability to pay. Life expectancy stands at 83 years, the highest in Iceland's Nordic and North Atlantic peer group. Infant mortality is just 1.5 per thousand, which is also the lowest in the peer group. Other headline health outcome indicators, such as the incidence of tuberculosis, HIV, cancer, and heart disease, and alcohol and cigarette consumption, all compare favorably with Iceland's peer group.

Table 2. General Health Information 1/
(Per 100,000 unless otherwise indicated)

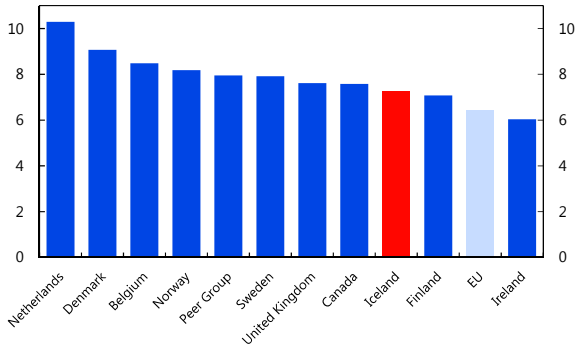
	Belgium	Finland	Iceland	Ireland	Ietherland	Norway	Sweden	UK	Peers	EU
Crude Death Rate (per 1,000 people)	9.8	9.5	6.7	6.5	8.4	8.1	9.4	9.0	8.7	10.1
Per Capita Health Expenditure	4526.1	3604.1	3645.8	3867.1	5601.1	6307.8	4243.8	3310.7	4494.4	3009.5
Public Health Expenditure (percent of GDP)	8.5	7.1	7.3	6.0	10.3	8.2	7.9	7.6	7.9	6.4
Total Health expenditure (percent of GDP)	11.2	9.4	9.1	8.9	12.9	9.6	9.7	9.1	10.1	8.7
Life Expectancy at Birth (years)	80.4	80.8	83.1	81.0	81.1	81.5	81.7	81.0	81.1	79.1
Maternal Mortality Ratio	...	5.5	...	6.0	7.0	6.0	4.5	7.0	6.0	7.2
Infant Mortality Rate (per 1,000 live births)	3.3	1.9	1.6	3.0	3.2	2.0	2.4	3.5	2.8	3.8

Sources: World Health Organization; and IMF staff calculations.
1/ Latest available data.

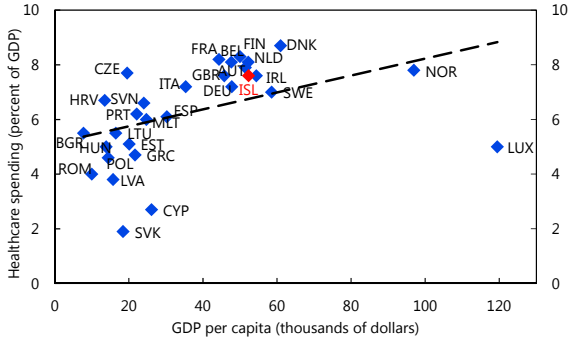
Figure 2. Healthcare Expenditure

Healthcare Expenditure
(Percent of GDP)

Healthcare Expenditure, 2014
(Percent of GDP)



Healthcare Spending, 2014
(Controlling for income)



Sources: Eurostat; Statistics Iceland; World Bank; and World Health Organization.

Measures of Health Sector 1/
(Per 100,000, unless otherwise indicated)

	Iceland	Peers	EU
Average length of stay, all hospitals (days)	5.9	7.8	7.8
Percentage of Inpatient care discharges	12.4	15.5	17.6
Primary health care units per 100 000	40.6	7.7	54.8
Nurses per 100 000	1615.6	1188.8	822.5
Percent of physicians working in hospitals	76.6	45.1	54.4
Percent of nurses working in hospitals	64.8	57.7	65.6
Pharmaceutical expenditure, percent of total health expenditure	15.4	12.7	17.9

Sources: WHO European Health for All database; and IMF staff calculations.
1/ Latest available data.

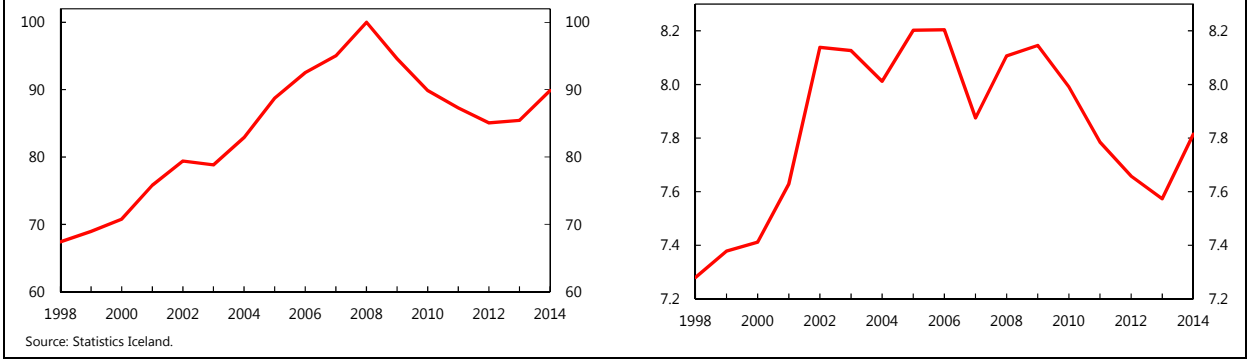
10. Iceland has a good track record of containing healthcare costs. Since 1998, public expenditure on healthcare has remained broadly stable at around 7–8 percent of percent of GDP. This ratio compares well with Iceland's peer group, a doubly impressive result given that Iceland's dispersed population is a challenge to keeping costs down. The health sector maintains two university hospitals (one in Reykjavík, the other in Akureyri). These hospitals provide services to a lower population density than in most of Europe.

11. Nonetheless, going forward, Iceland needs to address growing demographic challenges confronting its healthcare system. Long-term expenditure projections suggest healthcare costs could rise by around 4 percent of GDP. Demographic pressures are already evident in recent expenditure patterns. Despite strong cost containment efforts, expenditures on nursing homes have increased substantially in recent years.

Education

12. As in healthcare, cost containment in education also played a major role in the fiscal consolidation. Between 2009 and 2013, annual education expenditure fell by about ½ percent of GDP, although it has recovered somewhat subsequently. The education system is a shared responsibility between the central and municipal governments, with the municipalities responsible for the operation of preschools and primary and lower secondary schools, and the central government for upper secondary schools and universities.

Figure 3. Education Expenditure



Source: Statistics Iceland.

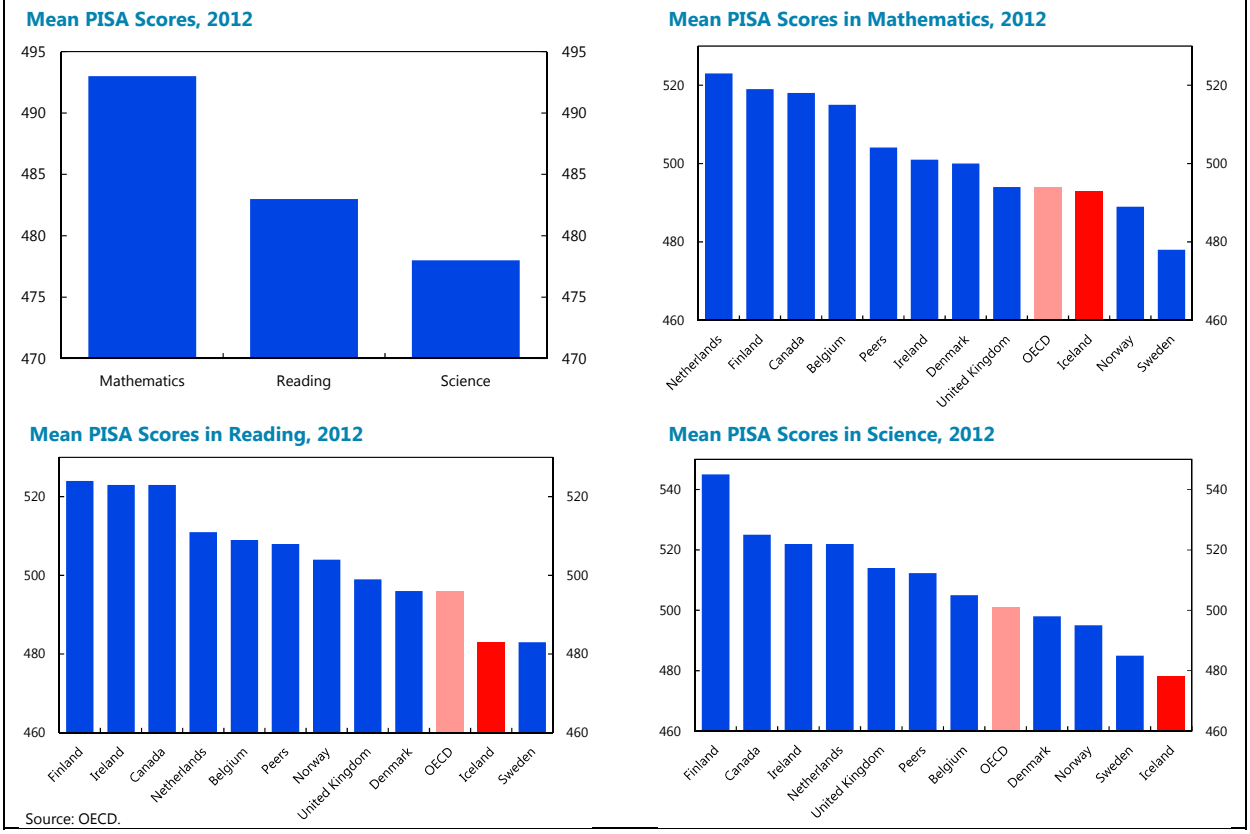
13. Iceland's education system has scored important achievements in terms of equity. Within the OECD, it has one of the lowest achievement gaps across schools (Ministry of Education, 2015) and one of the lowest percentages of students in low performing, socio economically disadvantaged schools (OECD, 2016). Enrollment in early childhood programs is almost universal.

14. Nonetheless, there are some grounds for concern. There is evidence that educational attainment has weakened slightly in recent years (OECD, 2016):

- Iceland's 2012 mathematics scores for 15 year olds under the OECD's Programme for International Student Assessment (PISA) system are broadly in line with the OECD average but considerably lower than the Nordic and North Atlantic peer group.
- Iceland's PISA scores for reading and the sciences are considerably lower than both the OECD and peer group averages.
- In all three subject areas—mathematics, reading, and the sciences—Iceland's PISA scores in 2012 were weaker than in 2009.

15. Iceland is also struggling with educational standards within its upper secondary education and vocational training systems (OECD, 2016). Many attainment indicators are below the relevant OECD averages. A major challenge is the drop out rate. Many students fail to complete their courses, citing the structure and quality of upper secondary education as reasons for their decision to leave education. The proportion of adults who have not completed an upper secondary education stands at 30 percent, one of the highest ratios in the OECD.

Figure 4. Comparative Performance of Iceland's Education System



Source: OECD.

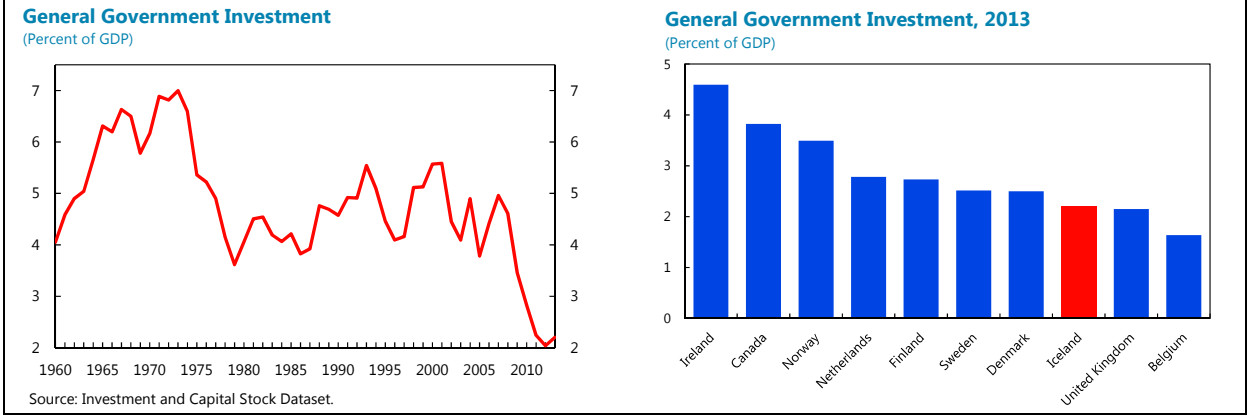
16. The sector is also experiencing human resource management difficulties. According to the OECD (2014 and 2016), salaries for teachers fell in real terms over 2006–12. The teaching profession is also aging: in 2012, almost half of all secondary school teachers were over 50 years old.

17. The authorities are seeking to address these issues. In 2015, the Ministry of Education published a White Paper on education reform. It set out two goals to be achieved by 2018: (i) at least 90 percent of students should meet the minimum reading standards, up from 79 percent; and (ii) at least 60 percent of upper secondary students should graduate on time, up from 44 percent.

Public Investment

18. Public investment fell particularly sharply in the post crisis period. In 2015, public investment was 2.9 percent of GDP; in the two decades prior to the crisis, it averaged 4.7 percent of GDP. The data do not support suggestions of a pre crisis public investment boom: public investment rates prior to the crisis were close to their long-run historical averages.

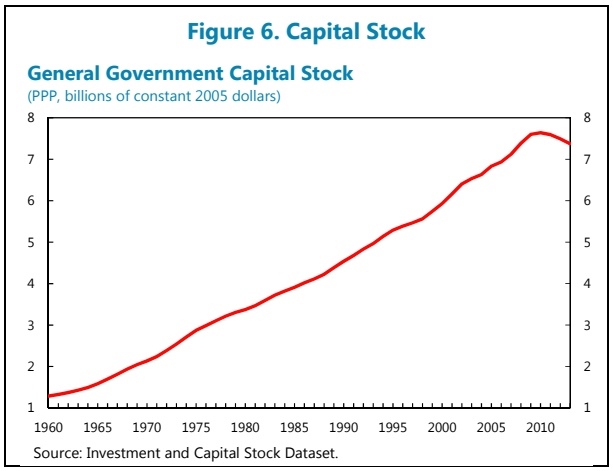
Figure 5. Public Investment



19. The extended period of expenditure compression has started to reduce the public capital stock. In 2012, the capital stock reached a tipping point where capital depreciation rates were larger than gross investment rates.

20. Iceland is accumulating a growing list of public investment projects. The most urgent sector is healthcare, where there are widespread demands to replace the national hospital. A new hospital is planned, a public investment that could cost as much as 5 percent of GDP. Furthermore, municipal public investment, which accounts for around 40 percent of total general government public expenditure, has been low since the crisis.

Figure 6. Capital Stock



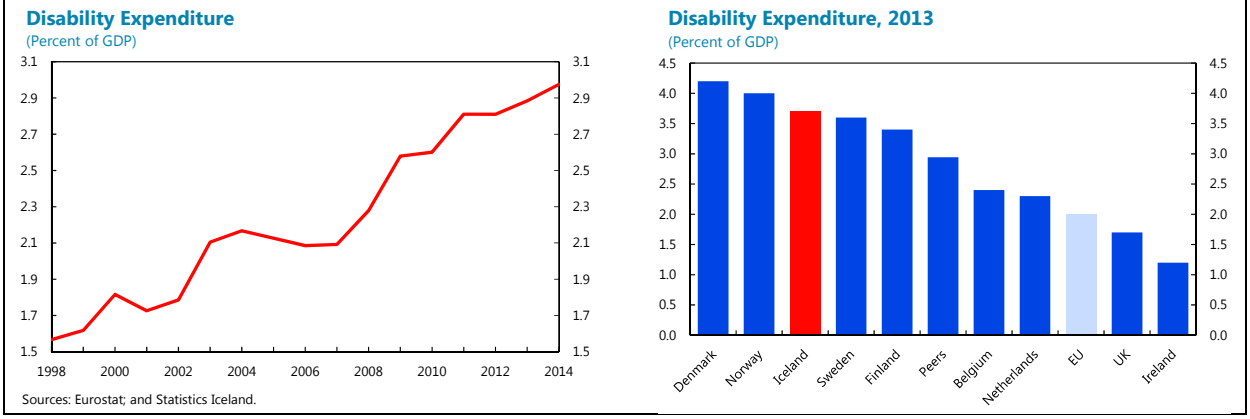
Disability Benefits

21. For several decades, outlays on disability benefits have risen, as a percentage of both GDP and total revenues. Moreover, levels are high compared to other advanced economies. This trend of higher outlays runs counter to the general improvement of health sector indicators, where

survey data on perceptions of personal health show the proportion of Icelanders reporting they are in "good" or "very good" health as higher than the OECD average (OECD, 2013).

22. The underlying causes of rising disability expenditures are complex. Like many OECD countries, Iceland has experienced a profound change in the composition of its disabled population with around one third of recipients suffering from mental health related problems. Extended periods of mental health related sick leave have led to high inflows into long-term disability benefits. Another one third suffers from musculoskeletal difficulties. Recent changes in the structure of economic activity toward lower skilled tourism related jobs have arguably reduced the options for disabled workers seeking to reintegrate into the labor force.

Figure 7. Disability Expenditure



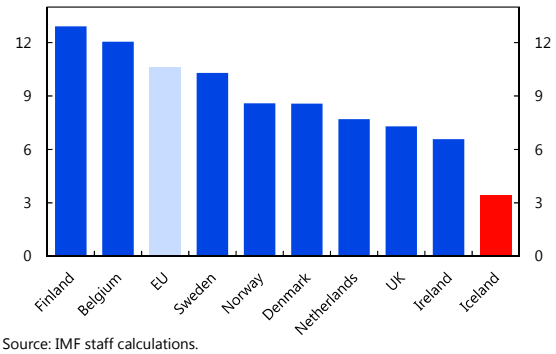
Sources: Eurostat; and Statistics Iceland.

23. Measures to reintegrate recipients of disability benefits into the labor market have the potential to lift growth and create additional room for other public spending. Many disabled workers likely could reenter the labor force given active labor market policies, especially training and job search support. Conversely, with human capital deteriorating over long spells of disability, the probability of leaving the disability benefits regime falls with time. This can lead to marginalization, with its concomitant risks of poverty and exclusion.

Public Pensions

24. As a consequence of past reforms and prudent management, the Icelandic pension system provides high pension payments at a comparatively low cost to the public sector. As an early adopter of pension reform, Iceland had by the mid 1990s established a well funded three pillar system. A publicly financed first pillar offers a minimum level of income for retirees, which is withdrawn above a certain income level. A mandatory and private second pillar, as generous as it is well funded, requires pension funds to

Figure 8. Pensions



Source: IMF staff calculations.

secure a minimum benefit of 56 percent of previous salary, provided the retiree has contributed for at least 40 years. A voluntary and private third pillar offers individuals the option of making tax exempt contributions.

25. There is, however, one segment with a funding shortfall: three public sector pension funds for workers who have chosen to remain in the pre reform system. Although these funds have accumulated sizable assets, they are unable to cover all of their future pension liabilities.

26. The Icelandic authorities provide transparent actuarial estimates of this shortfall, currently put at some 24 percent of GDP. These estimates are explicitly included in the general government balance sheet. Absent reforms to address this shortfall, projections suggest the government will have to inject around 1 percent of GDP annually into the funds starting in 2030 and continue to do so until 2060, although the precise timing of the public sector intervention will depend on future returns from the existing stock of assets.

27. This high level of transparency has ensured that there is a widespread acknowledgement of the issue across civil society. Indeed, the problem is widely understood to be one of the main long-term fiscal challenges facing the country. However, the authorities are also concerned that the issue is poorly understood outside Iceland, given that the bulk of the pension system is well funded. While the headline figure of 24 percent of GDP seems large, this cost is spread over several decades and it is manageable,

28. The government has announced that commencing in 2017 it will inject about 0.3 percent of GDP annually into these pension funds. There is also a live debate about whether part of the failed bank estates' stability contributions should be channeled toward this shortfall, with proponents arguing that such use of funds would be consistent with the statutory objective of paying down the public debt.

C. Conclusions

29. Iceland's fiscal policy priorities are evolving. The crisis related necessities—in particular, fiscal consolidation and debt reduction—have subsided. The fiscal position has moved decisively into balance and the public debt ratio is now firmly on a downward trajectory.

30. With fiscal risks subsiding and substantial interest savings on the horizon, there is an opportunity to reexamine public expenditure priorities. Given the receipts from the bank estates and prudent fiscal management, interest costs are projected to fall by around 2 percent of GDP. This opens up choices on how best to use the additional room for maneuver. After several years of necessary but painful restraint, growth enhancing expenditures on education, health, and investment need to decompress**.** In recent budgets, health and education expenditures have started to recover. However, capital spending remains at historically low levels. There is also need to rationalize expenditures on social protection, which jumped during the crisis and stay elevated despite subsequent job creation, and disability outlays, which have grown steadily over the last two decades. Furthermore, there remains the public pensions shortfall, a legacy of an otherwise

successful pension reform in the 1990s. This latter issue is manageable if a modest but steady annual stream of resources is allocated to ensure these pension funds are fully financed by 2030.

31. The new Organic Budget Law requires the authorities to provide a comprehensive statement of fiscal policies. This will provide an opportunity to identify a set of public expenditure priorities that could play a decisive role in promoting strong, sustainable, and equitable growth over the medium term without jeopardizing ongoing efforts to cement fiscal sustainability.

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CAPITAL FLOWS AND MONETARY POLICY EFFECTIVENESS IN SMALL OPEN ECONOMIES[1]

The global financial crisis and its aftermath have rekindled the debate about the ability of small open economies (SOEs) to conduct an independent monetary policy effectively in the face of large and volatile capital flows. This chapter assesses monetary policy effectiveness in inflation targeting SOEs, and whether macroprudential policies increase that effectiveness. Using quarterly panel data for 18 advanced and emerging SOEs over 2002–15, it finds that monetary policy is focused on inflation developments, but also that domestic interest rates affect capital flows, raising concerns about a reinforcing loop between monetary policy and capital flows. It finds that macroprudential policies help reduce risks emanating from credit growth, allowing monetary policy to focus on inflation, and reduce capital flows, providing monetary policy with room for maneuver.

A. Context

1. In the decades prior to the global crisis, a central result in international macroeconomics was that policymakers face a *trilemma*. Typically they were confronted with three desirable, yet contradictory, objectives: (i) to stabilize the exchange rate; (ii) to enjoy free international capital mobility; and (iii) to engage in a monetary policy oriented toward domestic objectives (Obstfeld, Shambaugh, and Taylor, 2005). The corrolary of this trilemma was that, in a financially integrated world, a flexible exchange rate would allow monetary policy to focus on domestic objectives.

2. A consensus emerged that price stability was the primary—and sometimes sole—objective of monetary policy. Many countries, including many SOEs, implemented a monetary policy framework with an inflation target (explicit or implicit) and a short-term interest rate as the main policy instrument. Iceland adopted an inflation targeting framework in 2001. However, the global financial crisis and its aftermath have rekindled the debate about the ability of SOEs to conduct an independent monetary policy effectively in the face of large and volatile capital flows.

3. Capital flows can create significant policy challenges. For SOEs in particular, both gross and net capital flows can be large relative to the size of domestic financial markets. As a result, such flows can complicate macroeconomic management, and indeed may undermine monetary policy independence, potentially even when exchange rates are flexible (Rey, 2013). For example, the prospect of large capital inflows related to a carry trade could dissuade central banks from hiking interest rates, even if warranted by inflation, owing to concerns about stoking further capital inflows, currency appreciation, and risk taking behavior. This self reinforcing loop between capital flows and monetary policy was very much in evidence in Iceland before the crisis. In the face of capital

[1] Prepared by Marco Arena (EUR) and Tahsin Saadi Sedik (MCM).

outflows, it can also play out in reverse. Central banks may keep policy rates high or even raise rates despite a growth slowdown in order to defend the currency and discourage capital from leaving.

4. Capital flows can affect the transmission of monetary policy in SOEs (Gudmundsson, 2015; and Obstfeld, 2015). Monetary policy in the major zones affects financial conditions globally, including in SOEs. Manifestations of this include effects on local interest rates, asset prices, and credit growth, transmitted in large part by international capital flows. Spillovers of monetary policy in advanced zones to monetary policy transmission in SOEs occur through two main channels. The first is co-movements of longer-term bond yields. Through this, the link between the short-term policy rate and longer-term rates in SOEs can be impaired. To the extent monetary policy works through its effect on longer-term interest rates such as those on mortgages or project finance, stronger international linkages across long-term rates can hamper the effectiveness of monetary policy in SOEs.[2] The second channel is that monetary policy actions in the major zones can affect liquidity conditions in SOEs, making credit supply less responsive to domestic monetary policy conditions, especially where foreign bank presence is extensive.

5. Capital flows can also give rise to financial stability risks through a range of different channels. These include increases in short-term wholesale (noncore) funding of the banking system, increases in foreign currency funding of the financial system, contributions of capital inflows to local credit booms and asset price appreciation, and credit risks from foreign currency denominated lending to unhedged borrowers. These risks were present in Iceland in the period leading up to the crisis. There remains a risk that, absent safeguards, such patterns could reemerge.

6. Countries have used (or plan to use) a range of policies to manage risks emanating from capital inflows. To mitigate the risks to financial stability, countries have developed various macroprudential tools. These include restricting foreign currency borrowing by unhedged domestic agents or imposing prudential limits on banks' foreign currency positions, in the form of liquidity coverage ratios (LCRs), net stable funding ratios (NSFRs), or caps on net open foreign currency positions (often relative to capital). Some countries are also contemplating some type of reserve requirement or tax to make capital inflows more expensive, thus limiting the increase in the effective interest rate differential vis-à-vis abroad when domestic interest rates are raised. However, the effectiveness of many of these measures remains uncertain.

B. Purpose of the Study

7. Empirical analyses of whether macroprudential policies can help improve the effectiveness of monetary policy are still nascent. In recent years, after the global financial crisis,

[2] Changes in international short-term interest rates need not feed one for one into domestic short-term interest rates, depending on the behavior of the exchange rate and the risk premium. But, given that sharp exchange rate changes may have effects on the domestic economy, central banks may intervene to dampen the effects on the exchange rate through sterilized foreign exchange intervention. The latter, however, may be limited in its effectiveness because it causes interest rates to increase and sucks in further inflows.

there has been an increase of empirical studies revisiting the topic of capital flow drivers, assessing both the effects that capital flows can have on financial stability (asset prices and borrowing) and how the "global financial cycle" affects the monetary policy stance (Adrian and Shin, 2010 and 2012; Bruno and Shin, 2012 and 2013b; Miranda-Agrippino and Rey, 2012; and Rey, 2013). Moreover, there has been a growing body of empirical work assessing the effectiveness of macroprudential policies in mitigating financial stability risks (bank credit growth, housing credit growth, and house price inflation).[3] However, empirical analyses of whether macroprudential policies can help to improve the conduct of monetary policy remain few and far between.

8. This study wades in to explore whether macroprudential policies enhance the effectiveness of monetary policy in SOEs that may experience large and volatile capital flows. Specifically, the chapter focuses on SOEs that use the short-term interest rate as their main monetary policy instrument and have floating exchange rate regimes.

9. The paper will ask two interlinked questions: how effective is monetary policy in inflation targeting SOEs, and do macroprudential policies increase this effectiveness? The first question speaks to the carry trade issue by assessing the sensitivity of capital flows to domestic interest rate in SOEs with inflation targeting regimes. In a broad sense, a carry trade will involve financial intermediaries and/or investors borrowing at a low interest rate in one country and lending/investing in the domestic economy in assets that have a higher (risk adjusted) rate of return. The second question speaks to whether the deployment of macroprudential policies can, by mitigating the risks emanating from credit growth and capital flows, enhance the effectiveness of monetary policy. The study seeks to put forward cross country evidence that can be relevant for Iceland as a country that is just beginning to implement macroprudential policies.

C. Methodology

10. To address the first question, on monetary policy effectiveness, the study uses a panel vector auto regression (VAR) in which all variables of interest are treated as endogenous while controlling for a number of exogenous variables. The model is summarized below:

$$y_{it} = \alpha_0 + \sum_{j=1}^{P} A_j y_j + \sum_{l=1}^{q} \beta_l X_{it-l} + \mu_i + \nu_{it}$$

where y_t is a vector of endogenous variables including inflation, the GDP growth rate, the short-term interest rate (policy rate), and a measure of non-FDI private gross capital flows or the real exchange rate. X_t is a vector of exogenous variables: the Chicago Board Options Exchange Volatility Index (VIX) as a proxy for global risk aversion, the international interest rate (weighted average of the shadow policy rates of the United States, United Kingdom, euro area, and Japan), the international GDP growth rate (weighted average of the GDP growth rates of said zones), and the growth rate of a commodity price index. A_j (j = 1, …, p)

[3] Among other papers, there are IMF (2012a), Bruno and Shin (2013a), Claessens *et al.* (2014), Cerutti *et al.* (2015), Bruno *et al.* (2015), and Akinci and Olmstead-Rumsey (2015).

and B_l (l = 1, …, q) are matrices of coefficients for the endogenous and exogenous variables, respectively; v_{it} is a vector of reduced-form residuals; and μ_i is a vector of country fixed effects to take account of unobserved heterogeneity across countries.[4]

11. With a fixed-effect estimator, the lagged dependent variables are, by construction, correlated with the error term. Therefore, the results are potentially biased. This bias is corrected by using generalized method of moments (GMM) estimators (Arellano and Bover, 1995; and Blundell and Bond, 1998). The panel VAR estimation procedure follows that by Albrigo and Love (2015). The ordering used for the VAR is: GDP growth, inflation, policy rate, gross capital inflows or real exchange rate, imposing a recursive structure for identification purposes (Cholesky identification strategy).[5]

12. For the second question, on whether macroprudential policy can help monetary policy by reducing risks emanating from credit growth and capital flows, the study estimates a fixed-effect dynamic panel regression. This is summarized as:

$$V_{it} = \alpha_0 + \alpha_1 V_{it-1} + \sum_{j=1}^{n} \beta_j X_{it}^j + \delta ST_t + \beta_k MPP_{it} + \mu_i + \nu_{it}$$

where V represents either the ratio of non-FDI private sector gross capital inflows to GDP or the growth rate of credit to the private sector (which represents an intermediary objective of macroprudential policies).[6] For the specification using gross capital inflows, X represents a vector of control variables: the GDP growth rate, the international GDP growth rate and the international interest rate (both as defined above), and the VIX index. For the specification using private sector credit growth rate, X represents a vector of the GDP growth rate and the VIX index.

As discussed in IMF (2012a), the measurement of the effect of macroprudential policy changes on financial and aggregate variables is subject to endogeneity problems because macroprudential policies could respond to credit and asset prices. The GMM estimators are used to mitigate this type of endogeneity.

MPP represents a macroprudential measure using 11 available categories: loan to value caps (LTV), debt service to income caps (DSTI), reserve requirements (RR), dynamic loan loss provisioning (DLLP), liquidity requirements (Liq. Req.), risk weights (RW), limits on foreign

[4] For example, the fixed effect takes account of all time-invariant country specific factors, including geography, climate, ethno linguistic characteristics, and unchanging political and legal systems.

[5] The ordering of GDP growth and inflation follows the one presented in the early empirical literature on monetary transmission mechanisms—e.g., Bernanke and Blinder (1992) and Eichenbaum and Evans (1995). An additional exercise was done reversing the order of the policy rate and capital flows (or real exchange rate) and the results were similar.

[6] The credit growth variable is the quarterly growth rate of seasonally adjusted real credit to the private sector. Nominal credit is deflated by the country's GDP deflator to calculate real credit. The data source of nominal credit is the International Monetary Statistics (IMF).

currency (FC) loans, limits on credit growth, conservation capital, limits on open FC positions, and loan restrictions. For each macroprudential measure a dummy variable is generated and takes the value of 1 if the measure was tightened, -1 if it was loosened, and 0 otherwise. After that, for each of the created dummy variables, a cumulative variable is created that sums the dummy (tightening net of easing) as a proxy for the macroprudential stance for each measure.[7] Given the way this variable has been constructed, the emphasis is on its qualitative results.

D. Sample of Countries and Data

13. The sample of countries is limited to SOEs with inflation targeting as the monetary policy framework, and includes many emerging market economies. The classification is done using the IMF's Exchange Arrangements and Exchange Rate Restrictions (AREAER) database. The countries included are: Australia, Brazil, Canada, Chile, Colombia, Czech Republic, Indonesia, Israel, Korea, Mexico, New Zealand, Norway, Peru, Philippines, Poland, South Africa, Sweden, and Thailand. Data for the selected variables come from the International Financial Statistics (IMF), Haver, and WEO databases and cover the period from Q1 2002 to Q2 2015.

14. The macroprudential data used in this study come mainly from a recent and more comprehensive IMF survey, called Global Macroprudential Policy Instruments (GMPI), carried out by the IMF's Monetary and Capital Markets Department during 2013 (Table 1). The survey was conducted by IMF staff with responses received directly from country authorities. This novel quarterly database also includes information from the Bank for International Settlements, the European Systemic Risk Board, and central bank websites for the period from Q1 1990 to Q2 2015.

Table 1. Number of Times Macroprudential Measures for Selected Sample Were Tightened or Loosened in Q1 2002 – Q2 2015

	Tightening	Loosening
Loan to value caps	24	8
Debt service to income caps	13	4
Reserve requirements	25	11
Risk weights	19	2
Liquidity requirements	6	2
Dynamic loan loss provisioning	9	1
Limits on FC loans	3	0
Limits on credit growth	8	1
Conservation capital	3	1
Limits on open FC positions	8	1
Loan restrictions	3	1

E. Results

15. Three main results arise from the panel VAR that includes gross non-FDI private sector capital inflows (Figure 1):

[7] As discussed by Akinci and Olmstead-Rumsey (2015), the study uses cumulative indexes instead of quarterly changes because it is difficult to know when macroprudential regulations impose biding constraints on borrowers and lenders.

- **Monetary policy is effective**. A policy rate hike reduces inflation, albeit with some lags. The initial increase in inflation could be related to the well know result in the literature of the price puzzle (Sims, 1992; Grilli and Roubini, 1995; and Sims and Zha, 1995). In addition, an increase in the policy rate reduces real GDP growth, but the effect is statistically significant only for a few quarters.
- **Monetary policy is focused on inflation developments**. An exogenous shock to inflation triggers a monetary policy tightening and the effect is persistent over time.
- **Pull factors do matter for capital flows**. The domestic interest rate is an important driver of capital flows. However, domestic GDP growth is also a driver of capital flows.

16. Two main results arise from the panel VAR that includes the real effective exchange rate: uncovered interest parity does not hold, at least in the short run; and the exchange rate channel plays a role (Figure 2). Contrary to the prediction of uncovered interest parity, a shock to the policy rate results in appreciation of the local currency and the effect shows some persistence. Also, the results suggest an appreciation of the local currency reduces inflation, increasing the effectiveness of monetary policy.

17. The study finds that many of the macroprudential tools considered have a negative association with credit growth, some of which are statistically significant (Table 2). In particular, this result holds for dynamic loan loss provisioning, risk weights, debt service to income caps, reserve requirements, loan restrictions, and a combined measure of macroprudential tools related to the housing market.

Table 2. Sign and Significance of Macroprudential Measures 1/

	Non-FDI gross private inflows		Credit growth	
	Sign	Statistics	Sign	Statistics
Loan to value caps	-		-	
Debt service to income caps	-	*	-	*
Reserve requirements	-	*	-	**
Risk weights	-		-	*
Liquidity requirements	-		-	
Dynamic loan loss provisioning	-	**	-	*
Limits on FC loans	-		-	
Limits on credit growth	-		-	
Conservation capital	-	**	-	
Limits on open FC positions	-		-	
Loan restrictions	-	*	-	*
Housing (risk weight + LTV + DSTI)	-	**	-	**

1/ * and ** indicate significance at 1 percent and 5 percent levels, respectively.

18. The study also finds that many of the macroprudential tools considered have a negative association with non-FDI gross private sector capital inflows, where for some tools the negative association is statistically significant. In particular, this result holds for dynamic loan

loss provisioning, conservation capital, reserve requirements, loan restrictions, and a combined measure of macroprudential tools related to the housing market.

19. Such negative association, where macroprudential tools curb credit growth or dampen capital inflows, could provide the sought after "room for maneuver" for monetary policy in inflation targeting SOEs. As shown before, absent such tools, an increase in the policy rate—responding to domestic economic conditions (e.g., elevated inflation expectations or risks of overheating)—attracts capital inflows to the economy, which can amplify demand pressures and require larger interest rate increases, generating a perverse feedback loop. The finding, however, suggests that implementation of macroprudential measures would not only mitigate risks to financial stability, their primary objective, but would also help allow monetary policy to focus on inflation.

F. Conclusions

20. The study finds that monetary policy is both effective and focused on inflation developments. An increase in the policy rate reduces inflation, albeit with some lags, and reduces real GDP growth, but the effect is statistically significant only for a few quarters. But pull factors do matter for capital flows: the domestic interest rate is an important driver of capital flows; domestic GDP growth is an even more important driver. Uncovered interest parity does not hold: a shock to the policy rate results in appreciation of the local currency and the effect shows some persistence. The results also suggest that appreciation reduces inflation—the exchange rate channel plays a role.

21. It also finds that many of the macroprudential tools considered have a negative association with non-FDI gross private sector capital inflows, where for some tools the negative association is statistically significant. Such negative association, where macroprudential tools curb credit growth or dampen capital inflows, could provide room for maneuver for monetary policy to increase interest rates in response to domestic conditions. Thus the deployment of macroprudential tools not only helps mitigate risks to financial stability but also can help monetary policy.

22. Some of the macroprudential measures considered may, depending on form and objective, also be considered capital flow management measures. These should be implemented in accordance with the conditions laid out in the IMF's *Institutional View* on the liberalization and management of capital flows (IMF, 2012b) and its framework to guide its country specific advice on macroprudential policy (IMF, 2013).

Figure 1. Panel VAR Results Including the Non-FDI Gross Inflows Ratio

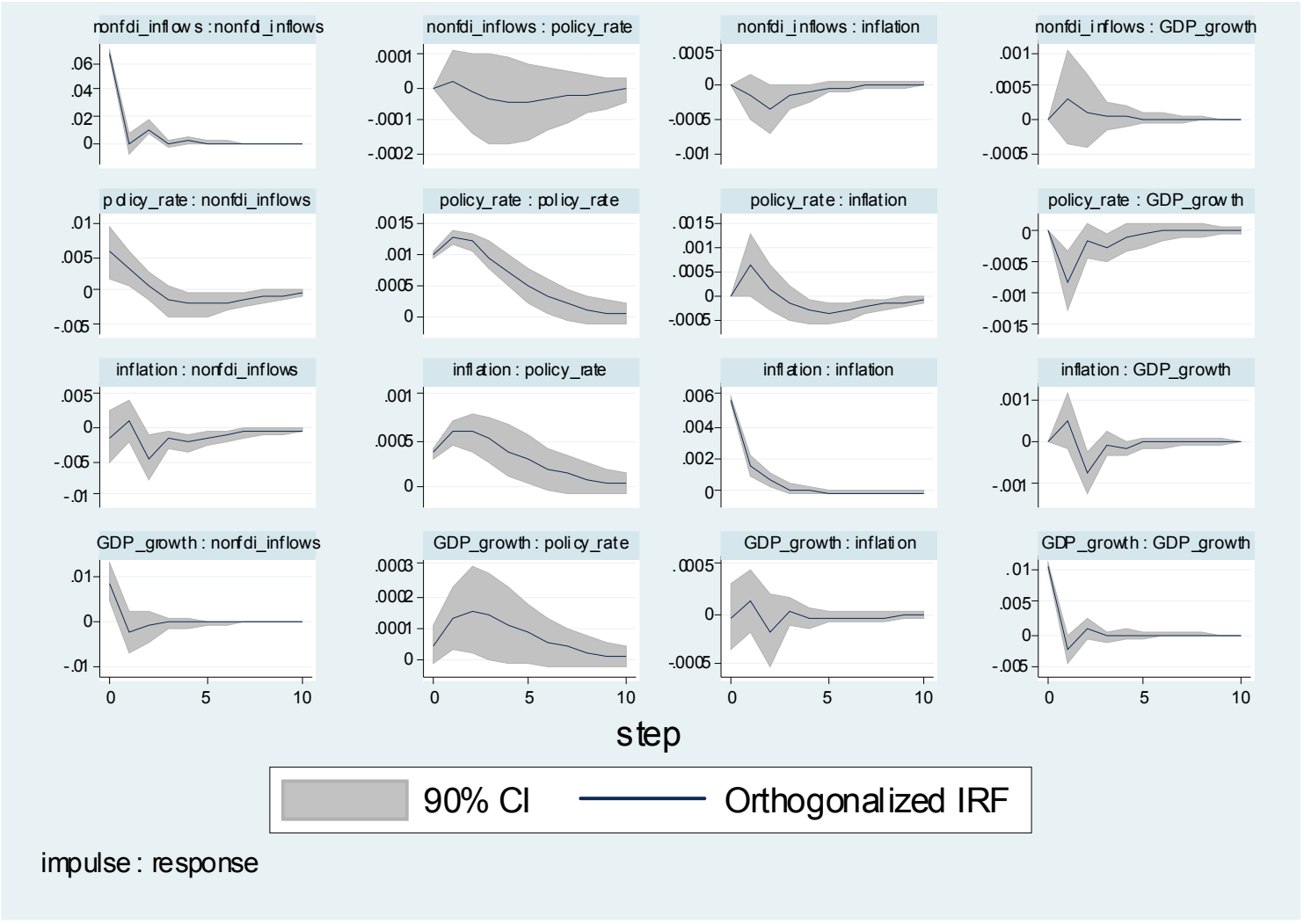
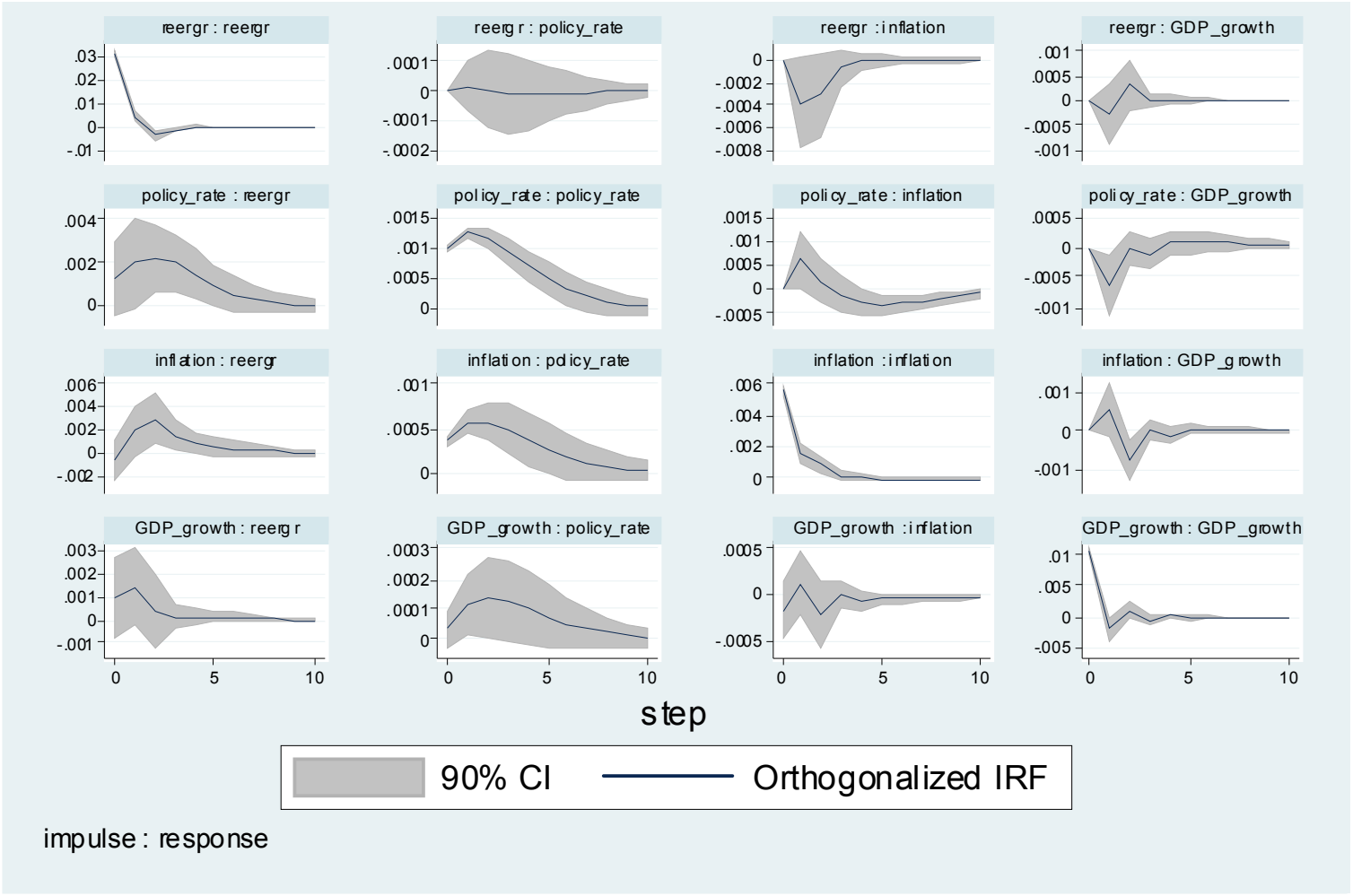


Figure 2. Panel VAR Results Including the Real Effective Exchange Rate



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