This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266800

# FESSUD

FINANCIALISATION, ECONOMY, SOCIETY AND SUSTAINABLE DEVELOPMENT

## Working Paper Series

## No 84

# Experiencing financialisation in small open economies: An empirical investigation of Ireland and Iceland

Hamid Raza
Bjorn Gudmundsson
Stephen Kinsella
Gylfi Zoega

ISSN 2052-8035

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266800

# Experiencing financialisation in small open economies: An empirical investigation of Ireland and Iceland

**Authors:** Hamid Raza[1], Bjorn Gudmundsson[2], Stephen Kinsella[1], Gylfi Zoega[2]

**Affiliations of authors:** [1]University of Limerick, [2]University of Iceland,

**Abstract:** We examine the macroeconomic factors associated with financialisation in Ireland and Iceland from the perspective of international capital flows. To understand financialisation in the two countries we construct three ARDL models using three aspects of financialisation: financial depth, credit growth and deposit liabilities of the financial sector. Focusing on the current account, we find that financialisation is associated with an increase in foreign rentiers' profit due to excessive international borrowing. Our measures of financialisation indicate that trade openness, also a measure of globalisation, has a negative relationship with financialisation in Iceland, while in Ireland the relationship is positive. Our results also suggest that both countries experienced an increase in the wage share along with rapidly increasing household debt in Ireland and increasing non financial corporate debt in Iceland. We conclude that institutional differences played a vital role in the solutions to the crises which destabilised the economies of Ireland and Iceland. We use the institutional differences between the two economies and suggest policy prescriptions to limit the scale and scope of similar crises in small open economies.

**Keywords**: Ireland, Iceland, Financialisation.

**JEL Codes**: G32, G44.

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266800

**Contact details:** stephen.kinsella@ul.ie

**Acknowledgments:** Paper prepared for Understanding and responding to the financial crisis, Warsaw, 17 October 2014. Funding from RANNIS and the Institute for New Economic Thinking is gratefully acknowledged.

**Website:** www.fessud.eu

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266800

# 1 Introduction

Financialisation matters. Over the years the relationship between economic and financial development has been a reoccurring research theme in economics and the recent financial crisis has only made the issue more important. While there is little doubt that increased financial sophistication is closely linked with long term economic growth (Levine 1997), the effects of excessive financialisation can be harmful and lead to negative short term and long term effects (Greenwood and Scharfstein 2013).

This paper examines the link between financialisation and the macroeconomic factors associated with financialisation in Ireland and Iceland. We focus on international capital flows and examine the role of openness to trade and factor payments on the current accounts of each country. We also examine the role of household debt as well as the changes in the income distribution through change in the share of wages.

Financialisation as a broad concept refers to an overall increase in financial activities of various kinds, introduction and use of new financial instruments contributing to ever increasing emphasis of financial motives among economic agents (Hein 2013). Apart from increased financial fragility and financial crisis, financialisation has been held accountable for declining business sector investments (Stockhammer 2004; Van Treeck 2008; Orhangazi 2008), increased household indebtedness (Palley 1996; Dutt 2006) and negative income distribution effects (Hein 2013). The international dimension of financialisation is discussed by (Hein 2012) and (Stockhammer 2004) with the emphasis on the role of capital-account liberalisation and financial globalisation. Stockhammer *et al* point out the liberalisation of capital flows has indeed contributed to global instability, particularly because of the influence of the speculative cross-border carry trade (Lancastle 2011). The above effects of financialisation are also considered the transmission channels of

financialisation on macroeconomy by (Hein and Dodig 2014). The view that simultaneous opening of trade and financial liberalisation promote financial development is also referred to as the (Rajan and Zingales 2003) hypothesis in the literature.

Our paper makes three contributions to the financialisation literature. First, we examine the institutional differences between Iceland and Ireland and show clearly that they do not, as many authors claim, represent the road less traveled, but for Ireland's membership of the euro. Second using three separate aspects of financialisation: financial depth, credit growth and deposit liabilities of the financial sector, we construct three ARDL models for each country and explore the dynamic relationship between financialisation and the transmission channels of financialisation in the literature mentioned above. Focusing on the current account, we find that financialisation is associated with an increase in the foreign rentiers' profit due to excessive international borrowing. Third, and in the light of our empirical findings, we carefully discuss the policy implications of excessive financialisation for small open economies.

The paper is organised as follows. Section 2 looks at the broad strokes of the story, examining in a comparative way the experiences of both economies with respect to their current accounts, private sector credit, financial depth, and the inter sectoral effects of financialisation. Section 3 builds on the empirical insights of section 2 to build an ARDL model of financialisation for the two countries. Section 4 reports the results. Section 5 concludes with policy recommendations and a plan for further work.

## 2 What, exactly, happened to Ireland and Iceland?

In Europe an extensive experiment in economic liberalisation has been under way for over two decades, from the Single Market initiative in the early 90s to the full scale

economic and financial integration among the EU and EEA countries. Ireland and Iceland have participated in this project from somewhat different initial conditions but have nevertheless both taken on all legal and institutional obligations implied by Ireland's membership of the EU and the Euro Zone and Iceland's membership of the EEA.

Few countries have witnessed such a rapid growth of the financial sector as Ireland and Iceland in a short period of time, and few countries have had to suffer the full consequences of a financial meltdown as directly. As we will show, however, the path towards ever increasing role of finance in these two countries was not the same.

Ireland became an international hub for large multinational companies and eventually an international centre of financial activity of considerable importance (Lane 2014). This achievement was largely due to tax policy initiatives aimed at attracting foreign investments (Ó'Riain 2014). Ireland's entry into the Eurozone increased its overall attractiveness for foreign investors, as Honohan (2010) highlights. Large capital flows and aggressive lending on rising residential and commercial property markets allowed the household and financial corporate sector to lever up from 2002 to 2007. The bubble which burst in 2007 was very much an old fashioned asset bubble, and the consequences have largely been borne by the household, government, and non financial corporate sector (Kelly 2007; Kinsella 2012).

In Iceland the road to financialisation was somewhat different although political factors also played an important role (Danielsson and Zoega 2009). Initially by adhering to the European legal framework through the EEA membership in the mid-90s, Iceland effectively became exposed to a fully liberalised financial environment within Europe (Bianchi *et al* 2001). The subsequent privatisation of the banking sector was seen as move away from backward State controlled banks into the modern era of financial liberalisation. Having gained access to global capital

markets, Icelandic companies and newly privatised banks rushed into financial ventures overseas, eventually accumulating financial obligations of gargantuan proportions, financed by capital inflow to a large extent.

Facing the abyss of financial collapse in late 2008, the Irish and Icelandic authorities responded somewhat differently, with Ireland effectively guaranteeing the obligations of the whole Irish banking system while Icelandic authorities only came to the rescue of the domestic part of the banking system with the institution of widespread capital controls.

Nevertheless, both countries shared the same destiny in the aftermath of the crisis as IMF based austerity programs were imposed aimed at restoring fiscal sustainability and restoration of the impaired financial system.

It is clear both Ireland and Iceland went through a period of excessive credit growth. Due to Ireland's membership in the EMU, interest rates decreased and the exchange rate risk associated with foreign borrowing was totally eliminated in the eurozone. This resulted in excessive credit inflow in Irish banks from abroad, while Iceland's borrowing is mainly linked with higher interest rates as compared to other developed countries. The over heating of the economy and high economic growth in both the countries was led by investment boom.

Investment in Iceland was mainly in the aluminium smelting projects and residential construction. The proportion of investment in housing was 7 percent of GDP while it reached almost 13 percent of GDP in Ireland as reported by Thorhallsson and Kirby (2011). Icelandic economy was more vulnerable to the share prices due to companies investing in each other as well as foreign businesses while Irish economy was exposed to its domestic asset prices (mainly housing prices). Figure 2 shows the development of private credit to GDP in the two countries. Credit in both the countries increased with the same pace and the ratio of credit to GDP almost doubled during 2004 to 2008. In Iceland, the credit from a level of 6.9 times

GDP in 2004Q1 increased to a highest level of 15 times GDP in 2008Q3, before falling in 2008Q4. In Ireland, credit from 5.6 times GDP in 2004Q1 increased to a level of 11.8 times GDP in 2008Q3 and further increased in the last quarter of 2009. The evolution of the credit ratio looks similar but the composition of credit is totally different in the two countries. Iceland's financial system is more innovative and complex with a major chunk of credit comprised of indexed and foreign currency loans, while Ireland's credit system is more conventional consisting of interest based short term and long term loans.

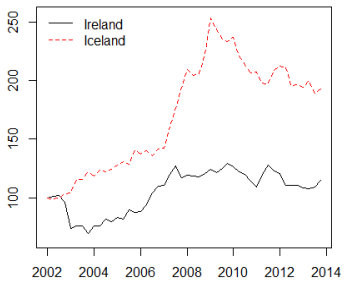


Figure 1: Stock of M3

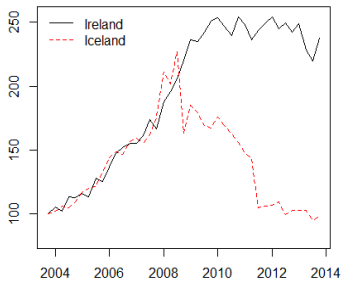


Figure 2: Credit

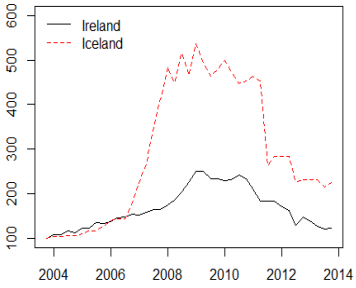


Figure 3: Deposit Liabilities

Figures 1 to 3 trace out, in comparative terms, the stories of financial development in the two economies from the early 2000s to 2013. On the face of it, a clear case can be presented for the influence of financialisation on these economies. Figure 1 shows the development of the broad money supply, M3, relative to GDP. This is often used as a proxy for financial development and financialisation (Mian and Sufi 2014). The stories are rather different: Iceland experiences a large increase in M3 from 2002 to 2008-09 as compared to Ireland, but the actual ratio of M3 to GDP in Ireland is slightly higher than in Iceland. In Ireland, the stock of M3 in 2002Q1 increased from 4 times the GDP to a maximum of 5.1 times the GDP in 2009Q4, while in Iceland the ratio in 2002Q1 increased from 1.8 times the GDP to a maximum of 4.5 times the GDP in 2009Q1. This is a clear indication of how rapidly Icelandic financial

activities expanded in this period. The deposit liabilities of the financial sector in the two countries also show an increasing trend until 2009 as figure 3 documents. But the stories here are different: Iceland in 2006, through high interest rates, attracted a large number of deposit holders in other countries where as in Ireland the Special Saving Incentive Account (SSIA) contributed in increasing deposit liabilities of the financial sector.

In 2008, liquidity dried up in the global markets leading to severe financial crisis along with a deep recession in Iceland and Ireland. During 2009 and 2010 the Irish government injected capital in the banks and finally in November, 2010 EU, ECB and IMF forced a bailout package on the Irish government. Protecting the banks in response to the crisis was not possible for Iceland. Along with huge size of the banks in Iceland, almost two-third of the banks' balance sheets comprised of the foreign denominated assets while the foreign currency available in the country's reserve was only 35 percent of the GDP as discussed by Thorgeirsson and Van den Noord (2013); while the ratio of reserve to external debt was only 8 percent as noted by Benediktsdottir *et al* (2011, p.30). This situation forced Icelandic authorities to go for a policy of denying the burden of foreign liabilities while protecting the domestic operations of the banks. In addition, Iceland faced several difficulties in finding external funders while Ireland benefited from EU membership as it received immediate rescue package from EU and IMF.

Due to different institutional configurations, the ongoing process of recovery is different in each country. If we compare Irish and Icelandic response to the crisis, it is clear that the differences are partly related to exchange rate and partly to the policies adopted (see Darvas 2011). For Iceland, exchange rate flexibility has played a crucial role in adjustment to the crisis. It increased the export growth while at the same time shifted demand from imported goods to the domestic goods. Adjustment through the exchange rate was not possible for Ireland as a member of the EMU

since 1999, but it is important to highlight that the Irish export sector has remained competitive as discussed in Darvas (2011). Exchange rate flexibility in Iceland had significant inflationary pressure as inflation reached 12.7 percent while Ireland benefited from the currency union as inflation remained low.

Krugman (2010) identifies a number of policy tools available to Iceland that helped in better recovery. First, Iceland saved its tax payers from the debt burden of financial sector while let the foreign lenders pay the price of their bad decisions. Second, Iceland imposed capital controls, an option not available in the currency union, and finally Iceland benefited from its own currency as well. Specifying these policy tools, Krugman further states, "*None of these heterodox options are available to Ireland, say the wise heads. Ireland, they say, must continue to inflict pain on its citizens - because to do anything else would fatally undermine confidence*" (Krugman 2010).

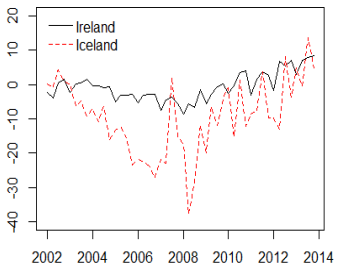


Figure 4: Current Account to GDP

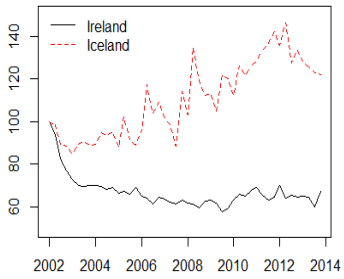


Figure 4: Trade Openness

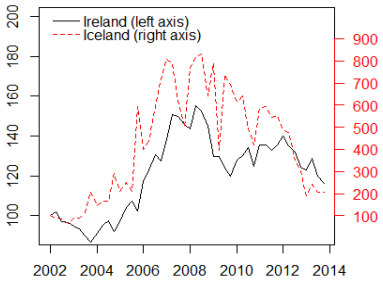


Figure 6: Net Factor Payments

Figure 4 to 6 begins to pull out the international dimension of the story, with the Irish ratio of trade openness initially falling below the index period until 2002Q1 before rising with the large increase until the onset of the crisis. Icelandic trade is consistently lower, showing the influence of the real economy on the crisis is much lower as the bubble builds up. In 2008, current account deficit in Iceland reached its highest level of 28.4 percent of GDP while it was moderate in Ireland around 5.6 percent of GDP. As a result net international investment position (NIIP) as a share of

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266800

GDP in Iceland was higher than Ireland (see Table 9 in the appendix). NIIP of Ireland has been increasing while for Iceland it has decreased; this is primarily due to a sudden stop of capital inflow into Iceland due to banks' collapse and capital controls, while capital continued to flow in Ireland after the bailout. Figure 6 dramatically shows the difference between investment income as a share of GDP in Iceland versus that of Ireland. Investment incomes are paid to non-residents in the form of interest and dividends on respective capital inflows. We refer to this as foreign rentier's income share in the current account. The increasing level of foreign rentier's income share clearly indicates a huge amount of foreign borrowing. In Iceland, foreign rentier's income share from 5 percent of GDP in 2002 increased to 50 percent of GDP in 2008. Figure 4 shows the current account as a percentage of GDP: both countries experienced persistent current account deficits due to trade deficits along with increasing foreign rentier's income share. Iceland experienced a much higher current account deficit than Ireland due to exchange rate movements. In particular during 2006 - 2009, large capital inflows in Iceland led to appreciation of the exchange rate, which in turn increased the current account deficit.

In the process of fictionalisation to the build up of the crisis, the evolution of non-financial corporations' (NFC) debt structure follows a similar pattern in both the countries, while the developments in household debt are different. Figure 5 contrasts the fortunes of Ireland's non-financial corporates in each country. For data consistency we begin this series at 2004Q1 but display the figure consistent with our other plots. NFC debt in both the countries increased from 3 times GDP in 2003Q4 to 7 times GDP at the moment of crisis. After 2008, Icelandic NFC debt has dropped to a lower level of 3 times GDP as a wave of bankruptcies and other restructuring measures changed the non financial corporate landscape in Iceland, while Irish NFC debt level remains high in the post crisis period.

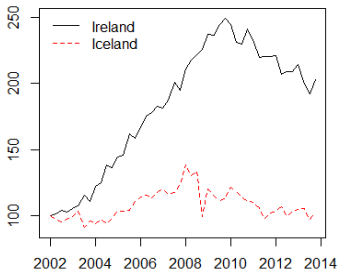


Figure 7: Household Debt

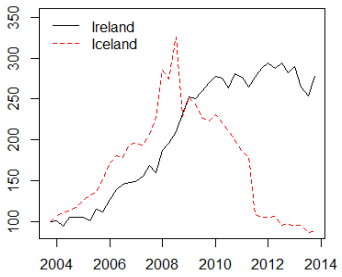


Figure 8: Firm's Debt

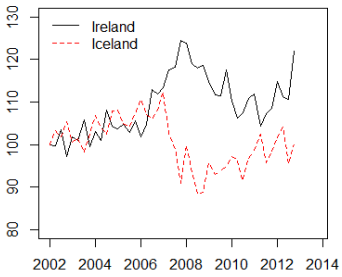


Figure 9: Wage Share(adjusted)

Figure 7 shows household debt as a share of GDP. The Irish story is clearly an old-fashioned asset bubble, where households over borrow based on rising asset price values. Icelandic households with an already high debt experiences a mild increase in their balance sheets as compared to Ireland, though it is surely the case that some Icelandic households over borrowed, the main changes caused by financialisation seem to have taken place in the non-financial sector. Despite dropping from its peak levels in 2008, the household debt in both the countries remains high. Apart from the financial sector, Irish household debt is more than often associated with the crisis in 2008 due to a sharp increase of 2.6 fold during 2002 to 2008. On the other hand, NFC debt in Iceland is associated with the crisis as credit development was dominated by the NFC's borrowing. It is important to point out that Icelandic household borrowing was higher than the NFC's in 2002-03, which is rare in developed countries. But in 2004, the NFC borrowing increased surpassing households, however the total NFC debt is even higher when accounted for the NFC securities owned by the financial sector.

Looking at figure 9, we see a large and persistent increase in the ratio of adjusted wage to GDP from 2002 to 2008 in both the countries. After the crisis, Icelandic wage share has significantly fallen from a peak of 73 percent of GDP to a lower level of 63 percent in 2009, while in Ireland the wage share has remained stable during the years of the crisis but has dropped in 2011. Icelandic wage share has slightly improved since 2010. Over the past decade, Iceland's adjusted wage

share has remained much higher than other countries in Europe and is currently the highest amongst all developed countries. Wage share in Iceland with an average of 69.1 percent of GDP during 2003 to 2013 is much higher than the average wage share in Ireland, which is 51.5 percent of GDP for the same time span. Several authors have pointed out that Ireland's debt-financed growth was wage-led, in the sense that a series of national pay agreements, plus a large increase per capita incomes, contributed to the expansion household balance sheets.

The stories in Ireland and Iceland are markedly different. Yes, both countries benefited from large flows of capital from abroad, and yes, both countries increased the size of their respective balance sheets but in Ireland, the household sector became more fragile as a result of increases in debt while in Iceland the non-financial corporate sector experienced the increase as discussed above.

## 3 Data description and choice of variables

We use three different proxies for financialisation. Our first proxy is based on the stock of liquid liabilities, M3 to GDP as a measure of financial development and financialisation. For this proxy, we use quarterly time series data from 1997Q4 to 2013Q4 for Iceland and from 2002Q1 to 2013Q4 for Ireland and the data are taken from the statistical databases of the respective central banks. Stock of liquid liabilities (M2 or M3) to GDP is the most commonly used measure of financial development in the literature (see Bhattacharya and Sivasubramanian 2003; Rousseau and Wachtel 2000; King and Levine 1993a). The assumption here is that stock of liquid liabilities is positively linked with financial activities and a higher M3 to GDP implies a larger financial sector.

However, financialisation is a broad concept with so many dimensions, hence there is no single variable which can grasp all the aspects. Along with stock of M2 or

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266800

M3 to GDP, many authors have used different measures of financial development in which the most commonly used are credit (households and non-financial corporations) to GDP and banks' deposit liabilities to GDP (see Levine 1997; King and Levine 1993b; Calderón and Liu 2003). Hence, we use two additional proxies for financial development and financialisation, namely private credit to GDP (Credit) and deposit liabilites of the financial sector (FDL), to measure financial development and financialisation. Models which are based on Credit and FDL as proxies for financialisation, we use quarterly data from 2003Q4 to 2013Q4 for Iceland and from 2002Q1 to 2013Q4 for Ireland; the data are taken from the quarterly financial accounts.

Using three proxies of financialisation has several advantages:

1. It covers different financial aspects in an economy.
2. It attempts to cover the developments in financial sector that took place in different time intervals. we believe that each of the proxies used in this paper presents an incomplete picture of financialisation and all the three financial proxies, despite being strongly correlated, evolved in different quarters. For example, banks' deposit liability does not present a comprehensive picture of financialisation in Iceland as the banks' relied on wholesale funding in the beginning of financial liberalisation while development in banks' deposit liabilities came much after the liberalisation of financial markets. Similarly, private credit to GDP is not an appropriate proxy for financialisation because household debt being a component of this measure dramatically increased in Ireland during 2002 to 2009, while it was already high in Iceland at the start of 2002, and further reached its climax in 2008.

The Pearson product-moment correlation for our measures of financialisation is reported in the Table 1. All measures of financialisation in both the countries are

strongly correlated, except the financial depth and credit in Iceland. The correlation is highly significant but strength of relationship is modest.

Ireland

| | FDEV | Credit | FDL |
|---|---|---|---|
| FDEV | 1 | 0.82 | 0.76 |
| Credit | | 1 | 0.77 |
| FDL | | | 1 |

Iceland

| | FDEV | Credit | FDL |
|---|---|---|---|
| FDEV | 1 | 0.43 | 0.88 |
| Credit | | 1 | 0.74 |
| FDL | | | 1 |

Table 1: Correlation Matrix

To analyse the relationship between financialisation and the components of current account, we use the sum of imports and exports to GDP to create a measure of trade openness(*Trade*). This is widely used as a measure of globalization in empirical studies. Foreign rentier's income share is the data of investment income to GDP (*IN*), which is paid in the form of equity and dividends to non-residents. This also reflects financial liberalisation of a country, since these returns are paid on their respective capital inflows. *Trade* and *IN* are taken from the current account in the balance of payments.

To analyse the relationship of financialisation and household debt, we obtain households' liabilities to financial corporations from the financial accounts and compute household debt (*HHD*) to GDP. Finally, to investigate the relationship of financialisation and wage share, we compute adjusted wage (*Wage*) to GDP according to the definition in AMECO[1]. For Iceland, quarterly data for compensation of employees is not available therefore we use quadratic sum method to compute quarterly time series from the annual observations. For Iceland, in model 1 we use unadjusted wage share due to data constraints, while in model 2 and model 3, we use

[1] http://ec.europa.eu/economy_finance/db_indicators/ameco/documents/list_of_variables.pdf

adjusted wage share. For Ireland, we use adjusted wage share in all the models. In Model 2 and 3 for both the countries, we restrain from using household debt in the model. The reason is that household debt is a component of private credit to GDP whereas for model 3, the data sample for Iceland is small which does not allow us to include many variables in the model. Hence, for consistent comparison we do not include household debt for Ireland in model 3 as well.

Table 2 and 3 report the statistical description of the variables used in our models. The negative values in the table for the skewness means the data is left skewed while the positive numbers indicate that the skewness is rightward. The absolute values of skewness for all the variables are less than 1, which means that the skewness is moderate and asymmetry is not extreme.

| | Obs | Mean | SD | Median | Min | Max | Skew | Kurt | SE | JB-$x^2$ | P.value |
|---|---|---|---|---|---|---|---|---|---|---|---|
| lnFDEV | 65 | 5.53 | 0.37 | 5.50 | 4.95 | 6.13 | 0.01 | -1.54 | 0.05 | 6.03 | 0.04 |
| lnCredit | 41 | 6.83 | 0.25 | 6.89 | 6.47 | 7.34 | 0.14 | -1.31 | 0.04 | 2.70 | 0.25 |
| lnFDL | 41 | 6.39 | 0.58 | 6.43 | 5.47 | 7.15 | -0.24 | -1.40 | 0.09 | 3.67 | 0.15 |
| lnWage | 65 | 4.04 | 0.05 | 4.04 | 3.93 | 4.18 | 0.04 | -0.32 | 0.01 | 0.16 | 0.90 |
| lnHHD | 65 | 5.93 | 0.14 | 5.94 | 5.60 | 6.24 | -0.28 | -0.21 | 0.02 | 0.92 | 0.63 |
| lnTrade | 65 | 3.98 | 0.14 | 3.95 | 3.74 | 4.29 | 0.42 | -1.03 | 0.02 | 4.52 | 0.10 |
| lnINV | 65 | 2.62 | 0.87 | 2.62 | 1.19 | 4.12 | -0.01 | -1.41 | 0.11 | 5.02 | 0.081 |

Table 2: Statistical Description for Iceland

For Ireland, kurtosis for all the variables is lower and negative except for *Trade*, which is positive and greater than the kurtosis value of 3 for a normal distribution. For Iceland, all the variables have a negative kurtosis.

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266800

| | Obs | SD | Median | Min | Max | Skew | Kurt | SE | JB-$x^2$ | P.value |
|---|---|---|---|---|---|---|---|---|---|---|
| lnFDEV | 48 | 0.18 | 6.09 | 5.63 | 6.24 | -0.7 | -0.91 | 0.03 | 5.56 | 0.06 |
| lnCredit | 48 | 0.37 | 6.88 | 6.24 | 7.22 | -0.3 | -1.61 | 0.05 | 5.54 | 0.06 |
| lnFDL | 48 | 0.32 | 7.49 | 6.99 | 8.02 | 0.05 | -1.17 | 0.05 | 2.39 | 0.30 |
| lnWage | 48 | 0.07 | 3.92 | 3.82 | 4.07 | 0.32 | -0.92 | 0.01 | 5.78 | 0.05 |
| lnHHD | 48 | 0.29 | 6.00 | 5.32 | 6.23 | -0.71 | -0.94 | 0.04 | 5.78 | 0.05 |
| lnTrade | 48 | 0.10 | 4.40 | 4.28 | 4.83 | 2.10 | 5.35 | 0.01 | 102.8 | 0.00 |
| lnINV | 48 | 0.17 | 3.92 | 3.56 | 4.14 | -0.36 | -1.22 | 0.02 | 3.68 | 0.15 |

Table 3: Statistical Description for Ireland

For all the variables, the distribution is platykurtic distribution (i.e. negative kurtosis) except for the trade share in Ireland which is leptokurtic distribution (i.e. positive kurtosis). This implies that the distribution of *Trade* has a higher peak than the normal distribution while all other variables have a flatter distribution.

JB-$x^2$ represents the Jarque Bera test, which is a joint statistic using skewness and kurtosis coefficients. It tests the null hypothesis of normality against the alternative that the distribution is not normal.

# 4 Methodology

## 4.1 Unit root and cointegration

We apply standard Augmented Dickey Fuller test (ADF) (Dickey and Fuller 1981) and Phillips-Perron (Phillips and Perron 1988) unit root tests to the level data in order to check if the variables are stationary. In general, Phillips-Perron test is prefered over ADF test because its reported statistics are adjusted for heteroskedasticity and autocorrelation. We test the null hypothesis of the existence of a unit root in a time series against the alternative hypothesis that the time series is stationary. We use general-to-specific strategy for the lag selection i.e. begin with a standard lag length of 12 for the quarterly time series and drop the insignificant lags step by step, until

we reach a significant lag length. At significant lag length we observe the test statistics and compare it with corresponding critical values.

We test the following equations for ADF unit root test.

$$\Delta X_t = \alpha + \beta_t + \sigma X_{t-1} + \sum \lambda_i \Delta X_{t-1} + \varepsilon_t \quad (1)$$

$$\Delta X_t = \alpha + \sigma X_{t-1} + \sum \lambda_i \Delta X_{t-1} + \varepsilon_t \quad (2)$$

$$\Delta X_t = \sigma X_{t-1} + \sum \lambda_i \Delta X_{t-1} + \varepsilon_t \quad (3)$$

We begin our analysis of the unit root by first reporting the t-statisitcs for trend in the data as shown in equation (1). If we cannot reject the null hypothesis of a unit root, we proceed to the next step of removing the trend and report the t-statistics for drift in the data as shown in equation (2). If a variable still exhibits a unit root, we remove both trend and drift from the estimation as given by equation (3).

Finally, we compare our results of ADF with the Phillip Perron test and conclude that all the variables for Icelandic and Irish data are non-stationary and have a unit root. To account for unit root, we difference the log of all variables and test them for a unit root again to determine the order of integration. After log-differencing, all the variables for both the countries we find that the variables are stationary and have an order of integration of one, i.e. I(1).

Once the order of integration is determined, we proceed to test the variables for cointegration since all variables in our models analysis are I(1). Existence of cointegration implies that the variables share a common long run path and have a stationary linear combination. From our unit root analysis, we derive the conclusion that all variables are I(1) which means econometrically we can not rule out the possibility of cointegration between our dependent variable and rest of the variables in the system.

We use three approaches to test for cointegration. First, we use residual based method suggested in (Engle and Granger 1987). According to this method, if two variables have a long run stationary relationship then the residuals of their combination is stationary. Second, we use the bound test by estimating an Unrestricted error correction model (UECM) and compare our test statistics with the corresponding bounds in (Pesaran *et al* 2001). Third, we use Johansen approach of cointegration based on trace statistics and eigen values (Johansen 1991). In Johansen procedure, we test the null hypothesis of 'r' cointegrating relations against the alternative of more than 'r' cointegrating relations.

From cointegration tests, we conclude that there is no long run relationship between the variables in our model. However, there is some economic evidence of cointegration between trade and financial development in the literature. To the best of our knowledge, apart from trade and financial development, there is no evidence of cointegration between financialisation and the variables we have chosen in this study. The selection of variables in this paper is merely to identify the type of relationship rather than explaining the determinants of financialisation process or aim to get a high explanatory power of the model. In addition, we are not interested in the discussion of causal relationship between financailisation and our independent variables.

## 4.2 Model of financialisation

We develop three ARDL models for each country. Apart from covering different financial aspects, using three models allow us in comparing the dynamics of one model with another for each individual country as well as between the two countries. The models are represented which as follows:

**Model 1**

$$\Delta \ln FDEV = \alpha_0 + \sum_{i=1}^{4} \alpha_1 \Delta \ln FDEV_{t-i} + \sum_{i=0}^{4} \alpha_1 \Delta \ln Trade_{t-i} + \sum_{i=0}^{4} \alpha_1 \Delta \ln INV_{t-i} + \sum_{i=0}^{4} \alpha_1 \Delta \ln HHD_{t-i} + \sum_{i=0}^{4} \alpha_1 \Delta \ln Wage_{t-i} + \Psi D_i + \phi T + \varepsilon_t$$

**Model 2**

$$\Delta \ln Credit = \alpha_0 + \sum_{i=1}^{4} \alpha_1 \Delta \ln Credit_{t-i} + \sum_{i=0}^{4} \alpha_1 \Delta \ln Trade_{t-i} + \sum_{i=0}^{4} \alpha_1 \Delta \ln INV_{t-i} + \sum_{i=0}^{4} \alpha_1 \Delta \ln Wage_{t-i} + \Psi D_i + \phi T + \varepsilon_t$$

**Model 3**

$$\Delta \ln FDL = \alpha_0 + \sum_{i=1}^{4} \alpha_1 \Delta \ln FDEV_{t-i} + \sum_{i=0}^{4} \alpha_1 \Delta \ln Trade_{t-i} + \sum_{i=0}^{4} \alpha_1 \Delta \ln INV_{t-i} + \sum_{i=0}^{4} \alpha_1 \Delta \ln Wage_{t-i} + \Psi D_i + \phi T + \varepsilon_t$$

In the model above, $\sum_{i=1}^{4}$ represents the sum of lags, $\Delta \ln$ represents first order difference of logged variables, $\Psi D_i$ represents the quarterly seasonal dummies, and $\phi T$ represents time trend. We choose to use an ARDL modeling strategy because:

1. It allows for mixing variables of different order of integration in the same equation,
2. In the presence of cointegration, it allows to directly estimate long run and short run coefficients along with the speed of adjustment (error correction term) from short run to long run,
3. Restricting the model by reducing the lag length of specific variables in the model is easier,
4. Reparameterising the model to study cumulative dynamics is simple.

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266800

For estimating the models, we follow a general-to-specific modelling strategy. Due to the small data sample we have, we begin our estimation with maximum 4 lags, which is against the spirit of dynamic modelling for quarterly data. We further reduce the model by dropping insignificant coefficients and confirm our reduction with an F-test. In some cases, we keep insignificant lags in the model to avoid the problem of autocorrelation in the residuals. We also consider AIC and BIC methods for making a choice in reducing the model. We use the first difference log of all the variables due to a presence of unit root and enter them as I(1) in the models. Since there is no long run relationship among the variables, the reported coefficients indicate short run dynamics.

## 5 Results

Table 4 and 5 reports the results of the restricted ARDL models for our specified equations, while Table 6 and 7 reports the cumulative dynamics of the unrestricted ARDL models. In case our results for individual lags are inconclusive or puzzling, we rely on the cumulative dynamics of the models and also perform additional experiments to derive conclusions.

Our results suggest that financialisation in both the countries is positively linked with foreign rentiers' income share in the current account. This reflects financial liberalisation in both the countries, which has clearly increased in the past decade and confirmed by our estimates. However, there is a remarkable difference in the financial liberalisation of both the countries. In the case of Ireland, FDI payments in the form of equity is more dominant than the interest payments, while for Iceland, interest on debt instruments totally dominates the payment stream to non-residents. Another important component of current account in our model is the trade openness, which reflects globalisation, shows different results in Ireland and Iceland.

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266800

Our results suggest that Icelandic trade openness has a negative relationship with different measures of financialisation which is unexpected. However, the negative effect of trade openness on financialisation in the short run is consistent with the findings of (Kim *et al* 2010); they find negative short run effects of trade openness on financialisation but positive long run effects. Trade openness in Iceland fell due to a fall in export to GDP at the time when financialisation process reached its peak in 2007-08. In the post crisis period trade openness has further increased where all financial measures have shrunk. For Ireland we find that trade openness has a positive relationship with financialisation. Different relationship of financialisation and trade openness in Ireland and Iceland could be explained by the fact that trade in a monetary union eliminates all kinds of currency risks associated with it. There are several studies which ranked Ireland on top in the trade openness, while Iceland has been placed in the lower bottom of OECD countries. Different findings in this paper makes the effect of trade openness on financialisation unclear and at the same time gives rise to the dual role of financialisation in small open economies.

Our results for financial depth to GDP as a measure of financialisation in model 1 indicates a positive relationship with household debt to GDP in both the countries. Finally, we find that our three proxies of financialisation indicate a strong positive relationship with wage share in both the countries. For Iceland, our results are consistent for both adjusted and unadjusted wage shares.

Our findings for the wage share are in contrast to the existing literature on financialisation. Here it is important to highlight that previous studies have mainly used annual data with a longer time span for their estimations, while we have used quarterly data for a shorter time span and estimated short run dynamics of the model. However, Hein and van Treeck (2010) and Dallery and van Treeck (2011) argued that in the medium to long run, the wage share is likely to decrease due to an

increasing shareholder power. It might well be the case that wage share and financialisation in Iceland and Ireland have a negative long run relationship, but our findings are inconclusive given the nature and length of our data.

## 5.1 Financial depth to GDP as a measure of Financialisation

Using financial depth as a measure of financialisation in model 1, we find that the non-residents' income share paid on capital inflows has a positive relationship with financialisation in both the countries (see Table 4 and 5). The strength of correlation is strong and highly significant for Ireland, while for Iceland the correlation is weak and statistically insignificant. Looking at the cumulative dynamics of model 1 as shown in Table 6 and 7, we find that the foreigners' income share has a strong and positive cumulative effect on financial depth in Ireland, while in Iceland the effect is positive but an insignificant one.

In model 1, trade openness for Ireland shows a significant negative relationship, while for Iceland the results for individual quarters are inconclusive due to sign changes. In this case we base our decision on the cumulative dynamics of the model. Model 1 in table indicates that trade openness in both the countries has a strong negative relationship with financialisation.

Our measure of financialisation indicate positive relationship with household debt for Iceland. For Ireland the result for individual quarters is inconclusive as household debt in the current quarter increases but falls in the previous quarter. However, Table 6 and 7 clearly shows that the combined effect of household debt over 4 quarters is positive and significant, while for Iceland the combined effect of household debt on financialisaiton is insignificant.

Financial depth as a proxy of financialisation in both the countries shows a strong positive relationship with the wage share as shown in Table 4 and 5. In Iceland, the effect of the wage share has changed from positive to a negative in the 2nd

quarter, but the positive effect in current quarter is almost twice the negative effect. Hence, the cumulative dynamics clearly show an overall positive effect of wage share on financial depth in Iceland as well as Ireland. However, the combine effect of all the quarters in Ireland is statistically insignificant.

## 5.2 Credit to GDP as a measure of financialisation

Using credit to GDP as a measure of financialisation, our results suggest that financialisation is positively related with developments in foreign rentier's income share in Iceland, while for Ireland the coefficients are insignificant. The cumulative dynamics of the model indicate that the combined effect of foreign rentier's income share over all the four quarters in the model is insignificant as well as negative for both Ireland and Iceland, which is puzzling. We therefore perform additional experiments by increasing the lag length of foreign rentier's income share to 8 quarters as reported in Table 8. We find that there exists a highly positive significant relationship between financialisation and foreign rentier's income share when the estimation is extended to 2 years. This reveals weakness of our original model, but unfortunately due to data constraints we cannot perform experiments on all the variables at the same time.

Our results regarding trade openness are different for both the countries. In Iceland trade openness has a strong negative impact on credit to GDP, while in Ireland the relationship is positive. However, the cumulative dynamics over 4 quarters in Iceland shows that trade openness and financialisation are negatively linked, but for Ireland the cumulative dynamics for all the quarters indicate an insignificant but positive overall effect.

Our proxy of financialisation in model 2 shows a positive and strong relationship with the wage share for both the countries. The results are similar for both the

countries. Also, the cumulative dynamics indicate that wage share has a positive impact on financialisation in our analysis.

## 5.3 Deposit liabilities to GDP as a measure of financialisation

Finally, our findings for the third model (see Table 4 and 5), which uses deposit liabilites of the financail sector as a measure of financialisation endorses our previous results for all the variables used in the model. Our results suggest that foreign rentiers' income share has a positive relationship with financialisation in both the countries. At individual quarters the effect is either positive or insignificant, whenever the sign is negative in some cases. The cumulative dynamics indicate that the overall effect of foreign rentier's income share on financialisation is positive.

Our results for trade openness again are differnt for both the countries. We find that trade openness in Iceland has a negative impact on financialisation while for Ireland there is a positive link. These findings are also valid for cumulative dynamics of trade openness on financialisation in both the countries.

The results in model 3 for the wage share are again similar for both the countries and also consistent with the results of other two models, leading us to conclude that wage share and measures of financialisation are strongly and positively linked. In addition, our findings for cumulative dynamics of wage share are consistent in all the three models.

## 5.4 Diagnostic test and robustness of our results

We conduct several diagnostic tests to make sure the estimated coefficients are efficient and unbiased. We test the models for autocorrelation using Durbin-Watson and Ljung-Box tests and accept the null hypothesis of no autocorrelation in all the models. We examine multicollinearity in the model by analysing variance inflation

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266800

factors (vif) and find evidence of low multicollinearity in the models, but not sufficient enough to affect the significance of our coefficients (see Fox and Monette 1992). However, it is important to highlight that the models representing cumulative dynamics have not been adjusted for multicollinearity [2]. To account for heteroskedasticity in the model, we adjust the coefficients using Newey West estimation method and report the heteroskedasticity and autocorrelation consistent (HAC) covariance matrix estimators.

Finally to ensure the stability of our model, we test the null hypothesis of model stability against the alternative that the estimated coefficients are not stable indicating a structural break in the model. We perform several structural break tests as follows:

1. We perform traditional Chow F-test proposed by (Chow 1960). We split the data into two sub samples i.e. before and after the crisis in 2008. The disadvantage of using traditional Chow test is that the exact break point has to be known before splitting the sample, especially for small data sample.
2. We extend the Chow test and compute F statistics for all potential break points in the model to overcome the above drawback.
3. We also perform stability tests on the cumulative sum (CUSUM) on recursive residuals and CUSUM on the estimators.

Figure 10 shows calculated F statistics for all potential break points in Iceland. We can clearly see that the computed F statistics for all the models is too large, crossing the corresponding critical bound at 5 percent level, indicating a structural

[2] A possible solution to avoid multicollinearity is to drop some of the independent variables, but we don't want to lose any information by removing variables from the model. We find strong collinearity between wage share and household debt in model 1 for Iceland; this is also the reason that this model indicates so many insignificant coefficients

break. Model 1 and 3 show signs of structural break in 2007-09, but model 2 indicates signs of structural break in 2010-11. This might be due to a significant decline in credit to GDP in 2010 as also shown in Figure 2.

Figure 11 shows calculated F statistics for all potential break points in our specified models for Ireland. Model 1 and 3 indicate a structural break whereas model 2 shows no signs of any breaks in Ireland. This might be due to the fact that except model 2 which is based on credit to GDP as a proxy for financialisation, other measures of financialisation in Ireland have fallen in 2008-09 as shown in figure 1-3.


Figure 10: F-Statistics for Icelandic Models

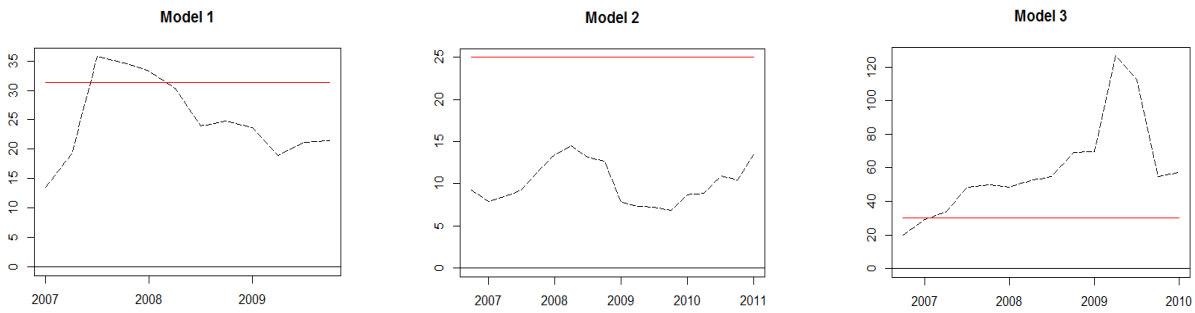


Figure 10: F-Statistics for Irish Models

For our models where the structure break exists in the period 2007-09, we cross check our findings with traditional Chow test which confirms our analysis.

Chow test cannot be applied to models which indicate a break in the beginning or in the end of sample e.g. in the case of Iceland, we find a structural break in 2010 in model 2. Finally, our stability test on CUSUM of the recursive residuals also failed to detect any structural break as shown in figure 12 and 13. A possible reason is that this test is based on conditional mean where a positive and negative spike in the residuals might cancel out the effect of each other leading us to a wrong conclusion. However, from the plots of the residuals we strongly believe the existence of a structural break in these models and this is also evident from our computed F statistics for all potential break points.

To avoid the impact of structural break in our models, we test model 1 before the occurrence of a structural break and after the structural break for both the countries. We find that the relationship of our independent variables with financialisation remains the same in both the countries. However, due to less degrees of freedom, we refrain from making any further conclusions here. Unfortunately, due to less data observations we could not split model 2 and 3 for Iceland. However, we strongly believe that in Iceland the sign of coefficients might not change after the crisis in 2008, but the strength of correlation between financialisation and our independent variables might become weaker. Model 2 for Ireland has no structural break while we don't perform any additional tests on this model as the structural break reaches its peak in 2010, leaving us with very less degrees of freedom in the post crisis period as shown in figure 11.

Most dynamic models are sensitive to lag lengths therefore we perform additional experiments on our models by varying lag length to ensure robustness. The estimated coefficients are found to be robust for all the models except for model 2 in both the countries, which is based on credit to GDP as a proxy for financialisation as discussed above. Additional experiments and robustness tests validate our findings of the original models except model 2, which is sensitive to lag lengths.

Finally, our modelling strategy in this paper is subject to several limitations primarily due to data constraints as follows:

1. We reduce the models to study the dynamic effects up to 4 quarters. This reduces the power of the model as we lose important information from the previous years.
2. We find structural break in all the models except model 2 for Ireland, but unfortunately could not re-estimate all the models for the periods before and after the structural break.
3. We use first order differences of logged data in our models to avoid the problems of spurious regression. This can possibly reduce the developments that take place in the original data and in turn might result in an underestimated impact of the variables.

## 6 Conclusion

The goal of this paper is to understand the different effects of financialisation on two small, open economies. Financialisation matters precisely because excessive capital flows can damage the structures of small open economies as well as amplifying boom-bust cycles with large distortionary and distributional effects.

The experiences of Ireland and Iceland are similar in many ways, in that large gross flows from the rest of the world acted to destabilise their economies in the run up to the 2007 crisis. There are sectoral differences both the issuance and the holding of the debt by country, however. In Ireland, the household sector holds almost all the debt, while in Iceland the non financial corporate sector built up very large debt levels.

By the end of the crisis period, the alternative institutional structures at play, including Ireland's membership of the European Union, resulted in large changes in

the fortunes of each country. Iceland's decision to impose capital controls during a wave of bankruptcies in the non financial corporate sector while restructuring their banking system contrasts sharply with Irish household debt remaining at historically high levels with no debt resolution while the senior creditors of all banks were made whole via a banking guarantee.

Our results emphasize the role of wage growth, of trade growth, and of credit growth, in financialisation. Policy makers require new tools to track credit flows to sectors, while the international dimension of small open economies like Iceland and Ireland remains a concern going forward.

# 7. Appendix

## 7.1 Main results for reduced ARDL models

| | (Model 1) | (Model 2) | (Model 3) |
|---|---|---|---|
| $\Delta lnWage_t$ | 0.72*** | 1.45*** | 1.27*** |
| | (0.09) | (0.23) | (0.41) |
| $\Delta lnWage_{t-1}$ | −0.46*** | 0.20* | 0.54*** |
| | (0.10) | (0.10) | (0.24) |
| $\Delta lnWage_{t-2}$ | −0.20 | 0.52* | 0.15 |
| | (0.12) | (0.30) | (0.54) |
| $\Delta lnWage_{t-3}$ | 0.14 | −0.74*** | – |
| | (0.10) | (0.21) | |
| $\Delta lnWage_{t-4}$ | – | – | – |
| | | | |
| $\Delta lnTrade_t$ | – | | −0.26 |
| | | | (0.20) |
| $\Delta lnTrade_{t-1}$ | −0.07 | −0.30*** | −0.48** |
| | (0.05) | (0.06) | (0.23) |
| $\Delta lnTrade_{t-2}$ | 0.03 | −0.30*** | −0.47*** |
| | (0.04) | (0.06) | (0.13) |
| $\Delta lnTrade_{t-3}$ | −0.08 | −0.24*** | |
| | (0.05) | (0.10) | |
| $\Delta lnTrade_{t-4}$ | 0.20*** | −0.31* | |
| | (0.05) | (0.10) | |
| $\Delta lnINV_t$ | – | – | 0.07*** |
| | | | (0.02) |
| $\Delta lnINV_{t-1}$ | – | – | 0.03 |
| | | | (0.05) |
| $\Delta lnINV_{t-2}$ | 0.02*** | – | −0.05 |
| | (0.01) | | (0.07) |
| $\Delta lnINV_{t-3}$ | – | 0.03 | 0.10* |
| | | (0.05) | (0.05) |
| $\Delta lnINV_{t-4}$ | – | 0.04*** | 0.08*** |
| | | (0.02) | (0.02) |
| $\Delta lnHHD_{t-2}$ | 0.25*** | – | – |
| | (0.09) | | |
| Constant | 0.002 | 0.004 | 0.009 |
| | (0.003) | (0.010) | (0.01) |
| Observations | 64 | 40 | 40 |
| Adjusted $R^2$ | 0.66 | 0.49 | 0.41 |
| Durban Watson | 2.18 | 2.18 | 2.06 |

Note: *p<0.1; **p<0.05; ***p<0.01

Table 4: Estimated Coefficients for Iceland

| | (Model 1) | (Model 2) | (Model 3) |
|---|---|---|---|
| $\Delta lnWage_t$ | – | 0.81*** | 1.11*** |
| | | (0.05) | (0.16) |
| $\Delta lnWage_{t-1}$ | – | –0.06 | 0.51** |
| | | (0.17) | (0.22) |
| $\Delta lnWage_{t-2}$ | 0.002 | 0.39*** | –0.03 |
| | (0.17) | (0.18) | (0.29) |
| $\Delta lnWage_{t-3}$ | 0.44*** | – | 0.64*** |
| | (0.15) | | (0.17) |
| $\Delta lnWage_{t-4}$ | 0.19 | – | 0.81*** |
| | (0.15) | | (0.17) |
| $\Delta lnTrade_t$ | – | – | – |
| | | | |
| $\Delta lnTrade_{t-1}$ | –0.22 | – | 0.91** |
| | (0.14) | | (0.32) |
| $\Delta lnTrade_{t-2}$ | –0.29*** | –0.21 | –0.28 |
| | (0.12) | (0.14) | (0.26) |
| $\Delta lnTrade_{t-3}$ | –0.008 | 0.24*** | –0.21*** |
| | (0.08) | (0.08) | (0.09) |
| $\Delta lnTrade_{t-4}$ | 0.12 | – | – |
| | (0.102) | | |
| $\Delta lnINV_t$ | 0.20* | – | – |
| | (0.10) | | |
| $\Delta lnINV_{t-1}$ | 0.35*** | –0.03 | 0.16 |
| | (0.10) | (0.08) | (0.12) |
| $\Delta lnINV_{t-2}$ | 0.05 | 0.01 | 0.02 |
| | (0.08) | (0.10) | (0.16) |
| $\Delta lnINV_{t-3}$ | – | –0.002 | 0.10 |
| | | (0.08) | (0.09) |
| $\Delta lnINV_{t-4}$ | – | 0.10 | – |
| | | (0.08) | |
| $\Delta lnHHD_t$ | 0.40*** | – | – |
| | (0.13) | | |
| $\Delta lnHHD_{t-1}$ | –0.42*** | – | – |
| | (0.11) | | |
| $\Delta lnHHD_{t-2}$ | 0.24 | – | – |
| | (0.158) | | |
| Constant | 0.0002 | 0.040*** | 0.059*** |
| | (0.006) | (0.012) | (0.021) |
| Observations | 47 | 47 | 47 |
| Adjusted $R^2$ | 0.46 | 0.54 | 0.51 |
| Durban Watson | 1.71 | 2.05 | 2.26 |

Note: *p<0.1; **p<0.05; ***p<0.01

Table 5: Estimated Coefficients for Ireland

## 7.2 Cumulative dynamics

| | (Model 1) | (Model 2) | (Model 3) |
|---|---|---|---|
| $\Delta lnWage_t$ | 0.87*** | 1.78*** | 1.46*** |
| | (0.28) | (0.35) | (0.51) |
| $\Delta lnWage_{t-1}$ | −0.11 | 2.03*** | 2.33*** |
| | (0.44) | (0.47) | (0.63) |
| $\Delta lnWage_{t-2}$ | −0.04 | 2.51*** | 2.66*** |
| | (0.40) | (0.79) | (0.83) |
| $\Delta lnWage_{t-3}$ | 0.28*** | 2.00*** | 3.23*** |
| | (0.39) | (0.82) | (1.00) |
| $\Delta lnWage_{t-4}$ | 0.33*** | 1.66*** | 2.93*** |
| | (0.64) | (0.75) | (0.85) |
| $\Delta lnTrade_t$ | −0.06 | 0.20*** | −0.23 |
| | (0.04) | (0.04) | (0.18) |
| $\Delta lnTrade_{t-1}$ | −0.21** | 0.37*** | −0.77*** |
| | (0.09) | (0.09) | (0.36) |
| $\Delta lnTrade_{t-2}$ | −0.20* | 0.19* | −1.17*** |
| | (0.11) | (0.10) | (0.43) |
| $\Delta lnTrade_{t-3}$ | −0.33* | 0.07 | −0.92*** |
| | (0.18) | (0.07) | (0.40) |
| $\Delta lnTrade_{t-4}$ | −0.18 | −0.20*** | 0.76 |
| | (0.21) | (0.08) | (0.48) |
| $\Delta lnINV_t$ | 0.005 | −0.01 | 0.09 |
| | (0.01) | (0.02) | (0.02) |
| $\Delta lnINV_{t-1}$ | 0.0003 | −0.05 | 0.10 |
| | (0.02) | (0.06) | (0.05) |
| $\Delta lnINV_{t-2}$ | 0.03 | −0.11 | 0.04 |
| | (0.02) | (0.12) | (0.12) |
| $\Delta lnINV_{t-3}$ | 0.027 | −0.13 | 0.12 |
| | (0.03) | (0.13) | (0.09) |
| $\Delta lnINV_{t-4}$ | 0.025 | −0.10 | 0.20 |
| | (0.03) | (0.13) | (0.10) |
| $\Delta lnHHD_t$ | −0.07 | – | – |
| | (0.08) | – | – |
| $\Delta lnHHD_{t-1}$ | −0.18 | – | – |
| | (0.13) | – | – |
| $\Delta lnHHD_{t-2}$ | 0.03 | – | – |
| | (0.22) | – | – |
| $\Delta lnHHD_{t-3}$ | 0.03 | – | – |
| | (0.23) | – | – |
| $\Delta lnHHD_{t-4}$ | −0.16 | – | – |
| | (0.23) | – | – |

Note: *p<0.1; **p<0.05; ***p<0.01

Table 6: Estimated Coefficients for Iceland

| | (Model 1) | (Model 2) | (Model 3) |
|---|---|---|---|
| $\Delta lnWage_t$ | 0.23 | 0.75*** | 1.04*** |
| | (0.28) | (0.08) | (0.27) |
| $\Delta lnWage_{t-1}$ | −0.30 | 0.61*** | 1.52*** |
| | (0.44) | (0.15) | (0.47) |
| $\Delta lnWage_{t-2}$ | −0. 15 | 1.00*** | 1.52*** |
| | (0.40) | (0.34) | (0.44) |
| $\Delta lnWage_{t-3}$ | 0.37 | 0.93*** | 2.24*** |
| | (0.39) | (0.36) | (0.59) |
| $\Delta lnWage_{t-4}$ | 0.04 | 0.95*** | 3.20*** |
| | (0.64) | (0.38) | (0.59) |
| $\Delta lnTrade_t$ | −0.19 | 0.14 | 0.24 |
| | (0.15) | (0.11) | (0.16) |
| $\Delta lnTrade_{t-1}$ | −0.4 | 0.18 | 1.33*** |
| | (0.20) | (0.23) | (0.31) |
| $\Delta lnTrade_{t-2}$ | −0.86*** | −0.01 | 1.12*** |
| | (0.33) | (0.33) | (0.42) |
| $\Delta lnTrade_{t-3}$ | −0.85** | 0.27 | 0.91*** |
| | (0.40) | (0.24) | (0.38) |
| $\Delta lnTrade_{t-4}$ | −0.62* | 0.26 | 0.99*** |
| | (0.32) | (0.28) | (0.44) |
| $\Delta lnINVt$ | 0.15 | −0.10 | −0.15 |
| | (0.09) | (0.12) | (0.10) |
| $\Delta lnINV_{t-1}$ | 0.44*** | −0.11 | 0.20 |
| | (0.13) | (0.12) | (0.12) |
| $\Delta lnINV_{t-2}$ | 0.55*** | −0.11 | 0.002 |
| | (0.17) | (0.15) | (0.15) |
| $\Delta lnINV_{t-3}$ | 0.40** | −0.14 | 0.05 |
| | (0.19) | (0.17) | (0.12) |
| $\Delta lnINV_{t-4}$ | 0.42** | 0.04 | −0.06 |
| | (0.19) | (0.20) | (0.18) |
| $\Delta lnHHD_t$ | 0.22*** | – | – |
| | (0.26) | – | – |
| $\Delta lnHHD_{t-1}$ | 0.19*** | – | – |
| | (0.16) | – | – |
| $\Delta lnHHD_{t-2}$ | 0.25 | – | – |
| | (0.158) | – | – |
| $\Delta lnHHD_{t-3}$ | 0.10 | – | – |
| | (0.26) | – | – |
| $\Delta lnHHD_{t-4}$ | 0.47*** | – | – |
| | (0.21) | – | – |

Note: *p<0.1; **p<0.05; ***p<0.01

Table 7: Estimated Coefficients for Ireland

## 7.3 Additional experiments

| | (Iceland) | (Ireland) |
|---|---|---|
| $\Delta \ln Trade_t$ | 0.12 | 0.041 |
| | (0.19) | (0.10) |
| $\Delta \ln Trade_{t-1}$ | 0.05 | −0.24*** |
| | (0.16) | (0.06) |
| $\Delta \ln Trade_{t-2}$ | −0.39*** | 0.06 |
| | (0.100) | (0.19) |
| $\Delta \ln Trade_{t-3}$ | −0.10 | 0.65*** |
| | (0.11) | (0.08) |
| $\Delta \ln Trade_{t-4}$ | −0.19** | 0.38*** |
| | (0.08) | (0.10) |
| $\Delta \ln INt$ | −0.02 | 0.01 |
| | (0.04) | (0.06) |
| $\Delta \ln IN_{t-1}$ | 0.003 | 0.03 |
| | (0.04) | (0.06) |
| $\Delta \ln IN_{t-2}$ | 0.05 | 0.16 |
| | (0.04) | 0.20 |
| $\Delta \ln IN_{t-3}$ | 0.03 | −0.07 |
| | (0.05) | 0.12 |
| $\Delta \ln IN_{t-4}$ | 0.10*** | −0.03 |
| | (0.02) | (0.07) |
| $\Delta \ln IN_{t-5}$ | 0.07*** | −0.12 |
| | (0.01) | 0.10 |
| $\Delta \ln IN_{t-6}$ | 0.04 | 0.04 |
| | (0.03) | (0.14) |
| $\Delta \ln IN_{t-7}$ | −0.00 | 0.17 |
| | (0.03) | (0.15) |
| $\Delta \ln IN_{t-8}$ | −0.07** | 0.60** |
| | (0.02) | (0.14) |
| Constant | −0.006 | −0.006 |
| | (0.00) | (0.00) |

Note: *p<0.1; **p<0.05; ***p<0.01

Table 8: Credit to GDP (Model 2)

## 7.4 Macroeconomic indicators

| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|---|---|---|---|---|---|---|---|
| **Real GDP growth (%)** | | | | | | | |
| Iceland | 6 | 1.2 | -6.6 | -4.1 | 2.7 | 1.4 | 2.9 |
| Ireland | 5 | -2.2 | -6.4 | -1.1 | 2.2 | 0.2 | -0.3 |
| **Investment (% of GDP)** | | | | | | | |
| Iceland | 29 | 24.6 | 13.9 | 12.5 | 14.4 | 14.8 | 13.8 |
| Ireland | 26.1 | 21.8 | 15.2 | 11.8 | 11.2 | 10.9 | 11.5 |
| **Vol. of Imports (% of GDP)** | | | | | | | |
| Iceland | -1.7 | -14.9 | -27.6 | 4.3 | 4 | -2.3 | 4.2 |
| Ireland | 9 | -13 | -17.2 | -1.1 | -2.4 | -2.9 | 1 |
| **Vol. of exports (% of GDP)** | | | | | | | |
| Iceland | 22.7 | 11.9 | 1.8 | -1.9 | 1.2 | 3.0 | 2.8 |
| Ireland | 4.6 | -0.3 | -5.4 | 5.2 | 3.8 | -3.6 | -3.9 |
| **Current Account Balance (% of GDP)** | | | | | | | |
| Iceland | -15.7 | -28.4 | -11.6 | -8.5 | -5.6 | -5.0 | 0.4 |
| Ireland | -5.3 | -5.6 | -2.3 | 1.1 | 1.2 | 4.4 | 6.6 |
| **Unemployment** | | | | | | | |
| Iceland | 1.0 | 1.6 | 8 | 8.1 | 7.4 | 5.8 | 4.4 |
| Ireland | 4.7 | 6.4 | 12 | 13.9 | 14.6 | 14.7 | 13 |
| **CPI Inflation** | | | | | | | |
| Iceland | 5.1 | 12.7 | 12 | 5.4 | 4 | 5.2 | 3.9 |
| Ireland | 2.9 | 3.1 | -1.7 | -1.6 | 1.2 | 1.9 | 0.5 |
| **Real Exchange** | | | | | | | |
| Iceland | 150 | 117.8 | 95.2 | 100 | 101.4 | 101 | 106.5 |
| Ireland | 107.5 | 112.5 | 107.2 | 100 | 100.1 | 95.4 | 97.3 |
| **NIIP (% of GDP)** | | | | | | | |
| Iceland | -101.8 | -325 | -713.3 | -653.3 | -572.8 | -527 | -444 |
| Ireland | -18.8 | -72.9 | -89.2 | -84.3 | -106.6 | -106.3 | -98.5 |

Table 9: Comparison of Macro indicators

## 7.4 CUSUM test of recursive residuals


Figure 12: Cusum of Recursive Residuals for Iceland

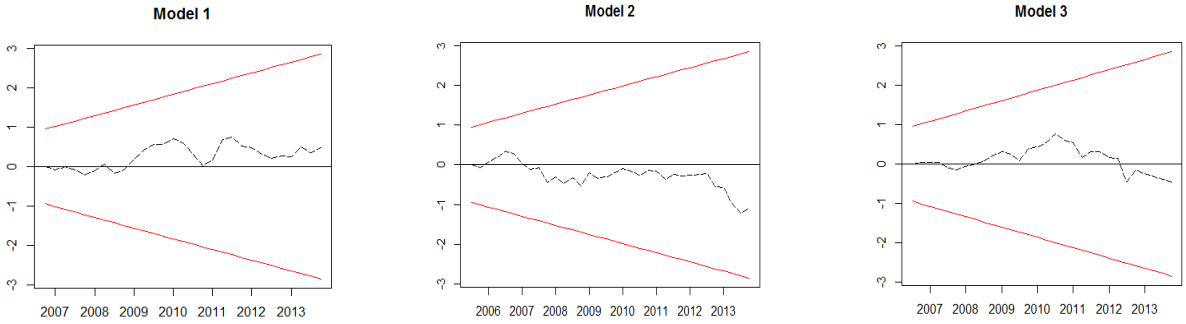


Figure 13: Cusum of Recursive Residuals for Ireland

## 7.5 CUSUM test of the estimators

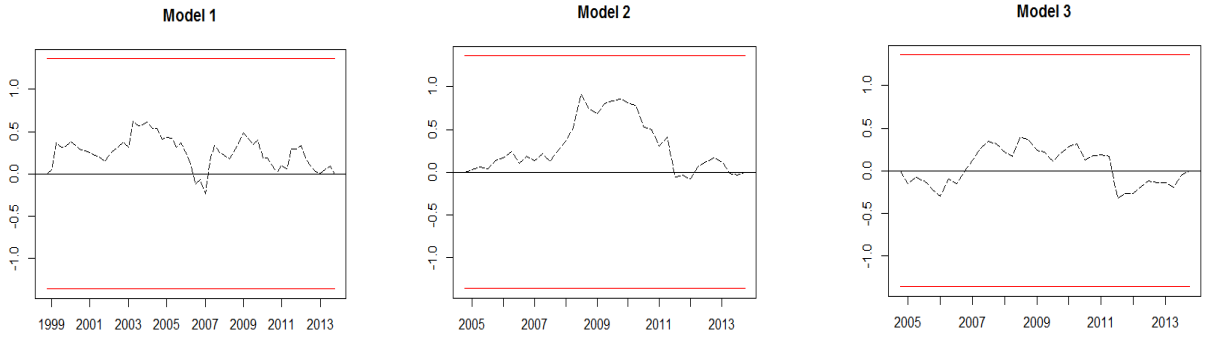


Figure 14: Cusum of Estimators for Iceland

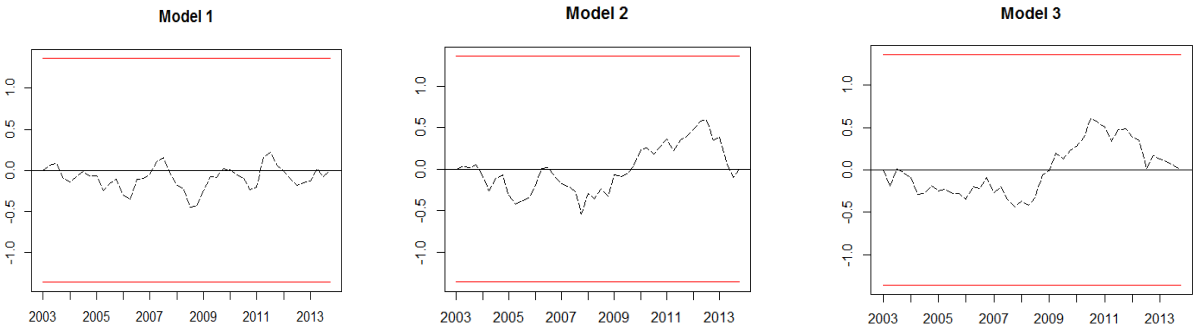


Figure 15: Cusum of Estimators for Ireland

## References

Prabir C. Bhattacharya and M. N. Sivasubramanian. Financial development and economic growth in india: 1970–1971 to 1998–1999. *Applied Financial Economics*, 13 (12): 925–929, 2003. 10.1080/0960310032000129590.

Marco Bianchi, Björn R Gudmundsson, and Gylfi Zoega. Iceland's natural experiment in supply-side economics. *American Economic Review*, pages 1564–1579, 2001.

César Calderón and Lin Liu. The direction of causality between financial development and economic growth. *Journal of Development Economics*, 72 (1): 321–334, 2003. http://dx.doi.org/10.1016/S0304-3878(03)00079-8. URL http://www.sciencedirect.com/science/article/pii/S0304387803000798.

Gregory C. Chow. Tests of equality between sets of coefficients in two linear regressions. *Econometrica*, 28 (3): pp. 591–605, 1960. ISSN 00129682. URL http://www.jstor.org/stable/1910133.

Thomas Dallery and Till van Treeck. Conflicting claims and equilibrium adjustment processes in a stock-flow consistent macroeconomic model. *Review of Political Economy*, 23 (2): 189–211, 2011. URL http://dx.doi.org/10.1080/09538259.2011.561557.

Jon Danielsson and Gylfi Zoega. The collapse of a country. *Institute of Economic Studies Discussion Paper W*, 9, 2009.

Zsolt Darvas. A tale of three countries: Recovery after banking crises. Bruegel Policy Contribution 2011/19, Brussels, 2011. URL http://hdl.handle.net/10419/72127.

David A. Dickey and Wayne A. Fuller. Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*, 49 (4): pp. 1057–1072, 1981. ISSN 00129682. URL http://www.jstor.org/stable/1912517.

Amitava Krishna Dutt. Maturity, stagnation and consumer debt: a steindlian approach. *Metroeconomica*, 57 (3): 339–364, 2006.

Robert F. Engle and C. W. J. Granger. Co-integration and error correction: Representation, estimation, and testing. *Econometrica*, 55 (2): pp. 251–276, 1987. ISSN 00129682. URL http://www.jstor.org/stable/1913236.

John Fox and Georges Monette. Generalized collinearity diagnostics. *Journal of the American Statistical Association*, 87 (417): pp. 178–183, 1992. ISSN 01621459. URL http://www.jstor.org/stable/2290467.

Robin Greenwood and David Scharfstein. The growth of modern finance. *Journal of Economic Perspectives*, 27 (2): 3–28, 2013.

Eckhard Hein. *The macroeconomics of finance-dominated capitalism and its crisis*. Edward Elgar Publishing, 2012.

Eckhard Hein. Finance-dominated capitalism and re-distribution of income: a kaleckian perspective. *Cambridge Journal of Economics*, page bet038, 2013.

Eckhard Hein and Nina Dodig. Financialisation, distribution, growth and crises: Long-run tendencies. Technical Report 35/2014, 2014. URL http://hdl.handle.net/10419/92913.

Eckhard Hein and Till van Treeck. Financialisation and rising shareholder power in kaleckian/post-kaleckian models of distribution and growth. *Review of Political Economy*, 22 (2): 205 – 233, 2010. ISSN 09538259.

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

Søren Johansen. Estimation and hypothesis testing of cointegration vectors in gaussian vector autoregressive models. *Econometrica*, 59 (6): pp. 1551–1580, 1991. ISSN 00129682. URL http://www.jstor.org/stable/2938278.

Morgan Kelly. On the likely extent of falls in irish house prices. *ESRI Quarterly Economic Commentary*, 2: 42–54, Summer 2007.

Dong-Hyeon Kim, Shu-Chin Lin, and Yu-Bo Suen. Dynamic effects of trade openness on financial development. *Economic Modelling*, 27 (1): 254 – 261, 2010. ISSN 0264-9993. URL http://www.sciencedirect.com/science/article/pii/S0264999309001618.

Robert G King and Ross Levine. Finance, entrepreneurship and growth. *Journal of Monetary Economics*, 32 (3): 513 – 542, 1993a. ISSN 0304-3932. http://dx.doi.org/10.1016/0304-3932(93)90028-E.

Robert G King and Ross Levine. Finance, entrepreneurship and growth. *Journal of Monetary Economics*, 32 (3): 513 – 542, 1993b. URL http://www.sciencedirect.com/science/article/pii/030439329390028E.

Stephen Kinsella. Is ireland really the role model for austerity? *Cambridge Journal of Economics*, 36 (1): 223–235, 2012.

Paul Krugman. *Eating the Irish*. The New York Times, November 25, 2010. URL http://www.nytimes.com/2010/11/26/opinion/26krugman.html.

Neil Lancastle. Circuit theory extended: The role of speculation in crises. *E-conomics*, 6 (34): 1–27, 2011.

Philip Lane. International financial flows and the irish crisis. In *CESifo Forum*, volume 15, pages 14–19. Ifo Institute for Economic Research at the University of Munich, 2014.

Ross Levine. Financial development and economic growth: views and agenda. *Journal of economic literature*, pages 688–726, 1997.

Atif Mian and Amir Sufi. *House of Debt*. University of Chicago Press, Chicago, 2014.

Özgür Orhangazi. Financialisation and capital accumulation in the non-financial corporate sector: A theoretical and empirical investigation on the US economy: 1973–2003. *Cambridge Journal of Economics*, 32 (6): 863–886, 2008.

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

Thomas I Palley. *Post Keynesian economics: debt, distribution and the macro economy*. Macmillan London, 1996.

M. Hashem Pesaran, Yongcheol Shin, and Richard J. Smith. Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics*, 16 (3): 289–326, 2001.

Peter C. B. Phillips and Pierre Perron. Testing for a unit root in time series regression. *Biometrika*, 75 (2): 335–346, 1988. 10.1093/biomet/75.2.335. URL http://biomet.oxfordjournals.org/content/75/2/335.abstract.

Raghuram G Rajan and Luigi Zingales. The great reversals: the politics of financial development in the twentieth century. *Journal of Financial Economics*, 69 (1): 5 – 50, 2003. ISSN 0304-405X. http://dx.doi.org/10.1016/S0304-405X(03)00125-9. URL http://www.sciencedirect.com/science/article/pii/S0304405X03001259.

P.L. Rousseau and P. Wachtel. Equity markets and growth: Cross-country evidence on timing and outcomes, 1980–1995. *Journal of Banking & Finance*, 24 (12): 1933 – 1957, 2000. ISSN 0378-4266.

Engelbert Stockhammer. Financialisation and the slowdown of accumulation. *Cambridge Journal of Economics*, 28 (5): 719–741, 2004.

Thorsteinn Thorgeirsson and Paul Van den Noord. The Icelandic banking collapse - was the optimal policy path chosen? Technical Report wp62, Department of Economics, Central bank of Iceland, March 2013.

Till Van Treeck. Reconsidering the investment–profit nexus in finance-led economies: An ardl-based approach. *Metroeconomica*, 59 (3): 371–404, 2008.

Financialisation, Economy, Society and Sustainable Development (FESSUD) is a 10 million euro project largely funded by a near 8 million euro grant from the European Commission under Framework Programme 7 (contract number : 266800). The University of Leeds is the lead co-ordinator for the research project with a budget of over 2 million euros.

## THE ABSTRACT OF THE PROJECT IS:

The research programme will integrate diverse levels, methods and disciplinary traditions with the aim of developing a comprehensive policy agenda for changing the role of the financial system to help achieve a future which is sustainable in environmental, social and economic terms. The programme involves an integrated and balanced consortium involving partners from 14 countries that has unsurpassed experience of deploying diverse perspectives both within economics and across disciplines inclusive of economics. The programme is distinctively pluralistic, and aims to forge alliances across the social sciences, so as to understand how finance can better serve economic, social and environmental needs. The central issues addressed are the ways in which the growth and performance of economies in the last 30 years have been dependent on the characteristics of the processes of financialisation; how has financialisation impacted on the achievement of specific economic, social, and environmental objectives?; the nature of the relationship between financialisation and the sustainability of the financial system, economic development and the environment?; the lessons to be drawn from the crisis about the nature and impacts of financialisation? ; what are the requisites of a financial system able to support a process of sustainable development, broadly conceived?'

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 266800

## THE PARTNERS IN THE CONSORTIUM ARE:

| Participant Number | Participant organisation name | Country |
|---|---|---|
| 1 (Coordinator) | University of Leeds | UK |
| 2 | University of Siena | Italy |
| 3 | School of Oriental and African Studies | UK |
| 4 | Fondation Nationale des Sciences Politiques | France |
| 5 | Pour la Solidarite, Brussels | Belgium |
| 6 | Poznan University of Economics | Poland |
| 7 | Tallin University of Technology | Estonia |
| 8 | Berlin School of Economics and Law | Germany |
| 9 | Centre for Social Studies, University of Coimbra | Portugal |
| 10 | University of Pannonia, Veszprem | Hungary |
| 11 | National and Kapodistrian University of Athens | Greece |
| 12 | Middle East Technical University, Ankara | Turkey |
| 13 | Lund University | Sweden |
| 14 | University of Witwatersrand | South Africa |
| 15 | University of the Basque Country, Bilbao | Spain |



Published in Leeds, U.K. on behalf of the FESSUD project.