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ESSAYS IN INTERNATIONAL MACROECONOMICS AND ECONOMIC INEQUALITY

*A Thesis Submitted to Trinity College Dublin, the University of
Dublin in Application for the Degree of Doctor of Philosophy
in Economics*

By

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Dublin, 2025

Declaration, Online Access and the General Data Protection Regulation

I declare that this thesis has not been submitted as an exercise for a degree at this or any other university and it is entirely my own work.

Chapter 2 of this thesis is co-authored with Alina Bobasu and Fabrizio Venditti.
Chapter 3 of this thesis is co-authored with Laura Boyd and Tara McIndoe-Calder.

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Simone Arrigoni
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Summary

This thesis consists of four essays at the intersection of international macroeconomics and economic inequality. Each chapter tackles important questions aimed at understanding the relevant macroeconomic dynamics between countries, the drivers of within-country wealth inequality, and the implications of their interaction. The thesis primarily consists of empirical contributions that employ various empirical methods, such as panel data models, quantile regressions, probit models, decomposition methods, and local projections. It makes use of different datasets, including macroeconomic data and household surveys.

The first essay (Chapter 2) studies the effectiveness and comparative performance of different approaches used to construct Financial Conditions Indices (FCIs) for a broad set of countries. An econometric evaluation shows that FCIs constructed through equal weights combinations of financial variables have good statistical properties and often outperform more sophisticated methods such as factor models with time-varying parameters and principal component analysis. This finding holds both in the context of quantile regressions, where they prove useful in signalling downside risks to economic activity, as well as in probit models, where they show a stronger correlation with future banking crises. Importantly, for the euro area and the United States, these simple indices outperform popular alternatives that rely on larger information sets and different econometric methods, specifically the Composite Index of Systemic Stress (CISS) and the National Financial Conditions Index (NFCI). The findings of this chapter are of particular interest to researchers and institutions interested in monitoring financial conditions in a large number of countries, including those for which data are too short or present too many irregularities to be treated through more formal econometric methods.

The second essay (Chapter 3) examines the impact of inherited wealth – inheritances and gifts – on the accumulation of household wealth and its distribution in Ireland. It employs household-level survey data to decompose the Gini coefficient of wealth inequality into the contributions from inherited wealth

and other sources of wealth, using the Marginal Gini Decomposition (MGD) methodology. The analysis shows that inheritances in Ireland contribute little to wealth inequality, and may even have reduced it over time, in line with existing findings for Britain and the United States. On the one hand, this finding could be attributed to the importance of inheritances in the acquisition of property assets for middle-wealth households. In proportion to their total wealth, inherited wealth is more significant for the middle and lower parts of the distribution compared to the top one. On the other hand, the flow of inherited wealth has increased over time alongside asset prices, such as house prices. Additionally, inheritors tend to substitute labour income with rental income.

The third essay (Chapter 4) investigates whether the advent of financial globalisation has contributed to increasing wealth inequality in the United States, France, and the United Kingdom. Using a fixed effects panel data model, I find that positive changes in the benchmark measure of financial globalisation are associated with a positive change in the top 1% and 10% wealth shares. This result is mainly driven by the concentration of ownership of portfolio equities and financial derivatives, the accumulation of new cross-border financial wealth over time, and differentials in recovery timings during financial crises. This chapter contributes to the discussion around policies such as capital flows management and capital or wealth taxes.

The fourth essay (Chapter 5) explores whether household heterogeneity affects the global transmission of monetary policy. I investigate how, and to what extent, inequality influences the way the Fed's monetary policy actions spill over to the real economy in the rest of the world. I employ state-dependent local projections and exploit variation in within-country disposable income inequality across a large panel of countries to estimate the heterogeneous responses of GDP to a monetary policy tightening in the United States. I rationalise these responses and the related mechanisms within a Two-Agent New Keynesian (TANK) model. I find that income inequality affects how foreign GDP responds to a US monetary policy shock. However, greater inequality strengthens the negative spillover effects of the shock on GDP in advanced economies, while it mitigates it in emerging market economies. The theoretical model suggests that this divergence depends on the level of participation in international financial markets. Households in emerging market economies face higher barriers to invest internationally, which increase their foreign bond holding cost. This means that, even with high inequality, households in these countries cannot re-balance their portfolios towards foreign bonds when the shock hits and thus the negative effect of higher inequality on domestic conditions is reduced.

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Pursuing a PhD and being a researcher is much like riding a roller coaster, with its inevitable ups and downs. Yet, my personal journey has been incredible. The past four years in Dublin would not have been the same without the new friends I made along the way and those who were already by my side.

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Chapter 1

General Introduction

Economic inequality, which defines within-country household heterogeneity in terms of wealth and income, has always been a distinctive feature of societies. While some countries are more equal than others, disparities in income and wealth are persistent. Moreover, economic inequality around the world has experienced a non-uniform increase since the 1970s and 1980s. However, inequality should not be seen as an inevitable phenomenon. Instead, it is the result of choices, many of which were indeed the drivers behind its rise. Deregulation and liberalisation, which usually result in beneficial effects on aggregate, can intensify economic disparities. Many of these policy changes occurred in a global context and within a cross-border framework. International macroeconomic dynamics, such as financial globalisation, trade liberalisation, and monetary policy spillovers, can influence and be influenced by economic inequality. The goal of this thesis is to analyse relevant dynamics within the dimensions of international macroeconomics and economic inequality. The first two chapters focus on these dimensions separately, while the other two investigate the interplay between the two. Visually, the concept of the thesis is summarised in Figure 1.1.

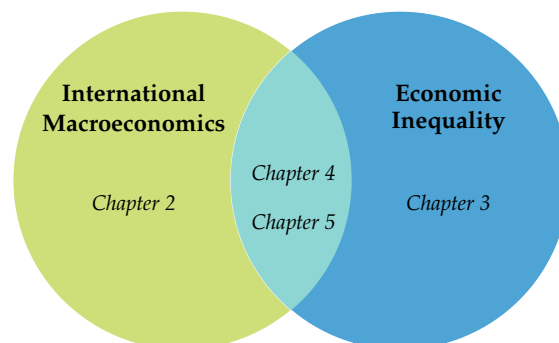


Figure 1.1: Concept of the research studies

In Chapter 2, *Measuring financial conditions using equal weights combination* (joint work with Alina Bobasu and Fabrizio Venditti, published in the *IMF Economic Review*), we study the effectiveness and comparative performance of different approaches used to construct Financial Conditions Indices (FCIs) for a broad set of countries. The concept of financial conditions, a summary measure of how easily firms, households, and governments finance themselves, is crucial in both financial stability and monetary policy monitoring. While measuring leverage is relatively straightforward, financial conditions are an elusive concept, and the question of how to measure them has spurred a large literature. A widely accepted interpretation is that financial conditions reflect the price of risk and that this compensation for risk plays a key role in the fluctuations of asset prices.

Against this background, the level of sophistication in constructing financial conditions indices has increased over time. However, sophisticated models, such as factor models with time-varying parameters, may be prone to certain flaws. This chapter argues that averaging with equal weights produces FCIs that are not inferior to, and often perform better than, those constructed with more sophisticated statistical methods. This method has a long tradition in the forecasting literature, preserves the heterogeneity and relevance of each component, allows for the diversification of signs of components based on economic judgement (e.g., exchange rates), and eliminates parameter estimation uncertainty. Moreover, it enables an easy decomposition of the index into its drivers, and it is a convenient way to address issues like short data and series irregularities, a pressing concern when working with emerging markets data.

We construct three measures of financial conditions, based on a common information set composed of nine macro-financial variables using different aggregation techniques. Specifically, one is constructed by aggregating the chosen indicators as simple (unweighted) averages, the second using principal component analysis, and the third employs a (single) factor model with time-varying parameters. The question is whether these latter methods offer statistical properties that make them preferable to simpler alternatives like equal weights averaging. We assess this by comparing the performance of the three FCIs in predicting tail risk to economic activity and future banking crises. Using quantile regressions, we find that equal weights FCIs perform at least as well as, or better, than alternative indicators in capturing in-sample downside risks and significantly outperforms them in out-of-sample predictions. In both exercises, neither the Chicago Fed's NFCI for the United States nor the CISS for the euro area, widely used in macroeconomic analysis, shows a superior predictive power. We then estimate a panel probit model and show that the FCI constructed

by averaging indicators is the only one that demonstrates both statistical and economic significance in predicting the occurrence of a crisis. Based on this econometric evaluation, we conclude that FCIs obtained via equal weights combinations of financial variables have good statistical properties and they overall outperform alternative measures based on principal component analysis or factor models with time-varying parameters.

This chapter and its related findings make an important contribution to the literature by providing FCIs that can be easily accessed and replicated by researchers and institutions interested in monitoring financial conditions for a large number of economies, including those for which the data is too short or presents too many irregularities to be treated using more formal econometric methods.

In Chapter 3, *The long and the short of it: Inheritance and wealth in Ireland* (joint work with Laura Boyd and Tara McIndoe-Calder, published in *The Journal of Economic Inequality*), we explore the role of intergenerational wealth transfers – i.e., inheritances and gifts – in wealth inequality in Ireland. We exploit household-level survey data from the Household Finance and Consumption Survey (HFCS), conducted by the European Central Bank in cooperation with national central banks and statistical offices. The background for our analysis is that by 2020, over one-third of households had received an inheritance or gift, with the aggregate real value estimated at €97 billion, accounting for approximately one-sixth of their total net wealth. Inheritors are typically much wealthier and own more property.

Against this background, we assess the impact of inherited wealth on wealth inequality by decomposing the Gini coefficient into the contributions from inherited wealth and other sources of wealth, using the Marginal Gini Decomposition (MGD) methodology. Wealthier households are more likely to have received inheritances. However, conditional on receiving an inheritance or gift, the value of inherited wealth represents a larger proportion of total wealth for those in the middle and lower portions of the wealth distribution than for those at the top. As a consequence, intergenerational transfers in Ireland do not appear to contribute significantly to wealth inequality and may even reduce it, in line with existing findings for Britain, the United States, and Germany. Other tentative channels that explain these results are the rise in house prices, which correlates with the value of inheritances, and the substitution from employee income to rental income among inheritors.

This study contributes to the literature in several ways. We provide further evidence of the link between inheritances and wealth inequality using updated

micro-data at the household level. Furthermore, we address a major gap in the literature by providing a decomposition of wealth inequality between inherited and non-inherited wealth for Ireland. The results are particularly relevant to the ongoing policy debate in the country regarding inheritance and wealth taxation more generally.

In Chapter 4, *Who gets the flow? Financial globalisation and wealth inequality* (published in the *Journal of Macroeconomics*), I study how financial globalisation has contributed to increasing wealth inequality. While the 20th century experienced a declining trend in the concentration of net wealth in advanced economies, wealth inequality started rising again from the 1970s and 1980s. This coincides with the intensification of financial globalisation, defined as the phenomenon of increasing global linkages through cross-border financial flows.

Financial globalisation is not a straightforward phenomenon to measure, and there are many ways to do it. I use the International Financial Integration index (IFI) as the benchmark measure, a widely used volume-based indicator summarising the amount of outstanding foreign assets and liabilities scaled by GDP. Using this indicator offers multiple advantages that are useful for disentangle channels and mechanisms in the empirical analysis, such as easy decomposition by its functional categories, the possibility of breakdown into a flow and a valuation component, and the widest country-time availability.

In this chapter, I use a fixed effects panel data model to estimate the effect of financial globalisation on the wealth distribution within the United States, France, and the United Kingdom. The main finding of the model is that a one standard deviation increase in the growth rate of the IFI is associated with a positive change in the wealth share growth of the top 1% (the rich) by 0.22 percentage points (pp) and of the top 10% (upper middle class) by 0.15 pp, and a negative change in the wealth share growth of the bottom 50% (working class) of the distribution by 0.07 pp. For easier interpretation of this result, back-of-the-envelope calculations suggest that an average increase in the IFI over the three countries and the time period of the analysis is associated with an increase in the top 10% and top 1% aggregate net wealth by approximately \$1 trillion (+8%) and \$1.6 trillion (+30%), respectively.

There could be multiple explanations behind these results. First, I explore what are the functional categories behind the IFI that drive this result. I find that portfolio equities and financial derivatives are the most relevant, as they are more closely linked to the distribution of personal wealth compared to others (e.g., FDI) and are also very concentrated towards the top of the wealth distribution.

Second, using Balance of Payments flows, I decompose the IFI into a flow and a valuation component to disentangle where the aggregate effect is coming from. I show that flows are driving the result, suggesting that the key mechanism is the wealthy expanding their international investments through new purchases or reinvestment of capital gains, rather than merely enjoying market value gains on their existing stock of wealth. Third, I assess the effects of financial crises and show that the main finding is strengthened during a systemic banking crisis. A potential explanation is that this reflects a mismatch in recovery times between the wealthy and the poor.

This chapter makes several important contributions to the literature. First, it builds upon and extends the literature that studies the link between financial globalisation and income (not wealth) inequality. Examining wealth is interesting because of its conceptual differences and implications with respect to income. Wealth is more unequally distributed than income, and their drivers in an international framework can differ. Second, I provide a cross-sectional analysis, whereas studies on wealth inequality have mainly focused on the United States or Nordic countries. Third, I bridge the literature on international finance and that on economic inequality by studying the international drivers of wealth inequality, while the traditional focus has been on domestic factors.

In Chapter 5, *Beyond borders, within societies: Inequality and the global transmission of US monetary policy*, I investigate how, and to what extent, within-country income inequality affects the transmission of United States (US) monetary policy to real economic activity in other countries. The motivation for this chapter lies in the fact that the way monetary policy in the United States affects economic conditions in the rest of the world is a central question in the international macroeconomics literature. Understanding the role of inequality in the heterogeneity of these effects is particularly relevant for recipient countries in implementing public policies aimed at reducing the impact of monetary policy spillovers on their economies. I address this research question both empirically and theoretically.

I construct a time series of US monetary policy shocks for a long time horizon (1966-2020), which identifies increases in US interest rates that could not have been predicted by domestic and global developments. I use this measure within a local projections empirical framework to estimate the response of macroeconomic variables, focusing on real activity, to a US monetary policy tightening for a large panel of countries. I find that in line with previous literature, monetary policy spillovers to GDP are substantial. I augment the model to incorporate the role of household heterogeneity and estimate heterogeneous responses to the shock, conditional on different levels of income inequality, using state-dependent

local projections. The novel contribution of this chapter is to provide evidence on how income inequality in the recipient country affects the intensity of these spillovers. I find that higher inequality is associated with a stronger negative effect transmitted from the tightening in the US. However, in emerging market economies, higher levels of inequality mitigate the negative spillovers to real output.

To rationalise why there is heterogeneity in the direction of the relationship between countries, I employ a three-country Two-Agent New Keynesian (TANK) model, in which household heterogeneity arises from differences in income between constrained (*hand-to-mouth*) and unconstrained households. While the former have labour income and consume all of it, the latter receive labour income and can invest in domestic and international financial markets. To reproduce the empirical response in the model, the key factor shaping the direction in which inequality affects the transmission of US monetary policy to foreign economies is their level of participation in international financial markets. When accounting for higher cost of holding foreign bonds in emerging markets, I find that higher inequality reduces the negative spillovers to the real economy. This is because, if unconstrained households face high cost of holding foreign bonds, they cannot re-balance their portfolio from domestic to foreign bonds once the shock hits. This reduces the negative effect on domestic financial conditions mitigating capital outflow.

This chapter contributes to three strands of the literature. First, I add to the literature on US monetary policy spillovers, validating the effect of a Fed tightening on foreign output for a wide panel of countries and assessing the heterogeneity of these spillovers by conditioning responses on different levels of inequality. Second, I contribute to the growing literature on the role of household heterogeneity in the transmission of monetary policy. Existing papers focus on the domestic effects, while I study the transmission to foreign economies. Third, the chapter adds to the literature that models distributional channels within theoretical frameworks.

Chapter 6 briefly summarises the main findings of this thesis and highlights the policy implications relevant for stakeholders and policymakers.

Table 1.1: Summary of the research studies

	Measuring financial conditions using equal weights combination	The long and the short of it: Inheritance and wealth in Ireland	Who gets the flow? Financial globalisation and wealth inequality	Beyond borders, within societies: Inequality and the global transmission of US monetary policy
Research question(s)	How do alternative measures of financial conditions indices (FCIs) perform across a large set of countries? How should a meaningful FCI be constructed?	How and how much does inherited wealth contribute to wealth inequality in Ireland?	What is the effect of financial globalisation on within-country wealth inequality?	How does income inequality affect the transmission of US monetary policy to the rest of the world?
Methodology	Quantile regressions and probit model to evaluate the ability of different FCIs to capture tail risk for economic activity and to predict banking and currency crises.	Decomposition of the Gini index into a component related to inherited wealth and one to non-transfer wealth. Computation of elasticity of the Gini to changes in the amount of inheritance received.	Panel data fixed effects regressions to estimate the average effects and channels through which cross-border capital flows affect wealth inequality.	Classic and state-dependent local projections, conditional on domestic income inequality. Theoretical analysis using a Two-Agent New Keynesian (TANK) model.
Authors	Simone Arrigoni, Alina Bobasu, Fabrizio Venditti	Simone Arrigoni, Laura Boyd, Tara McIndoe-Calder	Simone Arrigoni	Simone Arrigoni
Own-contribution	I collected the relevant macro-financial data, constructed the three FCI measures, ran the probit model analysis, assisted with the quantile regression analysis, prepared all figures and tables, co-drafted and co-reviewed the manuscript.	I collected the data and prepared the dataset, ran the analysis, prepared all figures and tables, co-drafted and co-reviewed the manuscript, led the submission and publication process as corresponding author.	I conceptualised the idea, collected and assembled the necessary data, ran the analysis, drafted and reviewed the manuscript, led the submission and publication process as corresponding author.	I conceptualised the idea, collected, cleaned, and assembled the relevant data to estimate the US monetary policy shocks and ran local projections, worked on the theoretical model, drafted and reviewed the manuscript.
Status	Published in the IMF Economic Review (2022)	Published in The Journal of Economic Inequality (2024)	Published in the Journal of Macroeconomics (2024)	Unpublished

Chapter 2

Measuring Financial Conditions using Equal Weights Combination

with Alina Bobasu and Fabrizio Venditti¹

Published in the IMF Economic Review (2022), Volume 70, pages 668–697

Financial conditions affect households' and firms' saving and investment plans, and, therefore, play a key role in influencing economic activity and the economic outlook. This is why the evaluation of financial conditions is so crucial in the conduct of monetary policy.

William C. Dudley (2017)

2.1 Introduction

The concept of financial conditions, a summary measure of how easily firms, households, and governments finance themselves, has received wide attention following the 2008-2009 Global Financial Crisis. Financial crises are typically heralded by long periods of low volatility, cheap borrowing rates, high asset prices, and compressed spreads, during which imbalances build-up. Loose financial conditions bring debtors close to their borrowing limits, setting the stage for non-linear effects when financial conditions tighten. In this context, financial conditions indices (FCIs) can help monitoring the phase of imbalances build-up and may provide a timely signal of mounting financial stress. Financial conditions are also often mentioned by monetary policy makers, who see asset

¹The views expressed are those of the authors and do not necessarily reflect those of the European Central Bank, the Bank of Italy, or the European System of Central Banks (ESCB).

prices as the first step of the complex transmission mechanism of monetary policy. Adrian and Liang (2018) go as far as opening their paper on monetary policy and financial stability with the sentence: “Monetary policy works by affecting financial condition”. And there is ample empirical evidence backing this statement, as monetary policy has been shown to generate large movements in credit costs, mostly via a widening of both term premia and credit spreads (Borio and Zhu, 2012; Gertler and Karadi, 2015).

A large number of papers have developed FCIs by summarising in a single indicator the information coming from different segments of the financial sector. A non-exhaustive list of papers on the topic includes Illing and Liu (2006), Hakkio, Keeton, et al. (2009), Hatzius et al. (2010), Matheson (2012), Brave, Butters, et al. (2012), Hollo, Kremer, and Lo Duca (2012), and Koop and Korobilis (2014). Most of these papers borrow their methodological setup from the factor model literature (Forni et al., 2000; Stock and Watson, 2002, 2011; Doz, Giannone, and Reichlin, 2012) and build on the idea that the relevant information contained in a large dataset can be summarised via data reduction techniques like principal components. The level of sophistication of these indices has increased over time. For instance, Koop and Korobilis (2014) have proposed to use factor models with time-varying loadings and time-varying volatilities to summarise the information contained in a large number of macroeconomic and financial variables. This methodology is designed to account for the fact that the relationship between the financial sector and the real economy is subject to structural breaks over time. Model instability can indeed be a concern. Hatzius et al. (2010), for instance, find that the predictive ability of FCIs for future GDP changes over time.

In this paper we argue that FCIs based on factor models, either with constant or time-varying parameters, may be prone to some flaws. First, these techniques are designed to reduce information dimensionality in datasets that are characterised by high collinearity. The intuition is that when many series behave in a very similar way, their linear combination summarises efficiently the information that they convey. Yet, the series that enter popular measures of financial conditions have very heterogeneous behaviour. Table 2.1 shows the correlation structure of a representative sample of nine macro-financial indicators that are typically used to construct financial conditions indices, including credit growth, interest rates, asset prices, volatilities and exchange rates.² Out of the 36 correlations that fill the off-diagonal elements of the table, only 3 are higher than 0.3 in absolute value. Given this heterogeneity and the lack of collinearity, it is very likely that

²The table is constructed by computing this correlation matrix for each of the 18 countries that we analyse in this paper and then averaging across countries.

the final composite index is largely going to reflect the behaviour of a limited block of the time series that compose the information set. To illustrate this point in a “large data” context, Figure 2.1 shows the correlation between the National financial conditions index (NFCI) for the US economy computed by the Federal Reserve of Chicago and the individual series that compose the index.³ The different colours illustrate the block to which the series belong (blue for *Spreads and volatilities*, violet for *Yields*, yellow for *Credit ratios*, orange for *Failure rates and delinquencies*, green for *Lending standards*, purple for *Issuance and open interests*). Visual inspection of Figure 2.1 shows that the NFCI loads very heavily on credit spreads, as shown by the large dominance of blue bars at the high end of the correlation spectrum. Some categories display a negligible contribution to the common factor, like for instance *Lending standards*.

Table 2.1: Correlation across macro-financial indicators

	Credit growth	10Y yields	Sovereign spread	Inter-bank spread	Term spread	Equity volatility	Stock re-turns	Real house prices	Exchange rates
Credit growth	1.00	-0.10	0.19	0.02	-0.09	0.14	0.20	0.27	0.02
10Y yields	-0.10	1.00	-0.13	-0.02	0.21	0.06	-0.12	-0.06	-0.02
Sovereign spread	0.19	-0.13	1.00	0.33	-0.12	0.55	0.25	0.12	-0.08
Inter-bank spread	0.02	-0.02	0.33	1.00	0.09	0.20	0.14	0.08	0.00
Term spread	-0.09	0.21	-0.12	0.09	1.00	0.00	-0.16	0.06	-0.02
Equity volatility	0.14	0.06	0.55	0.20	0.00	1.00	0.44	0.13	-0.22
Stock returns	0.20	-0.12	0.25	0.14	-0.16	0.44	1.00	0.07	-0.08
Real house prices	0.27	-0.06	0.12	0.08	0.06	0.13	0.07	1.00	0.14
Exchange rates	0.02	-0.02	-0.08	0.00	-0.02	-0.22	-0.08	0.14	1.00

Notes. Correlations are unweighted averages across countries. Country specific correlations are computed over the period January 1995-February 2020 for a sample of 18 countries including China, United States, India, Japan, Germany, Russia, Brazil, United Kingdom, France, Mexico, Italy, Turkey, South Korea, Canada, Australia, Sweden, Norway, New Zealand. See Appendix 2.B for data sources.

The second problem is that some of these statistical techniques do not give much control over the sign with which the individual components end up contributing to the final indicator. Yet, there is outside information that one might want to use to discipline the direction in which the individual series affect the final index. For instance, exchange rates will move financial conditions in different directions depending on the role that foreign currencies have in the domestic economy. For countries that borrow in foreign currency (typically, Emerging Economies, EMEs), a depreciation implies an increase of the cost of debt in domestic currency, i.e. a tightening of borrowing conditions, a mechanism Bruno and Shin (2015b) refer to as the financial channel of exchange rates. Moreover, EME sovereigns issue local currency debt but a large share of EMEs sovereign

³The Chicago Fed NFCI provides a comprehensive weekly update on US financial conditions in money markets, debt and equity markets, and the traditional and “shadow” banking systems. The NFCI is constructed using a dynamic factor model. Appendix 2.F reports the series that are included in the index.

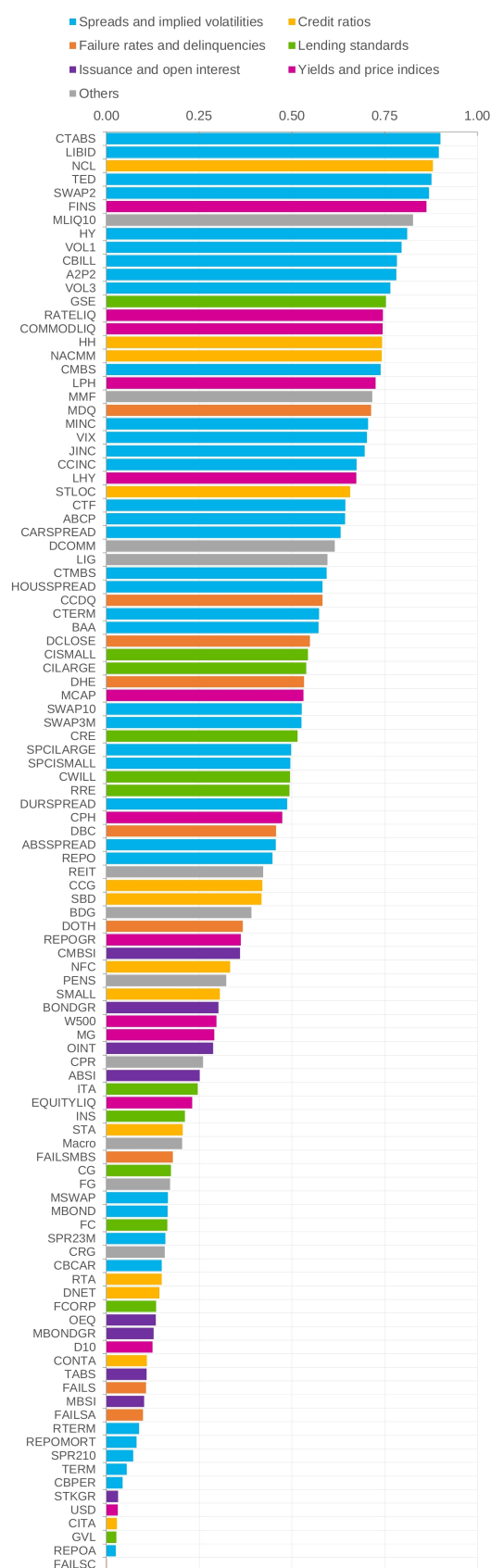


Figure 2.1: Correlation of NFCI subcomponents with the final index

Notes. For variables definitions and details on allocation to categories see Figure 2.F.1 in Appendix 2.F. Due to data availability, correlations are computed over the period 3 June 2005 - 29 May 2020 (weekly).

bonds are held by foreign investors. When the exchange rate depreciates, lenders incur in losses that lead to portfolio outflows. In response to these outflows, and to counteract the pass-through of the exchange rate to inflation (particularly strong in EMEs), central banks may end up raising interest rates, amplifying the initial financial tightening.⁴ Appendix 2.A illustrates these channels by showing how differently a financial shock originating in the US affects the exchange rate, asset prices, and monetary policy rates in neighbouring advanced and emerging economies, namely Canada and Mexico. The overall economic effect of exchange rate fluctuations then depends on whether this financial channel is stronger than the standard trade channel. Recent research finds that in emerging market economies, a depreciation is associated with weaker cross-border bank flows and lower real investment pointing to a prevalence of the financial channel (Avdjiev, Bruno, et al., 2019).

The third issue is that the weight that the single indicators receive reflects the nature of past shocks and past crises. It can therefore be the case that some variables that in the past did not cause any crises, yet that ex-ante would be interesting to monitor, end up receiving zero weight in a composite index.

We argue that *averaging with equal weights* the indicators of interest successfully addresses the three issues raised above and produces FCIs that are not inferior to, and often perform better than, those constructed with more sophisticated statistical methods. First, by making sure that no series receives zero weight, the heterogeneity of the underlying components is by definition reflected in the final index. Second, one can judgmentally decide the sign with which the individual components end up contributing to the final indicator (like for instance the exchange rate). Third, one can make sure that all the variables that one wants to keep in sight actually enter the final indicators. An additional benefit is that analysing the contribution of the individual components is trivial. Combination of indicators has a long tradition in the forecasting literature, dating back to the seminal work of Bates and Granger (1969). While numerous different weighting schemes have been proposed and analysed, equal weights combinations have been “the workhorse of the combination literature and have set a benchmark that has proved surprisingly difficult to beat” (Timmermann, 2006).⁵

Of course, these advantages need to be traded off against the costs of not using any statistical objective function to aggregate information. This cost, however,

⁴See the speech by Carstens (2019), “Exchange rates and monetary policy frameworks in emerging market economies”, available at <https://www.bis.org/speeches/sp190502.htm>.

⁵Smith and Wallis (2009) attribute the puzzling success of equal weights combinations to the fact that in more sophisticated methods, weights need to be estimated. In finite samples, estimation error can be large, leading to the inferior performance of optimally weighted combinations.

can be assessed by checking the performance of different financial conditions indices based on sensible criteria. We use two empirical criteria to evaluate the performance of different FCIs. First, in the context of quantile regressions, we examine across different methods the strength of the correlation between tightening in financial conditions and recessions. It is well known that recessions that originate in the financial sector are deeper than standard ones. A desirable property of an FCI is, therefore, to bear strong information for the left tail of GDP distribution (Adrian, Boyarchenko, and Giannone, 2019). We perform this exercise both in-sample as well as out-of-sample. The latter exercise is particularly challenging, as recent studies have documented a lack of predictability of tail GDP movements (Hasenzagl, Reichlin, and Ricco, 2020). Second, and related to the first, we examine how the alternative FCIs are correlated with future banking and currency crises (broadly speaking financial crises). Financial crises are somewhat related to deep recessions, so we see this exercise as complementary to the previous one. The results of our empirical analysis show that, for both exercises, FCIs constructed via equal weights averaging performs at least as well, and often better, than alternative FCIs.

One contribution of our paper is to test comparable FCIs for a large set of countries. This forces us to limit the number of variables underlying each index but also raises the question of whether “large data” alternatives, available for large advanced economies like the US or the euro area (EA), outperform our simple indices. In the paper we show that our FCIs outperform two popular alternatives, namely the Chicago Fed’s National Financial Conditions Index (NFCI) for the US and the Composite Index of Systemic Stress (CISS) by Hollo, Kremer, and Lo Duca (2012) for the euro area, in detecting out-of-sample movements in the left tail of GDP.

The question remains as to how to deal with structural changes. As technology, preferences and regulation evolve, so will the relationship between the financial system and the real economy. For instance, prudential regulation led to banks being more capitalised, weakening the relationship between measures of global risk like the VIX and capital flows (Avdjiev, Gambacorta, et al., 2020). The use of cryptocurrencies could further increase in the future, so that a question on how to account for them in FCIs could arise. Our answer is that econometric models and complex machinery cannot replace the judgement of economists when it comes to understanding the relationship between financial conditions and economic outcomes. Such a judgement will call for a revision of the indicators to be monitored whenever deemed appropriate in the face of structural changes. But simplicity in the aggregation method will continue to provide valuable robustness

to a synthetic index of financial conditions.

The paper is organised as follows. Section 2.2 provides some economic motivation to the exercise by reviewing the role of financial conditions in economic models. Section 2.3 provides a description of the data and details on the construction of the indices. Section 2.4 describes the criteria that we employ to assess the performance of our financial conditions indices and discusses the empirical results. Section 2.5 concludes.

2.2 Financial conditions, leverage and the macroeconomy

Interest in measuring and monitoring financial conditions burst out after the financial crisis in 2008-2009. The magnitude of the real consequences of this financial shock led to a renewed interest in better integrating the financial system in macroeconomic models. In particular, a large effort was devoted to building models that had inherent amplification mechanisms, able to reproduce the non-linear effect of financial shocks on output. It also led to the search for summary measures of financial conditions that could signal the build up of risk in the financial sector or signal imminent stress in the financial system.

On the theory side, two different strands are of interest for our purpose. The first is the set of papers that focus on economies with occasionally binding constraints (Deaton, 1991; Guerrieri and Lorenzoni, 2017). In these economies credit constraints embody a pecuniary externality that induces private agents to borrow excessively. Individual agents fail to internalise the aggregate consequences of their individual over-borrowing and carry too much debt when they face a tightening of financial conditions (Bianchi, 2011). When asset prices fall and their borrowing constraint becomes binding they need to scale back consumption significantly. This intuition can be generalised to non-financial firms, see for instance Jermann and Quadrini (2012) and Liu, Wang, and Zha (2013). These models predict that the loss of net worth due to a large drop in asset prices can lead to long-lasting recessions. In Bernanke and Gertler (1989), for instance, once a shock lowers the net worth of leveraged entrepreneurs, economic activity and profits falls and it takes entrepreneurs a long time to accumulate sufficient retained earnings to rebuild their net worth. Jordà, Schularick, and Taylor (2013) provide evidence that financial shocks can lead to protracted slumps.

In the second set of papers, financial intermediaries take centre stage. Financially leveraged institutions face a sudden spike in their leverage (debt to asset ratio) when the price of the assets that they hold suddenly falls and their net worth plummets. As they try to return to their leverage target, they generate fire sales,

exacerbating the initial price spiral and causing a financial crisis (Brunnermeier and Oehmke, 2013). Similar amplification effects emerge in models that include frictions in the financial intermediation process, see for instance Gertler and Kiyotaki (2010), Gertler and Karadi (2011), Brunnermeier and Sannikov (2015), and He and Krishnamurthy (2019).

A common theme in all these papers is the interplay between financial conditions and leverage. On the one hand, loose financial conditions favour the build up of leverage, as inflated asset prices increase the value of the collateral that borrowers can post to obtain credit as well as the equity of lenders. On the other hand, leverage itself makes the economy vulnerable to sudden gyrations in financial conditions as the unwinding of asset prices can trigger a cascade of margin calls and fire sales, whose effects can be amplified when borrowers deleverage simultaneously. This mechanism is asymmetric: the costs stemming from the materialisation of systemic risk are much higher than the benefits stemming from the build-up of systemic risk. This asymmetry is at the centre of the results in Adrian, Boyarchenko, and Giannone (2019) and of the Growth-at-Risk literature generated by this paper.

While measuring leverage is relatively straightforward, financial conditions are an elusive concept, and the question of how to measure them has spurred a large literature, see Kliesen, Owyang, and Vermann (2012) for a review. A widely accepted interpretation is that financial conditions reflect *the price of risk* and that this compensation for risk plays a key role in the fluctuation of asset prices. This is, for instance, the interpretation given in official IMF publications, and is the basis for measuring financial conditions via a weighted average of asset prices, where weights may come from principal components analysis, see for instance IMF (2019) and Barajas et al. (2021), or from a combination of principal components and time-varying parameters, see IMF (2017).⁶ Although *prima facie* appealing, these methods are prone to the shortcomings described in Section 2.1. In the rest of the paper we show that an approach based on equal weights averaging, which has a long tradition in the forecasting literature, is a valid alternative.

⁶In their analysis of leverage, financial conditions and risks to financial stability, Barajas et al. (2021) state that “Financial conditions are measured by the Financial Conditions Index (FCI) [...] It is a principal components aggregate measure based on a set of price related indicators, such as interest rates and spreads, equity prices and volatility, and real house price growth. It is often referred to as the price of risk, such that a decrease in its value can be interpreted as a fall in the price of risk—or a loosening of financial conditions”.

2.3 Data

Our analysis is based on data for 18 advanced and emerging economies at the monthly frequency from January 1995 to May 2020. As Figure 2.2 shows, these countries represent about 70% of the world's GDP at Purchasing Power Parity (PPP).

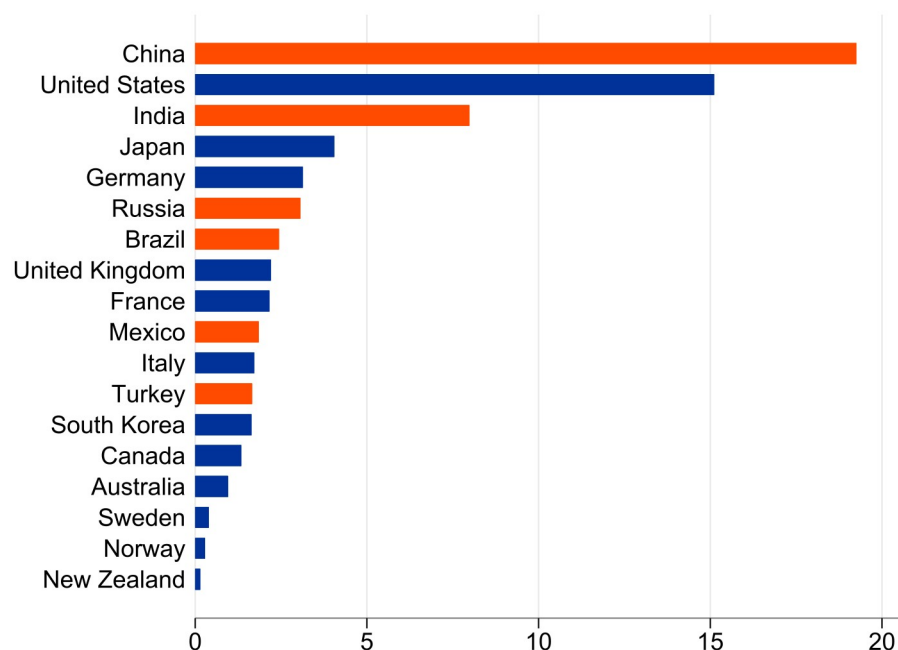


Figure 2.2: Shares of GDP at Purchasing Power Parity

Notes. Blue bars represent advanced economies, red bars represent emerging market economies. Data in percentages of the world's total. Source: IMF World Economic Outlook, 2019 data.

The information set. We base the FCIs on a common information set composed of nine variables, namely (i) nominal long-term government bond yields; (ii) a set of four spreads, i.e. sovereign (for emerging economies only), corporate (for advanced economies only), inter-bank and term spreads (for all countries); (iii) realised equity volatility; (iv) the percentage change of equity and real residential house prices; (v) the growth rate of credit to households and non-profit institutions serving households; (vi) the bilateral exchange rate with the US Dollar. For details on data sources and description of variables see Table 2.B.1 in Appendix 2.B. The choice of the indicators is very standard, aimed at covering the main segments of the financial market, and is broadly consistent with IMF (2019). We also include one non-price indicator, i.e. the rate of growth of credit to households, because housing debt constitutes the key vulnerability to a sudden re-pricing of risk and booms in real estate lending greatly heighten

the risk of financial crises (Jordà, Schularick, and Taylor, 2015). Results available upon request show that excluding this variable from the analysis does not alter the results. All variables are standardised before aggregation.

EW-FCI (Equal Weights - FCI). The equal weights FCI is constructed by aggregating the chosen indicators as simple (unweighted) averages. Table 2.2 summarises the signs that we use to construct the EW-FCI. Given that an increase in the index reflects a tightening, we assign a positive sign to interest rates, spreads, and volatilities and a negative sign to equity prices, house prices, and credit volumes. We let the exchange rate have a different role for indices constructed for advanced and emerging economies. Since emerging economies own a non-negligible part of their debt in US dollars (Bénétrix, Gautam, et al., 2019), when the local currency weakens against the dollar the cost of debt expressed in national currency rises and financial conditions tighten. For advanced economies we let the exchange rate work through a traditional trade channel, so that for these countries a weakening of the domestic currency results in an easing of financial conditions.

Table 2.2: Set of variables (all FCIs) and signs (EW-FCI)

	AEs	EMEs
10 years government bond yields	+	+
Sovereign spread		+
Corporate spread [†]	+	
Inter-bank spread [†]	+	+
Term spread	+	+
Equity volatility [†]	+	+
Equity prices, m-o-m growth rate [†]	-	-
Real residential house prices, m-o-m growth rate [†]	-	-
Credit to HHs and NPIs, m-o-m growth rate ^{†*}	-	-
Bilateral exchange rate with the US Dollar (LC/\$)	-	+

Notes. A positive sign indicates a tightening in the index, while a negative sign an easing. An increase in the bilateral exchange rate (being it expressed as national currency per US Dollar) denotes a depreciation of the national currency, while a decrease an appreciation. In line with how we want the exchange rate to contribute to the FCI, this explains the positive sign for emerging economies and the negative sign for advanced economies. *HHs = households, NPIs = non-profit Institutions serving households. [†]A 3 months centred moving average is applied to the variables defined by this symbol.

PCA-FCI (Principal Component Analysis - FCI). As a first alternative, we aggregate the indicators through principal component. We select the first principal

component, that is the one explaining the largest fraction of the variance of the original variables, to be our PCA-FCI. This aggregation method is widely used in the construction of FCIs, see Kliesen, Owyang, and Vermann (2012) and IMF (2019).

TVP-FCI (Time-Varying Parameters - FCI). In the third method, which follows Koop and Korobilis (2014) and Arregui et al. (2018), common dynamics across indicators are summarised through a (single) factor model with time-varying parameters. Time variation in the parameters provides a flexible weighting scheme for the input variables and should accommodate model instability. Appendix 2.C provides all the methodological details.

Visual inspection of the indices. Figures 2.3 and 2.4 compare the three sets of indicators. For a number of countries (United States and France, for instance) the three methods deliver very similar results. For some other countries, however, the measures differ notably and the TVP-FCI and PCA-FCI give results that are hard to interpret. First, for Germany and Japan they both present a visible upward trend, hard to reconcile with falling rates in both countries. Inspection of the model weights reveals that, for these two countries, the first principal component and the factor model assign a dominant weight to long-term interest rates, loading on this variable with a *negative* sign and with an opposite sign to spreads and volatilities.⁷ This is an issue that may arise when these techniques are applied to variables that present some mild non-stationarity and sounds an alarming bell on applying these methods heedlessly. The EW-FCI, on the other hand, correctly detects a peak of financial stress during the Great Recession and an easing of financial conditions thereafter. Second, in many cases a simple correlation analysis reveals that the TVP-FCI and PCA-FCI load heavily on some specific indicators, either inter-bank spreads or realised equity volatility. They therefore fail to capture the broader signal coming from many indicators, but rather over-weigh a selected number of indicators. As explained in the Introduction, this is likely due to the low collinearity of the data and is a major shortcoming of principal components and factor models based indicators.⁸ Third, for some countries the behaviour of the indices is hard to reconcile with well known economic narratives. In the case of Italy, for instance, the TVP-FCI and PCA-FCI (unlike the EW-FCI) do not detect a major tightening of financial conditions during the 2008 financial crisis nor the resurgence of stress during the Sovereign Debt crisis in 2011. The second striking case is that of Turkey, an economy that underwent significant financial stress in

⁷Hence, the issue does not have to do with a sign rotation of the principal components.

⁸Technically speaking, a second factor/principal component should account for the information contained in the remaining indicators.

2019 following a collapse of the Turkish lira. This episode is ignored by both the TVP-FCI and PCA-FCI but is captured by the EW-FCI.

2.4 Empirical analysis

Visual inspection suggests that, in some instances, the PCA-FCI and TVP-FCI can behave counter-intuitively. The question is whether these methods have some statistical properties that make them preferable to a simpler alternative like equal weights averaging. In this section we show that this is not the case. When applied in a growth-at-risk context, the EW-FCI delivers more accurate out-of-sample predictions and it is also a better predictor of banking crises.

2.4.1 Quantile regressions

The quantile regression approach provides a framework for estimating the impact of a given variable X on the entire conditional distribution of a dependent variable y . This is achieved through separate coefficients for the various quantiles (see Appendix 2.D for more details). Based on this approach, Adrian, Boyarchenko, and Giannone (2019) find for the US a close link between current financial conditions and the conditional distribution of future GDP growth. In particular, the lower quantiles of future GDP growth are much more sensitive than the higher ones to current financial conditions developments. Moreover, the entire distribution of future GDP growth evolves over time. Recessions are associated with left-skewed tails, while during expansions the conditional distribution is broadly symmetric. This asymmetry in the evolution of the conditional tails of the distribution of future GDP growth indicates that downside risks to economic activity vary more strongly over time and react more to developments in financial conditions compared to upside risks. We use quantile regressions to test for the non-linear impact of the three measures of financial conditions described in Section 2.3 on the different quantiles of industrial production (for data availability see Appendix 2.E).⁹ For a large majority of the countries in our sample, we find that (regardless of the FCI used) the impact of financial conditions on the lower quantiles of industrial production is significantly more negative than either on the central tendency or on the upper tails, confirming Adrian, Boyarchenko, and Giannone (2019) results in an international context.

Figure 2.5 compares the impact on the lower quantile (5th percentile) of the

⁹We use industrial production rather than GDP as data are available at monthly frequency and for a longer period of time, especially for emerging markets.

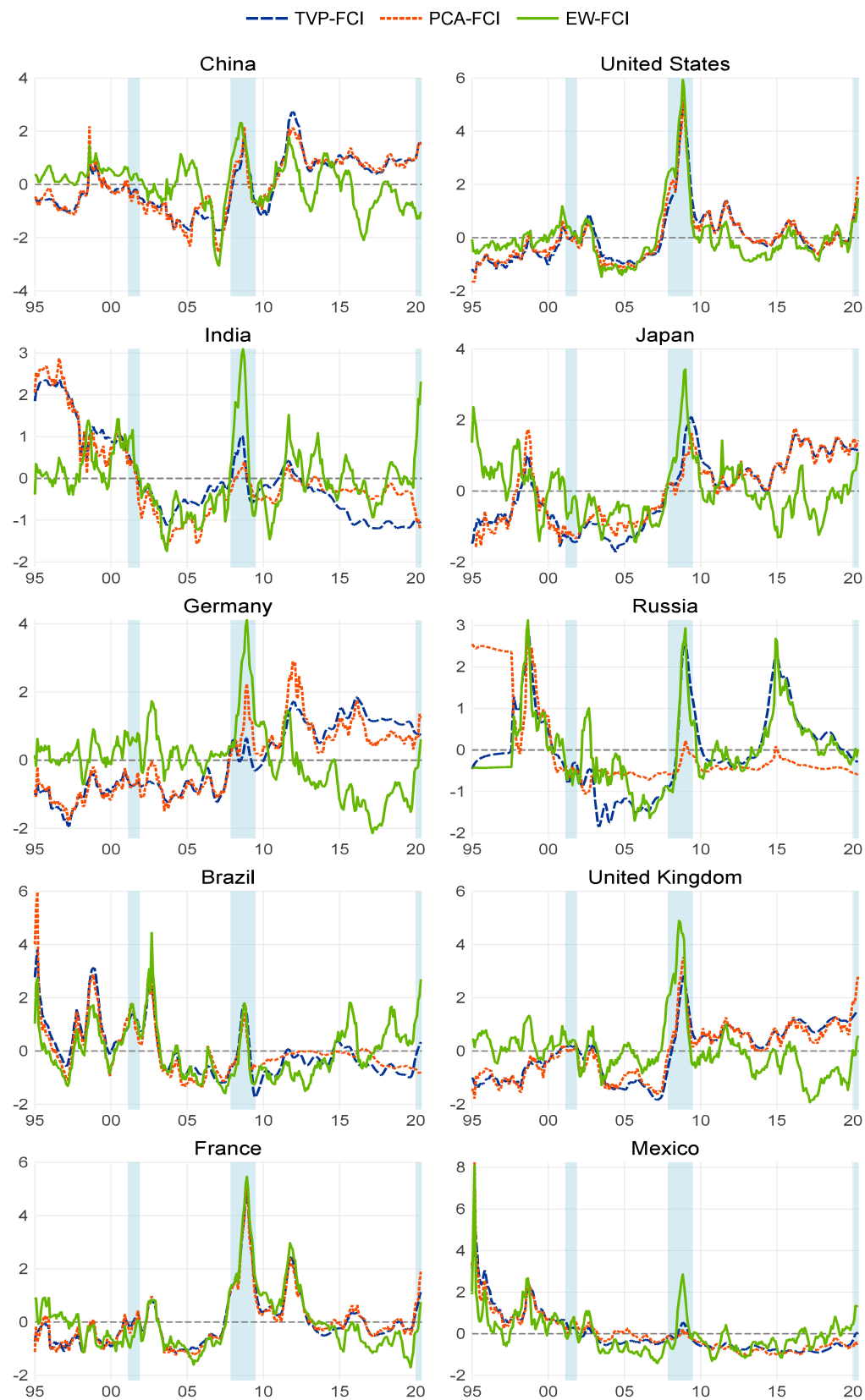


Figure 2.3: Comparison of the FCIs, 10 largest countries

Notes. Shaded areas represent NBER recessions (United States). All indicators are standardised. Countries are ordered by GDP PPP shares.



Figure 2.4: Comparison of the FCIs, continued

Notes. Shaded areas represent NBER recessions (United States). All indicators are standardised. Countries are ordered by GDP PPP shares.

distribution among the three FCIs.¹⁰ The first criterion that we use to rank the three FCIs is their ability to signal downside risk to economic activity. This is of course a subjective criterion. It could be the case that, over this specific sample period, for some of these countries economic recessions have originated from other (than financial) shocks, so that no dynamic relationship between FCIs and economic activity can be established. But if such a relationship exists, and is detected by some of the proposed FCIs, then a ranking across indices emerges. Using this metric, the number of countries for which an FCI *fails* to detect a significant relationship between financial conditions and economic activity is 8 for the TVP-FCI (India, Germany, Russia, Brazil, Italy, Canada, Norway, New Zealand), 7 for the PCA-FCI (India, Russia, Brazil, Mexico, Canada, Norway, New Zealand) and 6 for the EW-FCI (India, Russia, Turkey, Australia, Norway, New Zealand). In the case of India the EW-FCI is the only one for which the coefficient's point estimate has the right (negative) sign.

For countries for which large datasets of good quality are available, other indices based on different data reduction methods might work better than a simple average. Two obvious alternatives are the Chicago Fed NFCI for the US and the CISS by Hollo, Kremer, and Lo Duca (2012) for the euro area. The former, already described in the Introduction, is estimated via a large factor model. The latter is obtained by aggregating 13 indicators of financial stress through a time-varying correlation model. We therefore repeat the quantile regression analysis for the US and the EA including also the NFCI and the CISS as potential competitors. The results of this exercise, shown in Figure 2.6, indicate that neither of these indices has a superior in-sample predictive power.

A more stringent test for the usefulness of the FCIs is their ability to detect risks out-of-sample, i.e. to signal coming recessions in real time. We therefore test the out-of-sample predictive accuracy of the FCIs in the quantile regression framework. Following Adrian, Boyarchenko, and Giannone (2019), we compute predictive scores as the predictive distribution generated by the model and evaluated at the realised value of the time series.¹¹ The higher the predictive scores, the more accurate the out-of-sample prediction.

To provide a compact view of the results, we summarise them in a heat-map

¹⁰For reasons of space we only report here the impact on the 5th percentile (left tail) of the distribution of industrial production. The results obtained for the other percentiles of the distribution are available upon request.

¹¹More specifically, we re-estimate the quantile regressions using expanding windows, then fit the skewed t-density to the estimated quantiles and evaluate the predictive density score of this density at the actually realised value. We fit the skewed t-distribution developed by Azzalini and Capitanio (2003) to recover a probability density function.

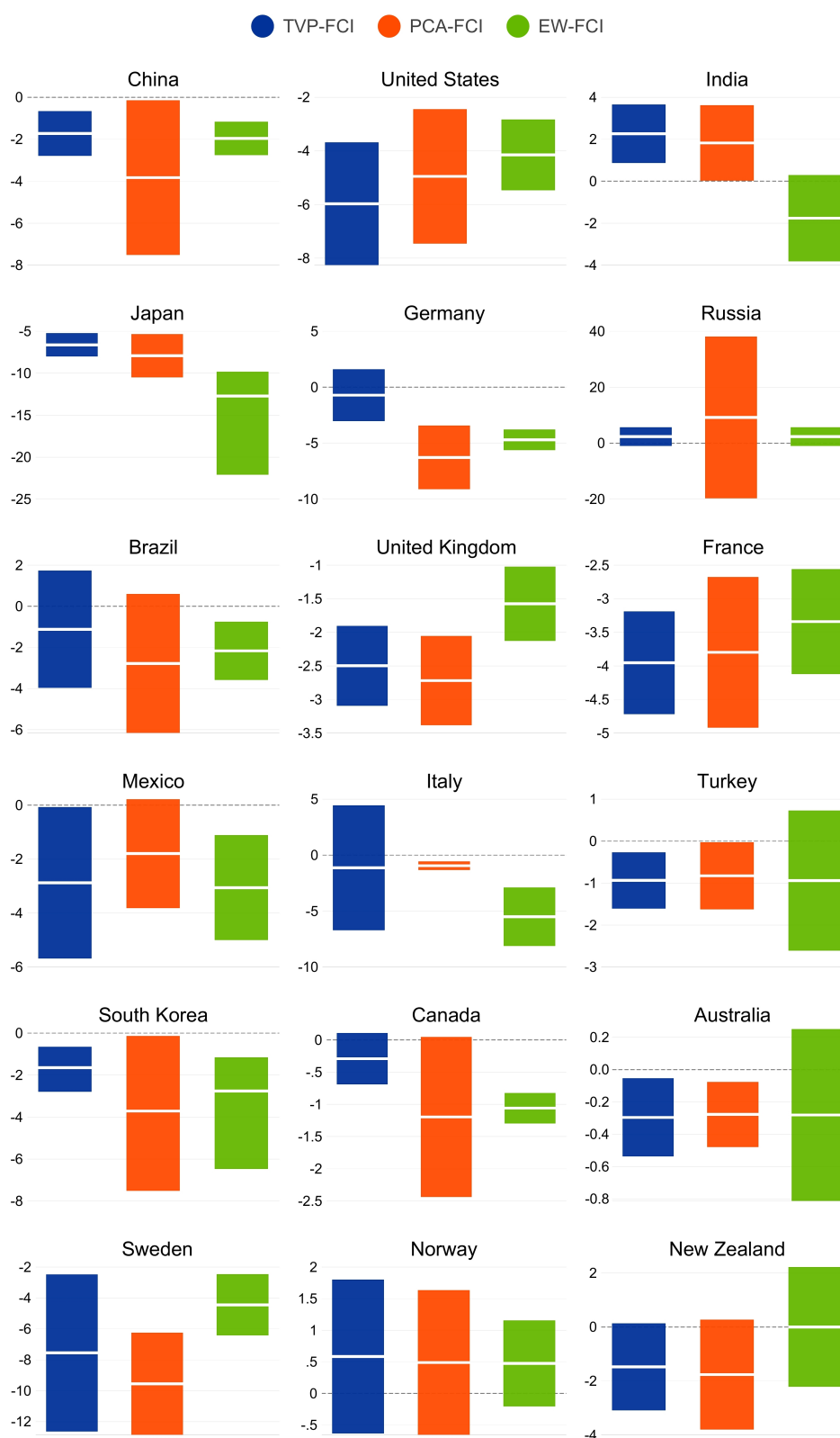


Figure 2.5: Impact of FCIs on the 5th percentile of the distribution of industrial production

Notes. The white line represents the mean impact of FCIs changes on the 5th percentile of industrial production, while the shaded areas represent the 95% confidence intervals around it. The country specific sample varies according to data availability, see Appendix 2.E. Countries are ordered by GDP PPP shares.

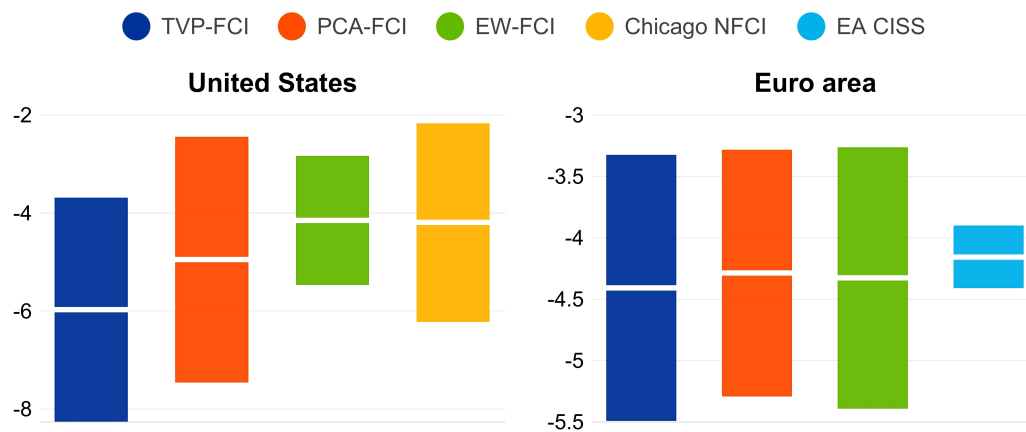


Figure 2.6: Impact of FCIs on the lower quantile of the distribution of industrial production - Comparison with Chicago NFCI and euro area CISS

Notes. The white line represents the mean impact of FCIs changes on the 5th percentile of industrial production, while the shaded areas represent the 95% confidence intervals around it. The euro area indicators are obtained by aggregating FCIs for Germany, France and Italy using varying GDP PPP annual shares as weights (see Figure 2.2, for 2019). For euro area the data coverage is January 2000 - December 2019.

(Figure 2.7) where the rows represent the countries and the columns the different FCIs. The darker the colour, the better the average out-of-sample performance, so the dark cells indicate the best performing FCI. We use an ordinal criterion to measure performance, i.e. the best performing model is the one that attains the highest score in most months. This avoids ranking first an FCI that has a much better performance in a few selected quarters but does not outperform the others on a consistent basis.¹² This exercise gives a very clear ranking, as the EW-FCI is ranked first in 10 out of 19 cases, the PCA-FCI in 5 and the TVP-FCI in 4. Out of these three indices, the TVP-FCI attains by far the worst performance, since it is ranked third in most cases. To provide a more complete picture we also include in this comparison the VIX and the Chicago Fed NFCI for the US and the CISS for the euro area. Their out-of-sample performance is very poor as they end up being ranked last.¹³

The main takeaway of this analysis is that the EW-FCI performs at least as well as a range of alternative indicators in capturing in sample growth-at-risk, and significantly better in an out-of-sample context. This finding aligns well with the conclusion in Timmermann (2006) that equal weights combinations are a surprisingly hard model to beat in out-of-sample forecasting.¹⁴

¹²We add the euro area as an independent economy in this exercise, so we have 19 economies.

¹³Since the VIX performs poorly in case of US, its out-of-sample performance was not tested for the other countries.

¹⁴The way the exercise is designed actually penalises the EW-FCI, since the parameters of the other competitors (TVP-FCI, PCA-FCI, CISS and NFCI) are estimated on the full sample, rather

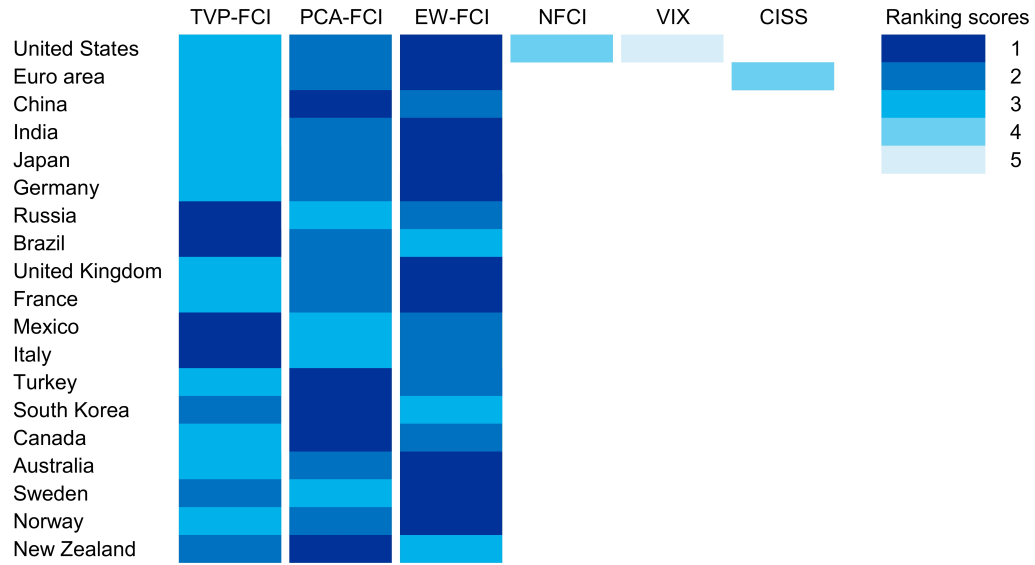


Figure 2.7: Rank of predictive scores of out-of-sample performance

Notes. The figure reports the predictive scores of the Probability Integral Transform (PIT). The out-of-sample predictive scores of the predictive distribution for industrial production growth are conditioned on each FCI at a time, a constant, and a lag of industrial production growth. The colour coding defines the score ranking by country: the index that performs best the highest number of times is coloured dark blue and ranked 1, the next one lighter blue and ranked 2, and so on with the lowest number of cases being coloured the lightest blue and ranked 5. Countries are ordered by GDP PPP shares, except for the United States and the euro area.

2.4.2 FCIs and crisis probability

As a second criterion for assessing the informational content of the three competing indices, we consider their ability to predict a set of crises, specifically systemic banking and currency crises.¹⁵ For this purpose, we collect data on the timing of these crises from Laeven and Valencia (2020) and estimate the following panel probit model for each set of crises:¹⁶

$$Pr(Y_t = 1 | X_{t-1}) = \int_{-\infty}^{X'_{t-1}\beta} \phi(t) dt = \Phi(X'_{t-1}\beta) \quad (2.1)$$

where Pr denotes the outcome probability, Y is a binary variable equal to 1 when a crisis occurs and 0 otherwise, and X is a vector of explanatory variables

than in pseudo real-time. These eliminates a source of estimation error that would further worsen their performance.

¹⁵Laeven and Valencia (2020) define a banking crisis as an event combining significant signs of financial distress in the banking system and significant banking policy intervention measures in response to significant losses in the banking system. They define a currency crisis as a sharp nominal depreciation of the domestic currency against the US dollar. We do not consider sovereign debt crises because there is only one episode matching our sample (Russia, 1998).

¹⁶Due to data constraints the model is estimated using quarterly data on the sample 1995-2017.

that influence the outcome.¹⁷ We estimate four different specifications. In the first three, we include each of the competing indicators of financial conditions separately. In the fourth, we include all of them. We also include a set of standard control variables (X_t), namely the growth rate of inflation and of real GDP, the level of real credit from banks to the private non-financial sector and the growth rate of real domestic and foreign credit.¹⁸ Since we are more interested in the predictive power rather than in the contemporaneous relationship of the variables, we lag all the regressors by one period.

Table 2.3 reports the results. Let us look first at banking crises (panel A). Except for the PCA-FCI, the coefficients associated with the FCIs have a positive sign (i.e. a tightening in financial conditions at time $t-1$ increases the probability of a banking crisis at time t). However, the only FCI that combines statistical and economic significance is the EW-FCI. In addition, the magnitude of the coefficients, as well as the value of the log-likelihood, suggest that the EW-FCI is the best performing measure. This result is confirmed by the fact that when we include all the indicators simultaneously (column 4), only the coefficient associated with the EW-FCI remains statistically and economically significant. For a graphical comparison of the models, Figure 2.8 plots the Receiver Operating Characteristic (ROC) curves for each of the model in Table 2.3 and a model including only controls and excluding any type of FCI (that we call model 5 in the chart). Conceptually, the ROC compares the true positive, i.e the probability of a crisis according to the model when there is a crisis (known as *sensitivity*), against false positives, i.e. the estimated probability of a crisis when there is not a crisis (known as *specificity*). The ROC curve of a random choice model is the 45 degrees line. The area below the ROC curve (AUROC) can be interpreted as a measure of accuracy of a binary model. The higher the AUROC, the better the model. The top panel of the chart confirms that the best performing model is model 4 (in yellow), that is the model that includes all FCIs. We formally test whether the AUROC associated with model 4 (i.e. the one with the largest AUROC and lowest log likelihood) is statistically different from the AUROC of every other model in pairwise comparisons. The top panel of Table 2.4 shows the results. For systemic banking crises, model 4 is not statistically different from the one solely based on the EW-FCI, while its performance is significantly better than that of the TVP-FCI and PCA-FCI models.

Moving to currency crises (panel B of Table 2.3), when indicators are included

¹⁷The database only specifies the exact quarter the crisis started for a subset of episodes. Whenever the starting quarter is unknown we assign a value of 1 to the dummy for the entire year, while we assign the value of 1 only to the exact quarter when available.

¹⁸The last three variables are expressed in US Dollars.

Table 2.3: Panel probit

A. Systemic Banking Crises				
	(1)	(2)	(3)	(4)
TVP-FCI _{t-1}	0.030 (0.112)			-0.034 (0.151)
PCA-FCI _{t-1}		-0.047 (0.124)		-0.298* (0.165)
EW-FCI _{t-1}			0.302*** (0.057)	0.499*** (0.052)
Controls	✓	✓	✓	✓
Observations	1,454	1,452	1,454	1,452
Log likelihood	-95	-95	-89	-85
B. Currency Crises				
	(1)	(2)	(3)	(4)
TVP-FCI _{t-1}	0.243* (0.128)			0.629** (0.282)
PCA-FCI _{t-1}		0.061 (0.113)		-0.431 (0.286)
EW-FCI _{t-1}			0.175* (0.090)	0.039 (0.252)
Controls	✓	✓	✓	✓
Observations	1,454	1,452	1,454	1,452
Log likelihood	-35	-37	-36	-33

Notes. Robust standard errors in parentheses. Statistical significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Given that the PCA-FCI for Japan and New Zealand have a large drop for the first data point, due to noise in the series, the indices for these countries start in February 1995, rather than January. This explains the difference in observations for the models including PCA-FCI.

on their own, the best predictors are the TVP-FCI and EW-FCI. When including all the FCIs in the model, TVP-FCI is the only one whose coefficient remains statistically and economically significant. In this case, however, formal tests do not detect statistically significant differences across the alternative models, as

shown in the bottom panel of Table 2.4.

Table 2.4: Test for statistical difference of AUROCs

A. Systemic Banking Crises			
H_0	χ^2	$Pr > \chi^2$	
AUROC(4)=AUROC(1)	8.4352	0.0037**	
AUROC(4)=AUROC(2)	8.6420	0.0033**	
AUROC(4)=AUROC(3)	2.2993	0.1294	
AUROC(4)=AUROC(5)	8.5388	0.0035**	
B. Currency Crises			
H_0	χ^2	$Pr > \chi^2$	
AUROC(4)=AUROC(1)	0.0684	0.7937	
AUROC(4)=AUROC(2)	1.6497	0.1990	
AUROC(4)=AUROC(3)	0.3696	0.5432	
AUROC(4)=AUROC(5)	2.0905	0.1482	

Notes. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. If $Pr > \chi^2$ is significant we can reject H_0 , i.e. the AUROC is statistically different from the AUROC of the benchmark model.

2.5 Conclusion

In this paper we evaluate alternative measures of financial conditions indicators for a large number of advanced and emerging economies.

Our econometric evaluation, based on a large sample of countries, shows that FCIs obtained via equal weights combinations of financial variables have good statistical properties. They are not inferior to, and in some instances perform better than FCIs constructed with principal component analysis or with factor models with time-varying parameters. The results hold both in the context of quantile regressions, where they prove useful in anticipating downside risks to economic activity, as well as in probit models, where they show a stronger correlation with future banking crises. Importantly, for the euro area and for the US these simple indices outperform popular alternatives based on larger information sets and on different econometric methods, namely the Composite

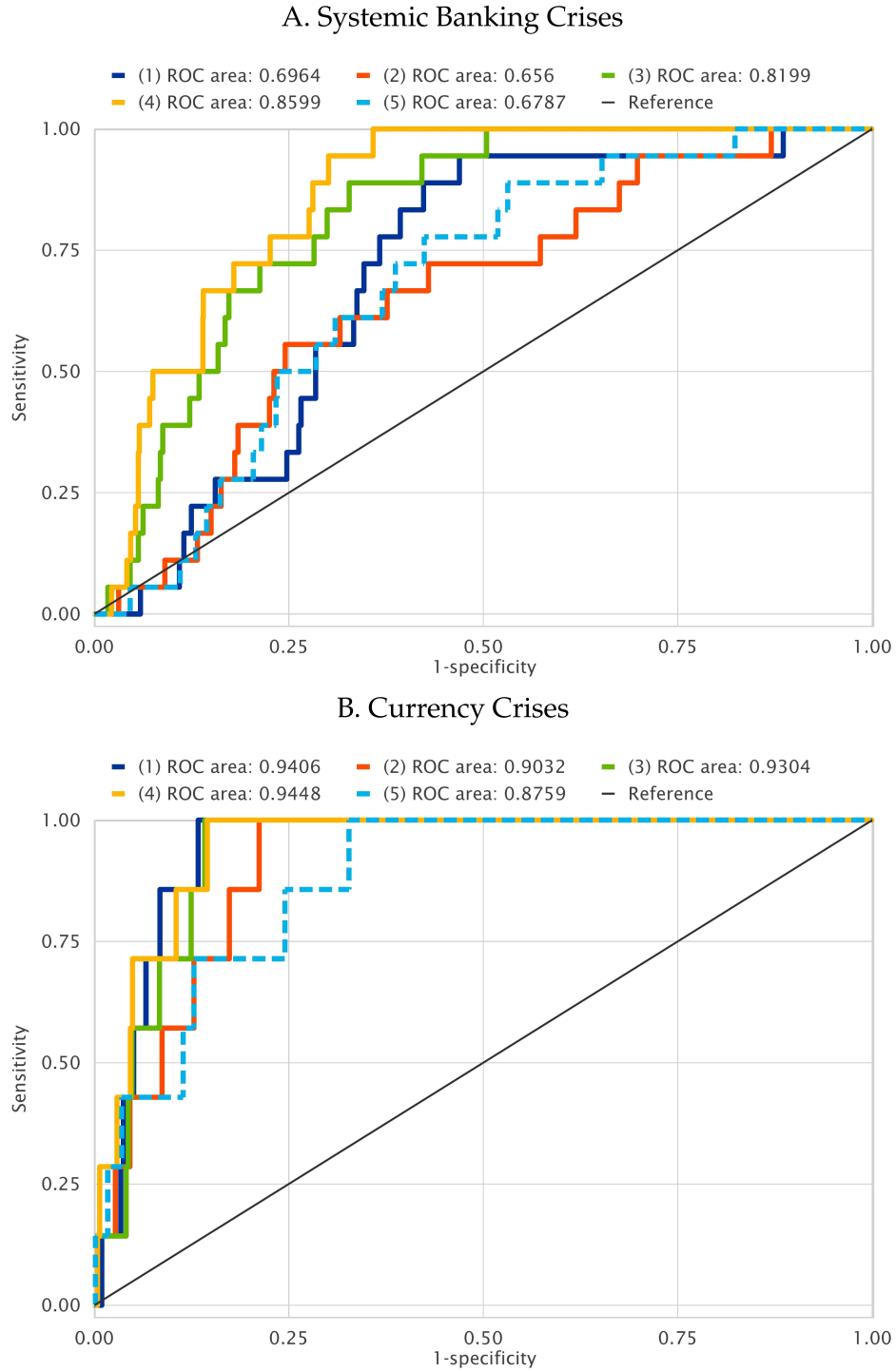


Figure 2.8: Comparison of ROC curves for each model

Notes. The numbers in brackets refer to the different models reported in Table 2.3. Lines represent the ROC curves for each of the models. The blue line refers to the model including TVP-FCI, the red line to the model including PCA-FCI, the green line to the model including EW-FCI, the yellow line to the model including all three FCIs, and the light blue line to the model including only controls and excluding any type of FCIs (the latter is not included in Table 2.3).

Index of Systemic Stress (CISS) for the euro area and the National Financial Conditions Index (NFCI) published by the Chicago Fed for the US.

Equal weights combination has a long tradition in the forecasting literature, does not suffer from parameter estimation uncertainty and allows for an easy decomposition of the contribution of the underlying indicators to the aggregate index. It is also less fragile in the face of short data and data irregularities, a pressing concern when working with emerging markets data. We believe the results of this paper will be of particular interest for researchers and institutions interested in monitoring financial conditions in a large number of economies, including those for which data are too short or present too many irregularities to be treated through more formal econometric methods.

Appendix 2.A Financial conditions and the macroeconomy: evidence from a spillover exercise

This Appendix presents some evidence on the causal and predictive relationship between financial conditions and the business cycle by studying the effects of a US financial conditions shock on two neighbouring countries, namely an emerging economy (Mexico) and an advanced economy (Canada). Given the centrality of the US in the global economy and the tight integration with Mexico and Canada, this analysis allows us to claim that we are isolating a causal impact of financial conditions on economic activity. We proxy US financial conditions via the Excess Bond Premium, a widely used measure of risk aversion and financial market sentiment for the US economy (Gilchrist and Zakrajšek, 2012; Lopez-Salido, Stein, and Zakrajšek, 2017) and study the effect of a US financial shock on the financial system (in particular on long term interest rates, stock prices, sovereign spreads, stock market volatility and the exchange rate) and on the macroeconomy (CPI, GDP and monetary policy rates).¹⁹

We follow a two step strategy. First, we estimate a small Vector Autoregression (VAR) on US economy using domestic variables (Consumer Price Index (CPI), Industrial Production (IP) and the Excess Bond Premium (EBP)) and global variables (the price of oil and global industrial production). We then identify a shock to financial conditions by assuming that the EBP reacts contemporaneously to slow moving variables (CPI, IP and the global variables), but that the latter only react with at least one month delay to an EBP shock. We then use the estimated shocks as exogenous variables in VAR-X framework to study the effects on individual economies. This two step procedure has been widely used, see for instance Cesa-Bianchi, Ferrero, and Rebucci (2018) and Bhattarai, Chatterjee, and Park (2020), and rests on the assumptions that US and global shocks are exogenous with respect to developments in the small economies (like Canada and Mexico).²⁰

The effect of the shock on individual countries is examined using the following

¹⁹GDP is interpolated at the monthly frequency using a cubic spline.

²⁰This crude identification assumption, based on Gilchrist and Zakrajšek (2012), captures a wide array of shocks (uncertainty, financial and credit supply shocks, just to name three) that impact contemporaneously financial conditions and that affect the business cycle with some delay. The exact definition of this shock is not crucial, as the purpose of the exercise is indeed to confirm that there is an important interplay between financial conditions and the business cycle conditional on a wide array of shocks. Bhattarai, Chatterjee, and Park (2020) use the same methodology to study the spillovers of US uncertainty shocks.

VAR-X model:

$$Y_t^i = \sum_{j=1}^p B_j Y_{t-j}^i + \Gamma^i s_t + \varepsilon_t^i \quad (2.2)$$

where Y_t^i is a vector of macro/financial variables for country i and s_t is the shock to financial conditions estimated in the first step. Both VARs are estimated with Bayesian methods using standard Minnesota priors. In this way we take into account all the sources of uncertainty when estimating the effects of the shocks on individual countries. In practice, conditioning on a draw of s_t from the posterior of the US/global VAR we take a draw from the country specific VARs and estimate the IRFs.

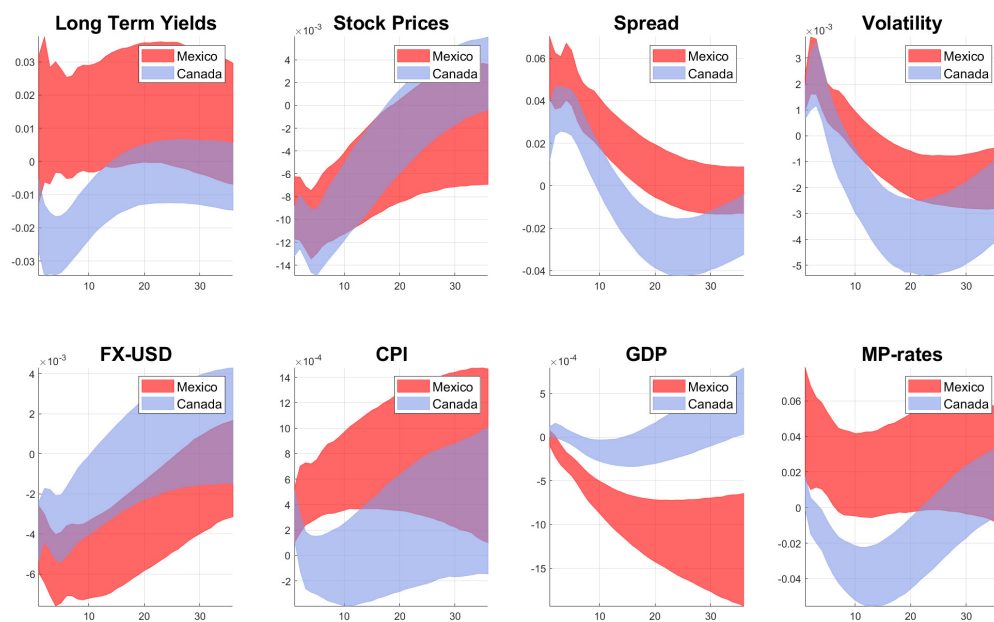


Figure 2.A.1: Effects of a tightening of global financial conditions

Notes. Impulse responses to a shock to the global financial conditions. The IRFs comprise confidence bands.

Following the shock, in both countries stock prices fall, sovereign spreads rise, implied stock market volatility increases, the domestic currency depreciates against the US dollar and GDP falls (Figure 2.A.1). Importantly, asset prices respond very quickly to the shock, while GDP falls with a significant delay. Besides these similarities, there are important differences. In Mexico, like in most EMEs where inflation expectations are poorly anchored and monetary policy is not perceived as credible, an exchange rate depreciation raises inflation and long term yields (i.e. leads to a further tightening of financial conditions). The central bank raises policy rates to stabilise the exchange rate, resulting in a deeper and longer contraction of economic activity. In Canada, similar to other AEs that have

a credible monetary policy framework in place, no trade off between stabilising inflation and GDP emerges (as they both fall) and the central bank can afford cutting rates to alleviate financial conditions and to support the economy. At the same time, GDP falls less and recovers sooner than in Mexico.

We take two important points away from this exercise. First, there is a wide array of shocks that induce a sharp tightening of financial conditions *that leads by several months a fall in GDP*. This dynamics, which resembles closely the lead-lag relation between asset prices and economic activity that emerges in financial accelerator models of the business cycle (Bernanke, Gertler, and Gilchrist, 1999), calls for a close monitoring of financial conditions, and has indeed constituted the main motivation behind the literature on FCIs discussed in the Introduction.²¹ Second, the use of judgement in constructing FCIs allows us to complement statistical analyses with economic intuition when assigning weights to different asset prices. This means, for instance, giving the exchange rate a different role in constructing FCIs for AEs and EMEs.

²¹ Alessandri and Mumtaz (2014) show that this predictive power is particularly strong for recessions. This does not mean that *all recessions* are preceded by a tightening of financial conditions. The Covid-19 recession, for instance, occurred in an environment of favourable financial conditions.

Appendix 2.B Data sources

Table 2.B.1: Data sources and descriptions

<i>Variable</i>	<i>Detailed description</i>	<i>Source</i>
Long term government bond yields	10-year nominal government bond yields	National sources via Refinitiv Datastream
Short term government bond yields	3/6 months or 1 year short term nominal government bond yields, according to country's best availability	National sources via Refinitiv Datastream
Sovereign spread	If available, we use the JPM EMBI stripped spreads. Otherwise we construct it as 10-years government bond yields minus the benchmark country's 10 years yield (US, UK, Germany, Japan, Switzerland)	Refinitiv Datastream, JP Morgan Chase
Corporate spread [°]	Constructed as redemption yields of corporate indices minus government bond yields with the same maturity	Merrill Lynch, Barclays and Refinitiv Datastream
Inter-bank spread	Constructed as 3-months government benchmark bid yield minus 3-months inter-bank offered rate	National sources via Refinitiv Datastream
Term spread	Constructed as short minus long term government bond yields	National sources via Refinitiv Datastream
Equity volatility	30-days historical volatility of national stock indices	National sources via Refinitiv Datastream
Equity prices, m-o-m growth rate	Price indices of national stock exchange	National sources via Refinitiv Datastream
Real residential house prices [°] , m-o-m growth rate	National residential property prices indices, deflated by consumer price indices	Bank for International Settlements, Oxford Economics, Cesa-Bianchi, Cespedes, and Rebucci (2015)
Credit [°] , m-o-m growth rate	Credit to households and non-profit institutions serving households provided by all sectors. Adjusted for breaks, market value	Bank for International Settlements
Bilateral exchange rate with the US Dollar	Market exchange rates, expressed as national currency per US Dollar	Refinitiv Datastream, International Monetary Fund, Federal Reserve Board, Haver
Industrial production	Industrial production indices, standardized	National sources via Refinitiv Datastream
Headline inflation	Consumer price indices	International Monetary Fund and Bank for International Settlements
Real GDP	Real GDP in local currency, seasonally adjusted at annual rate	Organisation for Economic Co-operation and Development, Haver
Real domestic banks credit	Real domestic credit from banks to non-financial sector in US Dollar	Bank for International Settlements
Real foreign banks credit	Computed as a weighted average of domestic banks credit using country specific GDP PPP weights, US Dollars	Bank for International Settlements, International Monetary Fund

Notes. ° Since these data are originally quarterly, when used monthly we keep the value constant over the relative months of the quarter. ° In some cases, to extend series of corporate spreads when not available, we extend them using equity volatility and standardize the combined series.

Appendix 2.C The dynamic factor model with time-varying parameters

Let $x_{it} = (x_{1t}, \dots, x_{nt})'$ be an n -dimensional vector of variables that follows a dynamic factor model of the form:

$$x_{it} = \lambda_{it} f_t + \epsilon_{it} \quad (2.3)$$

$$f_t = B_t f_{t-1} + \eta_t \quad (2.4)$$

where f_t is the $k \times 1$ vector of factors, λ_{it} is the $n \times k$ factor loadings, B_t is a $k \times k$ matrix of $VAR(1)$ coefficients and ϵ_{it} and η_t are disturbance terms. It is further assumed that $\epsilon_t \sim N(0, V_t)$ and $\eta_t \sim N(0, Q_t)$ where V_t and Q_t are the $n \times n$ and $k \times k$ diagonal covariance matrices respectively. Note that the ϵ_{it} are uncorrelated with both f_t and η_t at all leads and lags. In order to complete the description of the TVP-DFM model we need to define how the time-varying parameters evolve. We allow λ_t and β_t to evolve as driftless random walks:

$$\lambda_t = \lambda_{t-1} + u_t \quad u_t \sim N(0, R_t) \quad (2.5)$$

$$\beta_t = \beta_{t-1} + v_t \quad v_t \sim N(0, W_t) \quad (2.6)$$

The model has a standard state space representation where equation 2.3 is the measurement equation and 2.4 to 2.6 are the state equations. The state vectors f_t, λ_t, β_t are estimated via the Kalman smoother, provided that an estimate of the covariances, V_t, Q_t, R_t, W_t is available. We assume that errors across blocks of equations are uncorrelated, i.e. that u_t and v_t are *i.i.d.* errors, with each other as well as with ϵ_t and η_t at all leads and lags.²² The model covariances are estimated using a standard forgetting factor algorithm. First, R_t and W_t evolve as follows:

$$R_t = \left(\frac{1 - \theta_R}{\theta_R} \right) P_{t-1/t-1}^\lambda$$

$$W_t = \left(\frac{1 - \theta_W}{\theta_W} \right) P_{t-1/t-1}^\beta$$

where $P_{t-1/t-1}^\lambda$ and $P_{t-1/t-1}^\beta$ are the estimated covariance matrices of the unobserved state vectors λ_t and β_t in the model. The smoothing parameters θ_R and θ_W are set at 0.96. The matrices V_t and Q_t are estimated by suitably discounting past squared one step ahead prediction errors:

$$\widehat{V}_t = \kappa_v \widehat{V}_{t-1} + (1 - \kappa_v) \epsilon_t \epsilon_t'$$

$$\widehat{Q}_t = \kappa_Q \widehat{Q}_{t-1} + (1 - \kappa_Q) \eta_t \eta_t' \quad (2.7)$$

where ϵ_t is the vector that collects the measurement errors in equation 2.3 and κ_v and κ_Q are also set at 0.96.

²²See, for instance, Cooley and Lohnes (1971) and Koop and Korobilis (2014)

Appendix 2.D Quantile regression framework

In our exercise, a quantile τ for h quarters ahead of the distribution of industrial production growth (y) is modelled as a function of current financial conditions (or other financial measures), a constant, and the current industrial production growth:

$$y_{t+h,\tau} = \beta_c + \beta_{FCI} FCI_t + \beta_{y_t} y_t + \epsilon_{t+h,\tau} \quad (2.8)$$

where τ is the τ_{th} conditional quantile. In a quantile regression the slope β is chosen as to minimise the quantile weighted absolute value of errors. The predicted value is the quantile of y_{t+h} conditional on the vector of regressors. In the paper we consider $h=1$ (month).

Appendix 2.E Data sample for quantile regressions

The data sample that we use for quantile regressions differs among countries due to data availability for industrial production. Table 2.E.1 reports the country specific data sample.

Table 2.E.1: Data sample for quantile regressions

Country	Time Frame
China	Jan 1995–Nov 2019
United States	Jan 1995–Dec 2019
India	May 2005–Dec 2019
Japan	Jan 1995–Dec 2019
Germany	Jan 1995–Dec 2019
Russia	Jan 1999–Mar 2019
United Kingdom	Jan 1995–Dec 2019
Brazil	Jan 1995–Dec 2019
France	Jan 1995–Dec 2019
Mexico	Jan 1995–Dec 2019
Italy	Jan 1995–Dec 2019
Turkey	Jan 2010–Dec 2019
South Korea	Jan 1995–Dec 2019
Canada	Jan 1995–Nov 2019
Australia	Jan 1995–Aug 2019
Sweden	Jan 2000–Dec 2019
Norway	Jan 1995–Dec 2019
New Zealand	Jan 1995–Nov 2019

Notes. Countries are ordered by GDP shares at purchasing parity power.

Appendix 2.F NFCI subcomponents explainer

1	Spreads and implied volatilities
2	Credit ratios
3	Failure Rates and delinquencies
4	Lending standards
5	Issuance and open interest
6	Yields and price indices
7	Others

Mnemonic	Financial Indicator	Category	Mnemonic	Financial Indicator	Category
A2P2	1-mo. Nonfinancial commercial paper A2P2/AA credit spread	1	INS	Total Assets of Insurance Companies/GDP	4
ABCP	1-mo. Asset-backed/financial commercial paper spread	1	ITA	Fed funds and Reverse Repurchase Agreements/Total Assets of Commercial Banks	4
ABS1	Nonmortgage ABS Issuance (Relative to 12-mo. MA)	5	JINC	30-yr Jumbo/Conforming fixed rate mortgage spread	1
ABSSPREAD	BoFA/ML Home Equity ABS/MBS yield spread	1	LHY	Market High Yield (HY) 5-yr Senior CDS Index	6
BAA	Moody's Baa corporate bond/10-yr Treasury yield spread	1	LIBID	3-mo. Eurodollar spread (LIBID-Treasury)	1
BIG	Broker-dealer Debt Balances in Margin Accounts	7	LIG	Market Investment Grade (IG) 5-yr Senior CDS Index	7
BONDGR	New US Corporate Debt Issuance (Relative to 12-mo. MA)	5	LPH	CoreLogic National House Price Index	6
CARSPREAD	UM Household Survey: Auto Credit Conditions Good/Bad spread	1	MBOND	20-yr Treasury/State & Local Government 20-yr GO bond spread	1
CBAR	Commercial Bank 48-mo. New Car Loan/2-yr Treasury yield spread	1	MBONDGR	New State & Local Government Debt Issues (Relative to 12-mo.h MA)	5
CBILL	3-mo. Financial commercial paper/Treasury bill spread	1	MBSI	Total MBS Issuance (Relative to 12-mo. MA)	5
CBPR	Commercial Bank 24-mo. Personal Loan/2-yr Treasury yield spread	1	MCAP	S&P 500, NASDAQ, and NYSE Market Capitalization/GDP	6
CCDQ	S&P US Bankcard Credit Card: 3-mo. Delinquency Rate	3	MDQ	MBA Serious Delinquencies	3
CCG	Consumer Credit Outstanding	2	MG	Money Stock: MZM	6
CCINC	S&P US Bankcard Credit Card: Excess Rate Spread	1	MINC	30-yr Conforming Mortgage/10-yr Treasury yield spread	1
CG	Commercial Paper Outstanding	4	MLIQ10	On-the-run vs. Off-the-run 10-yr Treasury liquidity premium	7
CLARGE	FRB Senior Loan Officer Survey: Tightening Standards on Large C&I Loans	4	MMF	Total Money Market Mutual Fund Assets/Total Long-term Fund Assets	7
CISMALL	FRB Senior Loan Officer Survey: Tightening Standards on Small C&I Loans	4	MSWAP	Bond Market Association Municipal Swap/20-yr Treasury yield spread	1
CITA	Commercial Bank C&I Loans/Total Assets	2	NACMM	NACM Survey of Credit Managers: Credit Manager's Index	2
CMBS	BoFA/ML 3-5 yr AAA CMBS OAS spread	1	NCL	Commercial Bank Noncurrent/Total Loans	2
CMBSI	CMBS Issuance (Relative to 12-mo. MA)	5	NFC	Nonfinancial business debt outstanding/GDP	2
COMMODLIQ	COMEX Gold/NYMEX WTI Futures Market Depth	6	OEQ	S&P 500, S&P 500 mini, NASDAQ 100, NASDAQ mini Open Interest	5
CONTA	Commercial Bank Consumer Loans/Total Assets	2	OINT	3-mo. Eurodollar, 10-yr/3-mo. swap, 2-yr and 10-yr Treasury Open Interest	7
CPH	FRB Commercial Property Price Index	6	PENS	Total Assets of Pension Funds/GDP	6
CPR	Counterparty Risk Index (formerly maintained by Credit Derivatives Research)	7	RATELIQ	CME Eurodollar/CBOT T-Note Futures Market Depth	7
CRE	FRB Senior Loan Officer Survey: Tightening Standards on CRE Loans	4	REIT	Total REIT Assets/GDP	7
CRG	S&P US Bankcard Credit Card: Receivables Outstanding	7	REPO	Fed Funds/Overnight Treasury Repo rate spread	1
CTABS	ICE BoFA/ML ABS/5-yr Treasury yield spread	1	REPOA	Fed Funds/Overnight Agency Repo rate spread	1
CTERM	3-mo./1-wk. AA Financial commercial paper spread	1	REPOGR	Repo Market Volume (Repurchases+Reverse Repurchases of primary dealers)	6
CTF	ICE BoFA/ML Financial/Corporate Credit bond spread	1	REPOMORT	Fed Funds/Overnight MBS Repo rate spread	1
CTMSB	ICE BoFA/ML Mortgage Master MBS/10-year Treasury yield spread	1	RRE	FRB Senior Loan Officer Survey: Tightening Standards on RRE Loans	4
CWILL	FRB Senior Loan Officer Survey: Willingness to Lend to Consumers	4	RTA	Commercial Bank Real Estate Loans/Total Assets	2
D10	10-yr Constant Maturity Treasury yield	6	RTERM	3-mo./1-wk. Treasury Repo spread	1
DBC	ABA Value of Delinquent Bank Card Credit Loans/Total Loans	3	SBD	Total Assets of Broker-dealers/GDP	2
DCLOSE	ABA Value of Delinquent Consumer Loans/Total Loans	3	SMALL	NFIB Survey: Credit Harder to Get	2
DCOMM	Commercial Bank Total Unused C&I Loan Commitments/Total Assets	7	SPCILLARGE	FRB Senior Loan Officer Survey: Increasing spreads on Large C&I Loans	1
DHE	ABA Value of Delinquent Home Equity Loans/Total Loans	3	SPCISMAILL	FRB Senior Loan Officer Survey: Increasing spreads on Small C&I Loans	1
DNET	Net Notional Value of Credit Derivatives	2	SPR2	10-yr/2-yr Treasury yield spread	1
DOTH	ABA Value of Delinquent Noncard Revolving Credit Loans/Total Loans	3	SPR23M	2-yr/3-mo. Treasury yield spread	2
DURSPREAD	UM Household Survey: Durable Goods Credit Conditions Good/Bad spread	1	STA	Commercial Bank Securities in Bank Credit/Total Assets	2
EQUITYLIQ	CME E-mini S&P Futures Market Depth	6	STKGR	New US Corporate Equity Issuance (Relative to 12-mo. MA)	5
FAILS	Treasury Repo Delivery Fails Rate	3	STLOC	Federal, state, and local debt outstanding/GDP	2
FAILSA	Agency Repo Delivery Failures Rate	3	SWAP10	10-yr Interest Rate Swap/Treasury yield spread	1
FAILSC	Corporate Securities Repo Delivery Failures Rate	3	SWAP2	2-yr Interest Rate Swap/Treasury yield spread	1
FAILSBS	Agency MBS Repo Delivery Failures Rate	3	SWAP3M	3-mo. Overnight Indexed Swap (OIS)/Treasury yield spread	1
FC	Total Assets of Finance Companies/GDP	4	TABS	Total Assets of ABS Issuers/GDP	5
FCORP	Total Assets of Funding Corporations/GDP	4	TED	3-mo. TED spread (LIBOR-Treasury)	1
FG	Finance Company Owned & Managed Receivables	7	TERM	1-yr/1-mo. LIBOR spread	1
FINS	S&P 500 Financials/S&P 500 Price Index (Relative to 2-yr MA)	6	USD	Advanced Foreign Economies Trade-weighted US Dollar Value Index	6
GSE	Total Agency and GSE Assets/GDP	4	VIX	CBOE Market Volatility Index VIX	1
GVL	FDIC Volatile Bank Liabilities	4	VOL1	1-mo. BoFA/ML Option Volatility Estimate Index	1
HH	Household debt outstanding/PCE Durables and Residential Investment	2	VOL3	3-mo. BoFA/ML Swaption Volatility Estimate Index	1
HOUSSPREAD	UM Household Survey: Mortgage Credit Conditions Good/Bad spread	1	W500	Wilshire 5000 Stock Price Index	6
HY	BoFA/ML High Yield/Moody's Baa corporate bond yield spread	1	Macro	Macroeconomic adjustment due to activity and inflation	7

Figure 2.F.1: NFCI components and categories

Notes. The choice of macro-categories and the allocation of components to them is based on the judgement of the authors.

Chapter 3

The Long and the Short of it: Inheritance and Wealth in Ireland

with Laura Boyd and Tara McIndoe-Calder¹

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The three main causes of inequality of wealth are: unequal economic abilities, unequal inheritances and gifts of property, and unequal luck. [...] Inheritance cannot be an original or primary cause of unequal distribution, but it perpetuates and may intensify inequalities of wealth arising originally from other causes. The actual extent of its influence on distribution can only be decided by quantitative analysis of the relevant facts.

Josiah Wedgwood
The Economics of Inheritance (1929)

3.1 Introduction

Aggregate household net wealth, defined as total assets net of debt, has been increasing in Ireland since the beginning of the century. The latest value (€1,059.4 billion in 2022 Q4) is almost three times higher than it was twenty years earlier (€392.2 billion in 2002 Q4).² However, as is the case for other advanced economies, the distribution of net wealth in Ireland remains highly unequal, with the Gini

¹The views expressed are those of the authors and do not necessarily reflect those of the Central Bank of Ireland or the European System of Central Banks (ESCB). We would like to thank the CSO ICW team for granular data access.

²Source: [Quarterly Financial Accounts \(QFA\)](#), Central Bank of Ireland.

coefficient being 0.65 in 2020. Although this is still high in an historical sense, the coefficient has decreased by 10 percentage points since 2013.³ Horan, Lydon, and McIndoe-Calder (2021) find that the rise in house prices, the decline in the share of households with negative equity, and changes in home ownership are the main drivers behind this decline in wealth inequality.

Interest in the drivers of wealth inequality and the role of intergenerational wealth transfers (inheritances and gifts) in the determination of the net wealth distribution remains an area of active policy and research focus. There is evidence that the importance of inheritance has increased over time (Piketty, 2011; Piketty and Zucman, 2015; Atkinson, 2018; Ohlsson, Roine, and Waldenström, 2020; Acciari, Alvaredo, and Morelli, 2024). However, the literature has not yet reached a consensus on whether inherited wealth acts as an equaliser of the distribution of total net wealth or not. By and large, the answer depends on the country being considered. Differences in demographics, the propensity to transfer between generations and the evolution in wealth stocks over time, lead to heterogeneous results between countries. However, several recent studies which use micro-data find that intergenerational transfers act as an equalising force of the wealth distribution.

There exist a plethora of methodologies to study the link between inherited wealth and the accumulation of net wealth. Each one tackles the question from a different perspective and results from different methodologies should be seen as complements rather than substitutes. Nolan et al. (2021) implement a decomposition method to disentangle the relative contributions of inherited and non-inherited wealth to total wealth inequality, as measured by the Gini coefficient on wealth, for six advanced economies in 2010/11 (United Kingdom, France, Germany, Italy, Spain, United States). In this paper we implement and update this methodology for Ireland, using household level data from the latest wave of the Household Finance and Consumption Survey (HFCS).

We find that, by 2020, over one-third of households had received an inheritance or gift. For these households, the real value of inherited wealth is €97 billion and accounts for approximately one sixth of their total net wealth. Moreover, the incidence of inheritances appears to be increasing over time with a higher proportion of households receiving inheritances in the last 20 years than previously.

³We compute the Gini coefficients using micro-data from the Household Finance and Consumption Survey (HFCS). This is the same data that we use for the empirical analysis. The first HFCS wave in Ireland was conducted in 2013, while the latest data were collected in 2020. The evolution of the Gini coefficient, calculated from survey data, is as follows: 0.52 in 1987 (Horan, Lydon, and McIndoe-Calder, 2021), 0.75 in 2013, 0.67 in 2018 (0.7 considering the May 2023 revision by CSO), 0.65 in 2020.

Older households in 2020 (those whose head of household is aged 60 and over) are more likely to have received inheritances than similar households in 2013. Wealthier households are more likely to have received inheritances. However, for those households who have received an inheritance, the value of inherited wealth is a larger share of total wealth for those in the middle of the wealth distribution than for those at the top. Due to the relatively larger size of inherited wealth in total net wealth for households in the middle of the wealth distribution, inheritances in Ireland appear to contribute little to wealth inequality, and may even reduce it (similar to findings for Britain, the United States and Germany).

Addressing this research question has relevant policy implications. In Ireland the debate on wealth taxation centres on ways to increase the amount of tax collected, minimise distortions and improve equity. One example of which is *Foundations for the Future* (Government of Ireland, 2022), the report of the 2022 Commission on Taxation and Welfare, which considered a number of reforms to existing capital taxes, such as a minimum capital charge on inheritances and gifts. But the discussion has a global nature. In its *Inheritance Taxation Report 2021*, the OECD suggests that inheritance taxes are a useful instrument to reduce wealth concentration and enhance equality of opportunity (OECD, 2021). Moreover, compared to other taxes on wealth, they have lower efficiency costs and are easier to assess and collect. Uncovering the effect of inheritance for the distribution of wealth would help inform the policy discussion around this debate.

The remainder of the paper is organised as follows. Section 3.2 reviews the related literature. Section 3.3 provides a contextualisation of the Irish economy. Section 3.4 describes and explores the data providing a set of stylised facts. Section 3.5 explains the methodology and presents the results. Section 3.6 discusses potential mechanisms, while Section 3.7 provides robustness checks. Section 3.8 offers policy implications and concludes.

3.2 Literature

Part of the literature suggests that inheritances are associated with an increase in wealth inequality (Davies, 1982; Gokhale et al., 2001; De Nardi, 2004; Salas-Rojó and Rodríguez, 2022). Various papers document a strong intergenerational wealth correlation (Wedgwood, 1928; Harbury, 1962; Harbury and Hitchens, 1976; Harbury and Hitchens, 1979). Benetton, Kudlyak, and Mondragon (2022) estimate that in the United States the likelihood of homeownership is 60 per cent higher for individuals whose parents extract equity compared to those who don't. Adermon, Lindahl, and Waldenström (2018) document that in Sweden

at least 50 per cent of the intergenerational wealth correlation can be explained by bequests. Fagereng, Mogstad, and Rønning (2021) complement adoption data with Norwegian tax records and find that wealth amounts and decisions of adopted children are strongly influenced by the background of the adoptive family.

However, another substantial portion of the literature actually finds that inheritance can be an equalising force for the distribution of wealth. There are three main strands of the literature reaching this same conclusion, using different methodologies, frameworks, and data.

First, from a theoretical perspective, this result can be explained by the parents' decision on how to distribute their inheritance (Becker and Tomes, 1979; Tomes, 1981) and/or spousal backgrounds (Laitner, 1979). Tomes (1981) finds that inheritances make the distribution of wealth more fair because, all else equal, low-income children inherit proportionally more compared to children of advantaged households. This result follows a model of intergenerational wealth transfer that is based on altruism. As the recipient's income increases, the need for income compensation reduces and the donor shifts their own resources towards their own consumption, decreasing the value of the bequest.

Second, administrative data have been employed to show this result. Boserup, Kopczuk, and Kreiner (2016) use Danish administrative data and find that inheritances are associated with a reduction in relative inequality, via a decline in the share of wealth going to the top 1%. Elinder, Erixson, and Waldenström (2018) find a similar result using population register data for Sweden.

Third, there are papers that come to this result empirically using survey data. Survey data are not qualitatively as good as admin data, but they allow to run comparative analysis for a larger number of countries and to collect extra *ad-hoc* information. Moreover, they offer valuable insights when administrative data is not available to researchers, which is the case for Ireland. The main channel behind this result is that inheritances are relatively more important to people at the bottom of the distribution than to those at the top. Although differences in the institutional and economic setup of countries can lead to heterogeneous results, this finding appears to be robust across countries (Nolan et al., 2021). Relevant papers include Wolff (2002) and Wolff and Gittleman (2014) using the Survey of Consumer Finances (SCF) for the United States, Bönke, Werder, and Westermeyer (2017) using the Household Finance and Consumption Survey (HFCS) for European Union countries, Karagiannaki (2017) using the British Household Panel Survey (BHPS) for the United Kingdom, Klevmarken

(2004) using the Swedish Household Panel Surveys (HUS) for Sweden, Horioka (2009) using the Survey of Intra-household Distribution and Intergenerational Transfers for Japan, Wei and Yang (2022) using the China Health And Retirement Longitudinal Study (CHARLS) for China. Given the framework of this paper, the latter is the strand of the literature that relates the most to our work.

To summarise, the literature has not reached a consensus on this matter. The conclusion depends on the methodology which is implemented, the assumptions that are made, and the horizon of study. For example, Crawford and Hood (2016) find that inheritances are wealth equalising when pensions are not taken into account in the definition of wealth, while the effect lessens once these are included. Nekoei and Seim (2023) find that in Sweden inheritances reduce relative wealth inequality at the time of receipt, but they lead to the opposite effect within a decade. This is due to the heterogeneity in depletion rates of inheritances between the average receiver and the wealthier ones. Morelli, Nolan, et al. (2023) suggest that in advanced economies most inheritances and gifts serve as an equaliser for the distribution of wealth, while large inheritances and gifts worsen the relative wealth gap. In their policy discussion, they calculate specific monetary thresholds for each country, determining the point at which wealth transfers received throughout a household's lifetime become unequalising for the overall wealth distribution (i.e. a maximum tax-free threshold for inheritances and gift). This is interesting for our paper because in Ireland a framework has been adopted where inheritances and gifts are aggregated over an individual's entire life, and they are exempt from taxation if they fall below €335,000.⁴ The excess amount is taxed at a rate of 33 per cent.

In brief, different approaches should be seen as complements rather than substitutes.

Our study makes a significant contribution to the literature in two ways. On the one hand, we provide further evidence of the link between inheritances and wealth inequality using updated micro-data. Specifically, we aim to add to the third strand of the literature by using household-level survey data. Unlike previous studies that have used this data for other European countries (Nolan et al., 2021), we leverage the latest wave of the survey, allowing us to compare results with older waves and providing a more comprehensive analysis of the issue. In addition, we try to identify potential mechanisms behind our finding. On the other hand, we address a major gap in the literature by providing a decomposition of wealth inequality between inherited and non-inherited wealth

⁴This is the tax-free rate for transfers received by individuals in Group A. See [here](#) for more details on the Capital Acquisitions Tax, the threshold for other groups, and the tax rates.

for Ireland. Despite a few papers analysing this link in the Irish context (Nolan, 1992; Lawless and Lynch, 2017), our study is the first, to the best of our knowledge, to provide such decomposition. By focusing on Ireland, we believe that our study sheds light on an under-explored context and helps to fill a significant gap in the literature. We believe this is particularly important and interesting because national policy efforts have focused on the distribution of income in recent decades with less attention on the distribution of wealth. Wealth, including its distribution, is important to households and in aggregate due, for example, to the consumption smoothing role wealth plays in household financial behaviour (Ganong et al., 2020).

3.3 The Irish context

In order to frame our paper and have the necessary background to interpret its results, we want to provide the reader with a brief overview of the Irish context in terms of economic history and conditions.

A small post-colonial country adjacent to its erstwhile coloniser, independent Ireland underwent a prolonged process to converge on the living standards of its neighbors and major trading partners (Barry, Honohan, and McIndoe-Calder, 2014). Ireland's economic history sets it apart from euro area and indeed developed countries more generally. The country is characterised not only by its former colonial status but also its distinctive experience of mass emigration over almost a century alongside decades of unsuccessful post-colonial industrial policy. The economic policy choices implemented in Ireland since the 1980s lead to the economic boom and crash of the 2000s. This has been followed however, by more than a decade of sustained and wide spread economic growth, including rapid recovery from the 2020 pandemic. In summary, Ireland experienced two phases: an exceptional catch-up growth in the 1980s-90s followed by convergence with advanced economies in the current century (Ó Gráda and O'Rourke, 2022).

Ireland exemplifies globalisation harnessed to the advantage of its citizens. FitzGerald and Honohan (2023) provide evidence that this transformation resulted from the impetus EU membership gave Ireland. The largely coherent policy reform over the last half century is typified by its approach to the taxation of inheritance, i.e. simple (levied at the individual level and calculated on cumulative life time inheritance receipts), effective (in terms of achieving progress towards equality of opportunity – Morelli, Nolan, et al., 2023) and, as shown in this paper, perhaps even containing wealth equalising properties.

Ireland's unusual economic history warrants the study of processes and

policies informing wealth accumulation and distribution in their own right. Furthermore, the context suggests that the findings of our paper may be useful more broadly. For example, for countries that have experienced delays in converging to the living standards of regional peers. Similarly Ireland offers insights into how policy reforms and economic growth can shape the distribution of wealth in the long run.

3.4 Data

This section describes the data we use in our analysis and presents stylised facts that will help us to interpret the results we get from the empirical analysis.

3.4.1 HFCS

The [Household Finance and Consumption Survey \(HFCS\)](#) is a Eurosystem survey, coordinated by the European Central Bank (ECB) and conducted by the Central Statistics Office (CSO) in Ireland. It collects cross-sectional household-level data on wealth (real and financial assets, liabilities and credit constraints), income, intergenerational transfers and gifts, consumption and saving.

The HFCS was first conducted in 2010. However, Ireland only entered the country sample in 2013, at the time of the second wave. In this paper, we use data for Ireland from the latest HFCS wave, conducted in the second half of 2020 on a sample of 6,020 households.⁵ Among other reasons, we focus our analysis on Ireland, as access to data for this wave for the other countries is still limited. Household sampling is designed to ensure representativeness of the Irish population and a probabilistic sample design is applied.⁶ An oversampling of wealthy households is implemented, to account for the high concentration of financial instruments towards the top of the distribution. To correct for item non-response and increase quality, the dataset is imputed and complemented with official data, when available.

The HFCS includes questions on wealth that households inherited at any point in the past up to and including the year 2020. In this paper, we refer to *inherited* wealth as wealth received in the form of both inheritances and gifts. However, as

⁵For some comparisons and robustness tests we will also use the initial 2013 waves, who surveyed 5,419 households. Officially the ECB labels this wave as 2014, but we changed the reference to 2013 for better clarity, given that the fieldwork in Ireland happened between March and September 2013.

⁶The latter means that the ex-ante probability that each household in the target population will take part in the survey is non-zero. When aggregating HFCS statistics, representative weights are used to reflect the characteristics of the 2020 population.

of 2020 the vast majority of the cumulative value of inherited wealth consists of inheritances (90 per cent). We define *non-inherited* wealth (or non-transfer wealth) as any other type of wealth (total wealth minus inherited wealth). As standard in the literature, *net wealth* is defined as the total market value of a household's assets minus its outstanding debt.

Table 3.1 provides an overview of the HFCS variables that we will use for our analysis. Each household can report up to three of the largest inheritances or gifts received. This is standard in comparable surveys of household finances, such as the Survey of Consumer Finances (SCF) for the United States or the Wealth and Assets Survey (WAS) for the United Kingdom.⁷ Moreover, if household members received several gifts or inheritances at the same time from the same donor, these are all treated as one. This means that households can potentially report even more than three transfers.⁸ To exploit the largest amount of information, the value of inherited wealth for household i is the sum of the values of all inheritances and gift reported:

$$\text{Inherited Wealth}_i = \sum_{\$=1}^3 \text{HH040}\$_{x_i} \quad (3.1)$$

where $\$_$ denotes the specific inheritance or gift reported by household i , and x is used to identify additional information such as the type of asset received. We apply the same approach to the other information (type of asset, type of disposer, type of transfer), using the information attached to the three inheritances and gifts reported by each household altogether.

It is recognised that households, particularly those with high net wealth, tend to under-report information in surveys, which means that even though the sample weights are representative, the overall amount of inherited wealth estimated from these data is likely to be underestimated (Vermeulen, 2018; Kennickell, 2019). This remains a limitation of the dataset that we employ for our analysis, as administrative data on inheritance is not available for Ireland. Our estimate of the share of inherited wealth in total wealth (12 per cent) is consistent with survey data

⁷In Figure 3.A.1 in Appendix 3.A we observe the distribution of inheritances/gifts across the net wealth distribution. The data is broken down by the three largest inheritances received. While the share of households inheriting wealth shows a linear trend, the number of inheritances evolves exponentially and it does not seem to be under-estimated, especially due to the over-sampling of wealthy households. Notably, the number of inheritances reported by households in the 10th decile is 23 times higher than that reported by households in the 1st decile and 6 times higher than that reported by households in the 5th decile. Furthermore, while middle-low wealth households primarily report one inheritance/gift (representing 84 per cent of all inheritances), wealthy households tend to report multiple inheritances/gifts (in the 10th decile, only 63 per cent of inheritances/gifts are in the "first" group).

⁸Among the inheritors in Ireland, 99 per cent report at most 3 inheritances/gifts while 1 per cent report more than 4 inheritances/gifts, with the maximum being 6. The average is 1.4.

Table 3.1: HFCS variables

HFCS code	Description
HH0100	Any substantial gift or inheritance received.
HH020\$x	Gift/inheritance \$x: year in which gift/inheritance was received.
HH030\$x	Gift/inheritance \$x: what kind of asset received.
HH040\$x	Gift/inheritance \$x: value at the time of receipt.
HH050\$x	Gift/inheritance \$x: type of transfer (gift or inheritance).
HH060\$x	Gift/inheritance \$x: from whom received.

Source: ECB (2021).

Notes: \$ denotes a loop variable which can range from 1 to 3, as the HFCS allows households to report up to 3 substantial inheritances or gifts received. x is used to identify additional information such as the type of inheritance or disposer. Inheritance includes transfer of assets in connection with death of an antecedent, while gift is a transfer of assets made during the life of a donor, not connected to the death of that person. The value of the gift/inheritance is net of any corresponding inheritance or donation taxes applied at the moment of receipt.

estimates for other advanced economies. However, since there is no official data on the aggregate level of inheritance for Ireland, we cannot directly evaluate the potential underestimation. Instead, we compare the wealth aggregates derived from the HFCS data with those from the Central Bank of Ireland's Quarterly Financial Accounts (QFA) for the household sector. Figure 3.A.2 in Appendix 3.A presents the comparison using the three HFCS waves. We find that while there is substantial under-reporting of financial assets, the aggregate value of real assets in the HFCS data is higher than in official data. Additionally, the trends in real assets over time in HFCS closely match those in QFA. Overall, net wealth is underestimated by an average of 17 per cent. Given that real assets, such as dwellings and land, contribute the most to the total value of inheritances and gifts, our comparison results provide reassurance about the robustness of our analysis. Moreover, the response rate in Ireland is generally high (ECB, 2021), and the proportion of households that participate in the survey is particularly large compared to other countries used as a reference in this paper (Table 3.B.1 in Appendix 3.B).

We acknowledge an additional data limitation, which is not specific to survey data but reflects a broader issue. This limitation pertains to the incentives and strategies employed to avoid paying taxes on inheritances and gifts. Specifically, we discuss two strategies.

First, considering that the Irish system provides a tax-free threshold on the cumulative value of inherited wealth, there is an incentive for the *donor* to either rearrange their portfolio or reduce its value to ensure it does not exceed the

threshold on the *recipient's* side. Examining the *donor* side, our data suggest that this issue is likely to be limited. In fact, portfolios of Irish households appear relatively stable along the wealth distribution and have not substantially changed over time, except at the very top (Horan, Lydon, and McIndoe-Calder, 2021). This reflects the fact that the Irish economic boom, and the subsequent enlargement and diversification of portfolios, is relatively recent. Regardless of their wealth level, households predominantly own real assets (Appendix Figure 3.A.4) and, as a consequence, land and dwellings cover the majority of inherited assets. Given that these assets are relatively illiquid, it is challenging for the *donor* to liquidate them to reallocate their portfolio. Additionally, there is limited scope for doing so, when financial assets remain a small portion of wealth even at the very top of the distribution. On the *recipient* side, we observe in our data that, on average, compared to years when the tax-free threshold is unchanged, aggregate inherited wealth is 1 per cent higher (1.3 per cent lower) in years when the threshold is reduced (increased).⁹ Although this is not a causal exercise and the differences are not particularly large, these results suggest that the incentive to avoid taxes on the *recipient* side might be somewhat internalised in the survey data. Moreover, by cumulating the nominal values of inheritances/gifts reported by each household and using the year in which the latest one was received as a reference, we see that almost all observations are nowhere near the time-varying threshold, both from below and above. Merely about 3 per cent of the observations fall within a range of +/-10 per cent around the threshold and 1.5 per cent being below the threshold and within the same lower bound. Considering all of the above, we believe that the potential impact of this first type of behaviour on our results is reduced.

Second, the role of offshore and hidden wealth is noteworthy. Assets held by households in tax havens are estimated to constitute 8 to 10 per cent of global financial wealth (Zucman, 2013; Alstadsæter, Johannesen, and Zucman, 2018). Furthermore, offshore wealth is increasing in income and wealth (Alstadsæter, Johannesen, and Zucman, 2019). This has implications for this paper, as for instance Cummins (2022) estimates that the very wealthy in England are hiding between 28 and 39 per cent of their inherited wealth, as a lower bound. While we acknowledge that this factor could potentially impact our results, addressing it with survey data is particularly challenging. Unlike under-reporting, even administrative data may not fully uncover this phenomenon. However, considering available data on offshore wealth (see Figure 5 in Alstadsæter, Johannesen, and Zucman, 2018), Ireland's figure is half that of the United Kingdom, aligning more

⁹We use the time series of inherited wealth as constructed in Figure 3.7, but in nominal terms. It's important to keep in mind that tax-free thresholds and marginal tax rates are applied at the individual level, while our analysis is conducted at the household level.

closely with the world average, and lower than all the countries compared in our study, except the United States. Thus, while the issue persists, it may be less relevant for Ireland than for other countries undergoing similar analyses to ours.

3.4.2 Stylised facts

Just over a third (36 per cent) of Irish households report having ever received an inheritance or gift. The relationship between net wealth and receiving an inheritance is strictly positive (Figure 3.1). However, as we will show in Section 3.6, the value of inheritances and gifts as a share of net wealth is decreasing in the distribution of net wealth.

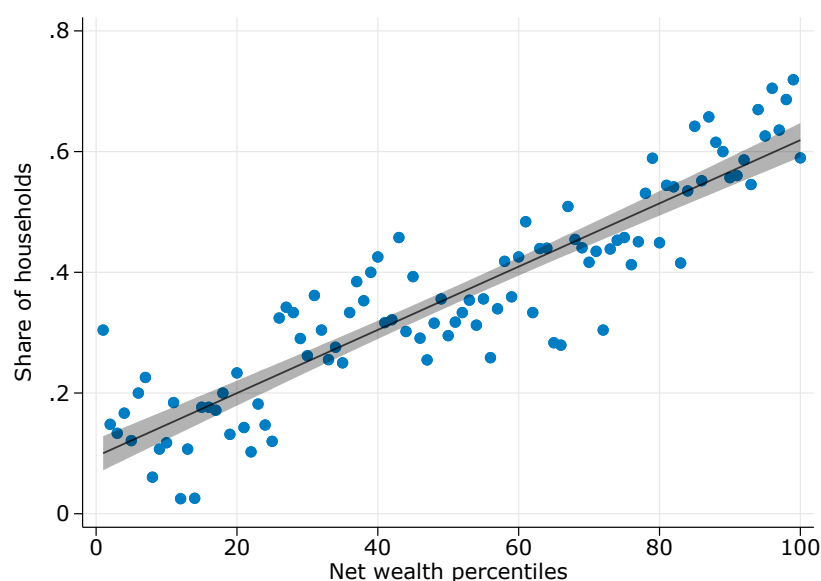


Figure 3.1: Households receiving substantial inheritances or gifts

Source: HFCS and authors' calculations.

Notes: Values of reported inheritances and gifts are adjusted to 2020 values using the Consumer Price Index (CPI).

Inheritances and net wealth are positively correlated (Table 3.2). Inheritors' median gross income and net wealth are 17 and 155 per cent higher respectively than those who have not inherited. Inheritors are also more likely to own a home or private business, relative to those without inherited wealth (23 and 13 percentage points higher, respectively). Whilst these are correlations, as opposed to causation, this provides tentative evidence of what Benetton, Kudlyak, and Mondragon (2022) call "dynastic home equity", whereby persistence in home-ownership across generations in the United States – i.e., when donors (parents) own housing or property – generates a substantial increase in young adults' housing wealth inequality.

Table 3.2: Composition and value of wealth for households

	With inheritances or gifts	Without inheritances or gifts	All households
Net wealth (median)	€331,500	€130,079	€193,100
Homeownership (share)	0.86	0.63	0.71
Private business ownership (share)	0.24	0.11	0.16
Income (equivalised, median)	€34,733	€29,654	€31,490

Source: HFCS and authors' calculations.

Notes: Home-ownership means owning all or part of the residence or use it for free (e.g. usufruct). Private business ownership refers to ownership of all/part of any business that is not publicly traded where the household has an active role in running the business or ownership of any business that is not publicly traded where the household acts only as an investor or silent partner. Equivalised income is defined as total gross annual household income equivalised using the modified OECD equivalence scale which accounts for the number of consumption units in the household.

Income and age are also relevant factors for wealth, home-ownership and business ownership. But even controlling for these, we find a strong correlation with inheritances. Controlling for income and age, we find that households that receive an inheritance have higher net wealth. At the median, a 1 per cent increase in inheritance (log) relates to a 0.2 per cent increase in net wealth. Moreover, households who receive an inheritance are on average 2.7 per cent more likely to own a home and 6 per cent more likely to own a private business.¹⁰

Based on the self-reported year of the inheritance, inherited wealth appears to have increased over time. Specifically, the proportion of households who have inherited wealth in the past 20 years is higher than at any time prior to this. When dis-aggregating this information by age cohort, we find that older households (i.e., those whose head of household is aged over 60) in the 2020 survey are more likely to have received inheritances or gifts than comparable households in the 2013 survey (Figure 3.2). Younger cohorts however, show a similar likelihood in both 2013 and 2020.

The HFCS also provides an overview of the main classes of assets that households typically inherit. Money was the most common type of asset received (57 per cent) by households who reported ever having received an inheritance, as shown in Figure 3.3. Dwellings (33 per cent) and land (19 per cent) were the other most common asset types reported by households in the 2020 survey. However,

¹⁰0.2 is the coefficient of a log-log OLS median regression of the log of inheritance on the log of net wealth. 2.8 and 6.3 are the marginal effects from a probit model with home-ownership and business ownership dummies as dependent variables, respectively, estimated at the average inheritance log value. All estimations control for the log of income, age, and age squared. Full regression results are available upon request.

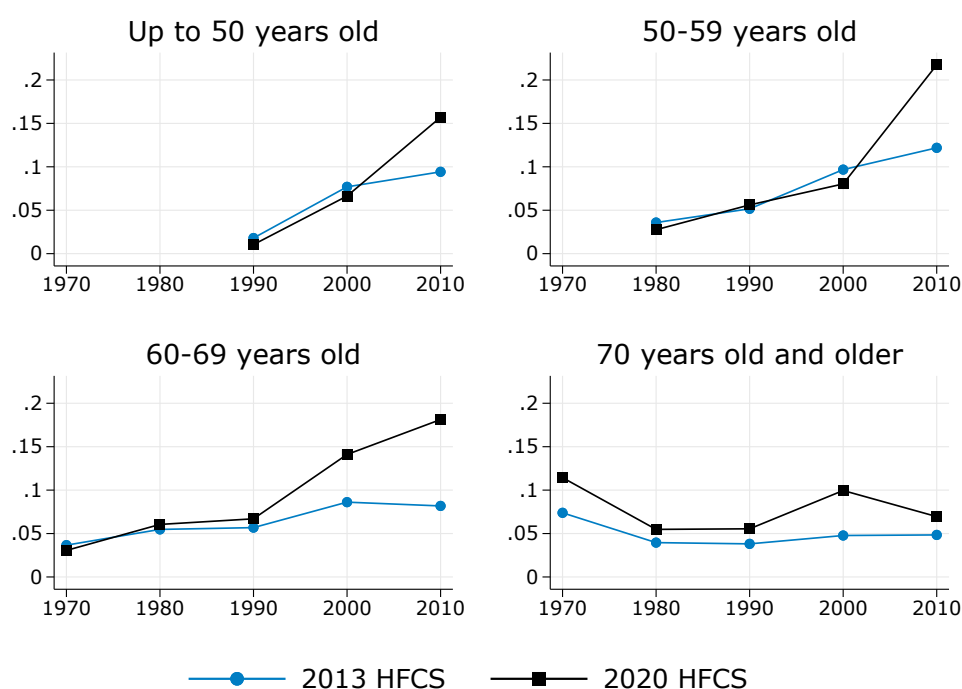


Figure 3.2: Households receiving inherited wealth over time by age, share

Source: HFCS 2013 and 2020, and authors' calculations.

Notes: The years refers to when the household received the inheritance/gifts. Age refers to the age of the household head in the survey year (2013 or 2020). We have linearly adjusted the share for the 2010 decade in the 2013 wave to account for the missing years compared to the 2020 wave.

when looking at the value, land and dwellings represent about 70 per cent of the cumulative value of all inheritances received by households by 2020.

Figures 3.4(a) and 3.4(b) break down the value of inheritances received over time by type of inheritance and relation with the donor, using the self-reported year of the inheritance. Dwellings represented the largest value in total inheritance up to the 1980s, when land started to increase in importance. While, after the 1990s, money became a consistent part of the value of transfer wealth. This decomposition reflects the changes that the Irish economy, and thus Irish households, have experienced over time. The vast majority of disposers were parents of the beneficiary. Parents account for 78 per cent of the total value of all inheritances and gifts as of 2020.

3.5 Decomposing the wealth Gini

Inherited wealth can plausibly impact on wealth acquisition in a variety of ways. For example, households can spend out of inherited wealth or use it to stimulate

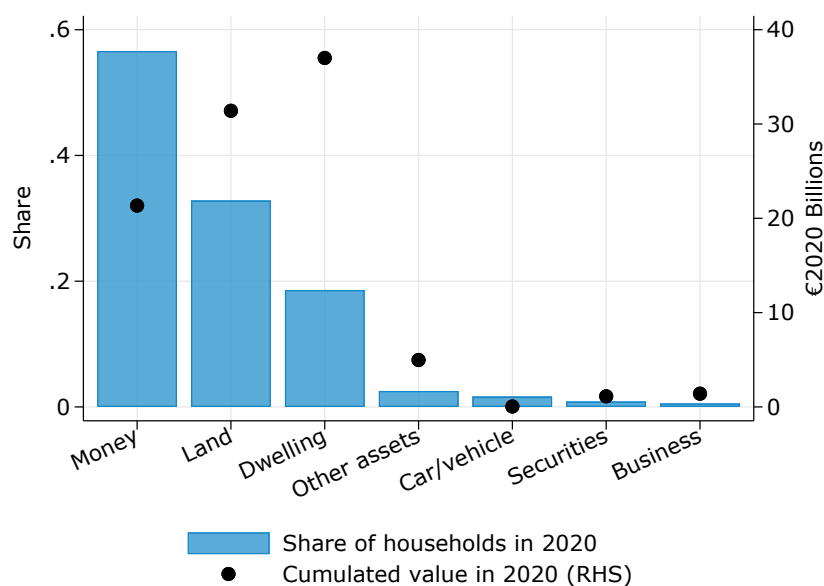


Figure 3.3: Type of assets received as inheritance or gift

Source: HFCS and authors' calculations.

Notes: Conditional on having received inheritance. The figures includes all the inheritances and gifts received up to 2020. "Other assets" includes use of dwelling (reserve/usufruct), jewellery/furniture/artwork, life insurance, and any other type of assets that is not specified as a category. Values of reported gifts and inheritances are adjusted to 2020 values using the Consumer Price Index (CPI) and then cumulated over time.

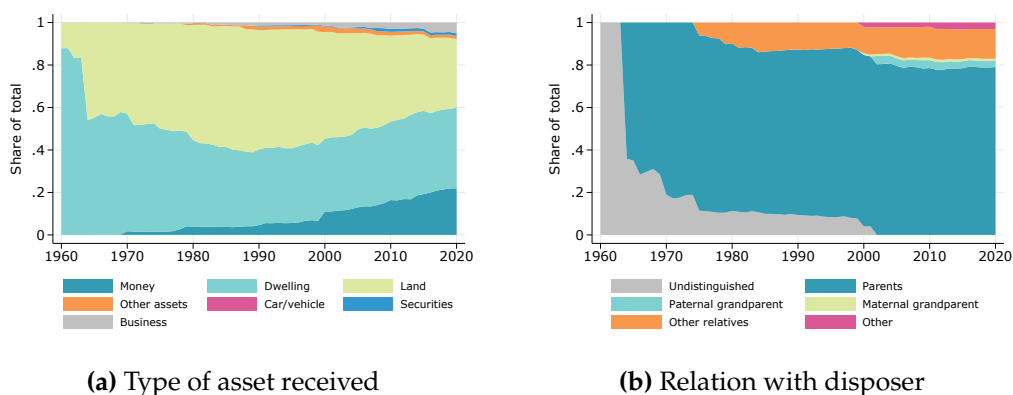


Figure 3.4: Inherited wealth over time, share of total value

Source: HFCS and authors' calculations.

Notes: Conditional on having received inheritance. The figures includes all the inheritances and gifts received up to 2020. "Other assets" includes use of dwelling (reserve/usufruct), jewellery/furniture/artwork, life insurance, and any other type of assets that is not specified as a category. Values of reported gifts and inheritances are adjusted to 2020 values using the Consumer Price Index (CPI) and then cumulated over time. No return/disinvestment on transfer wealth is assumed. Due to data confidentiality, "undistinguished" include the sum of all categories with less than 30 cumulative observations at that point in time.

additional saving (i.e., use inherited wealth to acquire additional assets). As a result, there are a growing number of studies seeking to understand how

intergenerational transfers contribute to the distribution of total wealth. Here, we decompose changes in wealth inequality – as measured by the Gini coefficient – by contributions from inherited wealth (“*transfers*”) and other sources of wealth (“*non-transfers*”). We use the Marginal Gini Decomposition (MGD) methodology developed for analysis on wealth inequality by Nolan et al. (2021) (NPVKM), who in turn adapted the income version by Lerman and Yitzhaki (1985). This type of decomposition has been used in several empirical papers, either to decompose the Gini coefficient or the coefficient of variation (Wolff and Gittleman, 2014; Wolff, 2015; Crawford and Hood, 2016; Karagiannaki, 2017; Bönke, Werder, and Westermeier, 2017). Methodological limitations have been addressed in a comprehensive way by Urban (2022). While other options are possible (e.g., wealth shares, variation coefficient), we use the Gini coefficient as a proxy for wealth inequality given that this measure relies less on extreme observations.

The Gini coefficient for total net wealth (G_W) is separated into the weighted contributions from transfer (C_T) and non-transfer (C_{NT}) wealth, with the shares of the two types of wealth into total wealth as weights (S_T and $S_{NT} = 1 - S_T$):

$$G_W = \underbrace{(S_T \cdot G_T \cdot R_T)}_{\text{Transfer wealth contribution (C}_T\text{)}} + \underbrace{((1 - S_T) \cdot G_{NT} \cdot R_{NT})}_{\text{Non-transfer wealth contribution (C}_{NT}\text{)}} \quad (3.2)$$

G_T and G_{NT} are the Gini coefficients for transfer and non-transfer wealth, while R_T and R_{NT} are the respective correlations with total wealth.¹¹

Implementation of the methodology involves inflating all disclosed intergenerational inheritances and gifts received by households in the 2020 HFCS to 2020 values, using the Consumer Price Index (CPI).¹² As in NPVKM, whenever the values of transfer wealth are larger than total wealth for a given household, we cap the former at the latter value.¹³

¹¹The decomposition methodology uses ranked, or non-parametric, correlations. These are Pearson non-parametric correlations between values of transfer and non-transfer wealth ranked by their rank in the total wealth distribution, rather than by their own distribution. This means that transfer, non-transfer, and total wealth values are ordered from the smallest to the largest before computing correlations. The only assumption required of the data is that the two series are monotonic in their ranks. In other words, the ranked correlation allows transfers and non-transfers to be related to total wealth in a way that does not assume linearity, which is important for variables like wealth which tend to be very concentrated in particular parts of the population.

¹²We deflate inheritances and gifts using the CPI to adjust for inflation changes and to align the stylised facts with the empirical methodology following Nolan et al. (2021). While other options are available, we believe CPI is the most appropriate measure given that we do not have information on what the receivers of the inheritance do once they have inherited wealth. Thus, any other type of adjustment would require rather strong assumptions. Note that, given that each household can report up to three inheritances or gifts, each of them is deflated before we aggregate them at household level to account for different prices at the time of receipt of each of them.

¹³Piketty, Postel-Vinay, and Rosenthal (2014) suggest this procedure as resulting in a plausible

Table 3.3 shows the decomposition results. Our baseline specification for the decomposition assumes no real return on inherited wealth, as we cannot precisely know what households did with the inheritance once received.¹⁴ However, given that inherited wealth can change wealth both directly and indirectly – that is, by investing it and/or using it to acquire additional assets – we will allow for wealth capitalisation using different returns on wealth as a robustness test (Section 3.7). We find that results are robust to different specifications.

Table 3.3: Contribution to wealth inequality from transfer and non-transfer sources

	Baseline (without capitalisation)
Gini total wealth (G_W)	0.65
Gini transfer wealth (G_T)	0.91
Gini non-transfer wealth (G_{NT})	0.67
Share of transfers in total wealth (S_T)	0.12
Correlation transfers with total wealth (R_T)	0.67
Correlation non-transfers with total wealth (R_{NT})	0.98
Contribution of transfer wealth to Gini total wealth (C_T)	0.07
Contribution of non-transfer wealth to Gini total wealth (C_{NT})	0.58
Relative contribution of transfers to Gini total wealth ($\frac{C_T}{G_W}$)	0.11
Implied % change in Gini total wealth for 1% increase in transfer wealth: $(\frac{G_T R_T}{G_W} - 1) \cdot S_T \cdot 100$	-0.79

Source: HFCS and authors' calculations.

Similar to NPVKM, the distribution of inherited wealth in Ireland is highly unequal (see Table 3.B.2 in Appendix 3.B for cross-country comparison). The inheritances Gini coefficient (G_T , 0.91) is similar to that for Britain, France, and Germany (around 0.89). The correlation of inherited wealth to total wealth (R_T , 0.67) is lower than the correlation of non-inherited wealth (R_{NT} , 0.98). Moreover, the share of inheritances in total wealth is particularly low (S_T , 0.12), which

estimation of transfer wealth by better accounting for the coexistence of savers and dissavers out of transfer wealth.

¹⁴The debate on whether to capitalise inherited wealth or not was a key issue in the Kotlikoff-Summers (capitalisation) versus Modigliani (no capitalisation) discourse of the 1980s. See Piketty, Postel-Vinay, and Rosenthal (2014) for a review. In our study, we have opted to present our primary estimates without capitalisation and include the non-capitalised estimates as a robustness check for two reasons. Firstly, this allows for comparability with results from NPVKM, whose primary estimates are also without capitalisation. Secondly, due to the unavailability of both aggregate data and information in the HFCS, we are unable to accurately compute the rate of capitalisation.

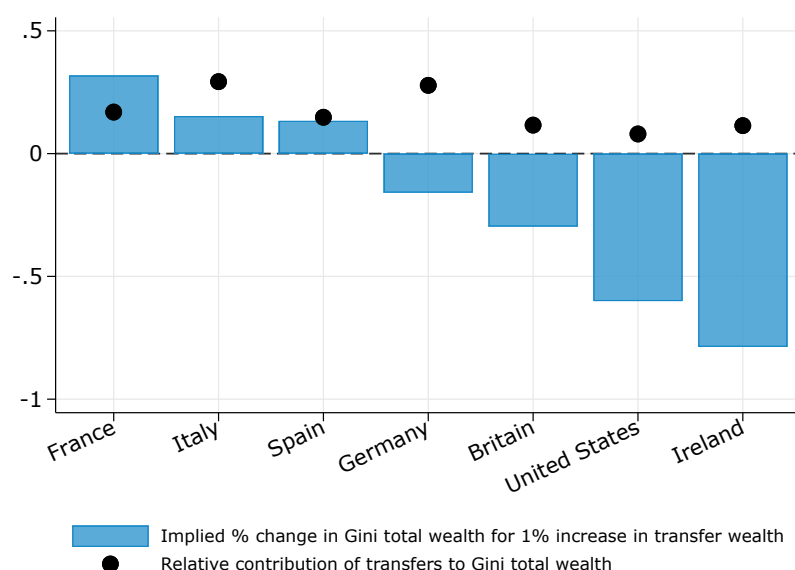


Figure 3.5: Cross-country comparison of results

Source: Nolan et al. (2021), HFCS and authors' calculations.

Notes: Our estimates are based on the 2020 wave of HFCS, while the estimates from Nolan et al. (2021) for France, Italy, Spain, Germany, Britain, and the United States are based on the first wave of HFCS (2010/11). Results refer to the "without capitalisation" specification.

resembles the results for Britain and the United States (0.12 and 0.09 respectively). Together, these three factors – the last one in particular – explain why the contribution of transfer wealth to total wealth inequality is small (C_T , 0.07), and far more modest than the contribution of non-transfer wealth (C_{NT} , 0.58).

The combination of the relative inequality of inherited wealth (G_T) and low correlation of inherited wealth with total wealth (R_T), means that a proportionate increase in transfer wealth of 1 per cent would reduce Ireland's Gini of total wealth (G_W) by 0.79 per cent.¹⁵ This estimated change in wealth inequality is equivalent to one third of the average annual fall in the Gini observed in the data between the first survey wave (2013) and the latest one (2020).¹⁶

Figure 3.5 provides a visual summary of our results, compared with those from NPVKM for other advanced economies.¹⁷ Our findings for Ireland are similar to results for Britain, Germany, and the United States.

¹⁵To compute this elasticity we follow the definition by Stark, Taylor, and Yitzhaki (1986), as Nolan et al. (2021) did.

¹⁶This figure is calculated by comparing the annual fall in wealth Gini between HFCS 2013 and HFCS 2020 (0.014) with the implied change in wealth Gini computed by applying the estimated elasticity from the decomposition to the Gini from HFCS 2020 (0.005).

¹⁷We still do not have wide access to 2020 data for the other countries, so we compare our results directly with those from Nolan et al. (2021).

3.6 Mechanisms

Shedding light on the potential channels driving the results we find with the Gini decomposition is particularly challenging using HFCS data. HFCS provides a snapshot for the year of the survey. Using the self reported year of receipt it is possible to construct a time series of inheritances, but we do not have any information about the household at the time of receipt. This means that we cannot assess the contribution of inheritances to wealth accumulation, controlling for initial characteristics of the household. Therefore, we refrain from employing econometric strategies to assess the mechanisms that drive our findings, given that results would not be reliable. However, to theorise why inheritances could reduce wealth inequality in Ireland, we can use complementary facts from HFCS. We identify three channels.

PROPOSITION 1.

Inheritances are especially important for the middle and lower part of the distribution.

Figure 3.6 shows that while the share of households receiving inheritance increases with net wealth, its contribution – when present – to their net wealth is decreasing in net wealth. It is this latter finding that provides the intuition for *Proposition 1*. Specifically, the share of inherited wealth in net wealth is highest for households in the lower half of the net wealth distribution. Thus, everything else equal, an equi-proportionate increase in transfer wealth transmits more to households in the lower half of the distribution than those at the top, relative to their total net wealth, reducing wealth inequality.¹⁸

PROPOSITION 2.

The flow of inherited wealth increased over time alongside asset prices.

House price growth was one of the key drivers behind the fall in wealth inequality between 2013 and 2018 in Ireland (Horan, Lydon, and McIndoe-Calder, 2020, 2021). Real assets represent the vast majority of assets owned by Irish households, with housing assets accounting for a large part of them and being particularly relevant in the middle of the net wealth distribution (Figure 3.A.4 in Appendix

¹⁸In Figure 3.A.3 in Appendix 3.A we show the total amount of inheritances in euros to evaluate the plausibility of households' reported values, particularly at the top end. Our findings reveal that nearly half (44 per cent) of the total €97 billion is concentrated in the 10th decile, while the bottom 50% accounts for only 18 per cent. This evidence complement what we show in the data section, suggesting that the under-estimation in reported amounts is likely to be contained. The evolution of the total, average, and median amounts across the net wealth distribution evolves in line with theoretical expectations.

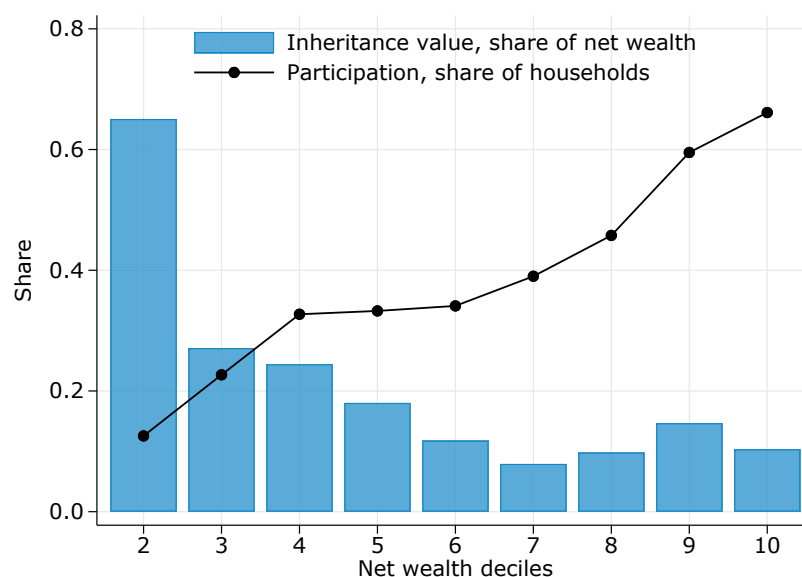


Figure 3.6: Inheritance along the distribution of net wealth

Source: HFCS and authors' calculations.

Notes: We exclude the first decile from the chart as it includes a large amount of negative and zero wealth. Each bar is the median of the values of inheritance as a share of net wealth of households in that decile, conditional on having received inheritance.

3.A). Figure 3.7 shows that the flow of inheritance in real terms increased hand in hand with real and financial asset prices, between 2013 and 2020 and more generally since 1970.¹⁹ This, together with housing representing a larger part of the value of inherited wealth (Figures 3.3 and 3.4(a)), could explain our finding that inheritance may have reduced wealth inequality.²⁰

PROPOSITION 3.

Although its share is higher, rental income is less skewed among inheritors compared to non-inheritors. Instead, income inequality is similar across inheritors and non-inheritors.

Our analysis focuses on wealth inequality and how inheritances impacted the stock of wealth that households own. However, to rationalise our findings, it is worth examining the flow component, i.e. income. Does receipt of an inheritance provide additional income generation channels for recipient households? Do

¹⁹In Appendix 3.A we show additional information. First, Figure 3.A.5 presents a comparison of the quantity and value of inheritances. The correlation coefficient between these two series is 0.58. It is important to note, however, that between 2013 and 2020, the correlation turns negative (-0.11). This indicates that both quantity and prices are significant factors in shaping the overall flow of inheritance over time. Second, Figure 3.A.6 compares the flows and the stock of inherited wealth that we constructed using 2020 and 2013 HFCS, as a robustness. The correlation is high.

²⁰The caveat here remains that using HFCS data we cannot assess what households did with the inheritance they have received.

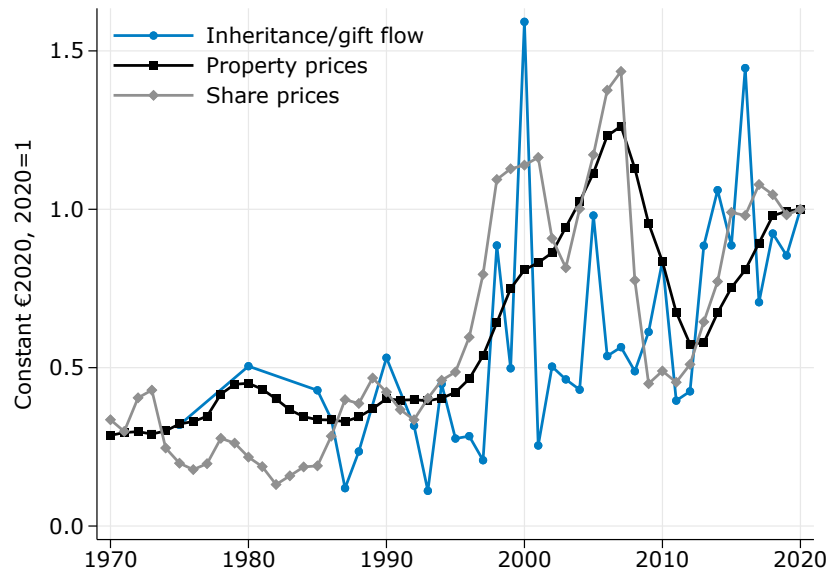


Figure 3.7: Evolution of inherited wealth and asset prices

Source: HFCS, BIS Residential Property Price database, OECD Main Economic Indicators.

Notes: The inherited wealth series is constructed from HFCS using the reported year of receipt, summing over the three main inheritances reported by each household, and adjusting for inflation using the Consumer Price Index (CPI). No return on inherited wealth or dismissal/reinvestment of it is assumed. Due to data confidentiality, inheritance flow is plotted only for years in which there are at least 30 observations. Property prices include all types of new and existing dwellings in the whole country. Share prices include all the shares for Ireland. As a robustness we computed the inheritance flow using HFCS 2013. The correlation between the two time series (2020 and 2013) expressed in constant prices is high: 0.75 over the whole sample, 0.67 after 1970.

they use these additional sources of income to substitute or complement existing income sources in their efforts to accumulate wealth and/or consume? In order to assess the relative role of income streams for inheritors compared to non-inheritors, we use the same decomposition methodology employed above, but here we examine the contribution of different income sources to the total gross income Gini (G_Y).²¹ HFCS provides the following income sources: employee income (E), self-employment income (SE), rental income from real estate property (R), capital income from financial assets (C), income from pensions (P), regular social transfers (ST), and regular private transfers (PT). For further details on income sources please see Appendix 3.B, Table 3.B.3. Similar to the wealth one, the decomposition for income is the following:

$$G_Y = \sum_{i \in I} \underbrace{(S_i \cdot G_i \cdot R_i)}_{\text{Income } i \text{ contribution } (C_i)} \quad I = \{E, SE, R, C, P, ST, PT\} \quad (3.3)$$

²¹HFCS does not provide post-tax income, so one should keep in mind that our analysis is on gross income. However, transfers from the government are included (Social Transfers) which account for part of the redistribution policies.

where G_Y is the total income Gini, G_i the Gini coefficient for income source i , S_i the share of income source i in total income, R_i the correlation coefficient of income source i with total income, and C_i the contribution of income source i to the total income Gini.

Table 3.4 reports the result of the decomposition for three different groups of households: all households, inheritors, and non-inheritors. The Table conveys two interesting results, that are relevant for the interpretation of our main findings. First, income inequality is homogeneous across groups. Differences in the Gini coefficient among the three groups are only visible at the third decimal, and are thus not substantial. Second, while among non-inheritors the contribution of employee income is higher, for inheritors rental income appears to be more relevant. In fact, examining the decomposition we can see that the share of income coming from rental properties is higher for inheritors, however it is less concentrated towards the top of the distribution, as demonstrated by the lower Gini coefficient. There is no difference in the correlation.

The income decomposition provide suggestive evidence that recipients of an inheritance may afford income source diversification. However, it provides little evidence that inheriting households have used additional available income sources to augment spending or saving decisions. Rather, we conclude that Table 3.4 is consistent with households using inherited wealth and associated income flows, to substitute for alternate sources of income and savings. In this way it is not surprising that inheritor households are not significantly contributing to wealth inequality in aggregate.

3.7 Robustness checks

We conduct several robustness checks to validate our findings. We start by comparing our baseline results with results accounting for capitalisation. We apply the same 3 per cent real annual return on inheritances and gifts used in the reference paper, to allow comparability. Results are similar to the baseline (Table 3.5, column 1). As in NPVKM the major difference is the share of transfers in total wealth (S_T), which increases to 0.19 when returns are taken into account. The marginal change in the total wealth Gini (G_W) following an increase in transfers remains negative, but slightly lower. In addition, we do not find significant differences when applying a more data-oriented return (i.e. 6.3 per cent, column 2).²²

²²We compute this as the median wealth return in advanced economies from Jordà, Knoll, et al. (2019), net of median inflation in Ireland, over the period 1995-2020 (1995 is the 25th percentile of

Table 3.4: Contribution to income inequality by income source

Source	All households						Inheritors						Non-inheritors					
	G	S	R	C	C/G		G	S	R	C	C/G		G	S	R	C	C/G	
Employee (E)	0.62	0.61	0.84	0.32	0.75		0.62	0.58	0.82	0.29	0.68		0.61	0.64	0.87	0.34	0.79	
Self-employment (SE)	0.95	0.10	0.74	0.07	0.16		0.92	0.11	0.70	0.07	0.16		0.97	0.09	0.77	0.07	0.15	
Rental (R)	0.96	0.03	0.79	0.03	0.06		0.94	0.06	0.79	0.05	0.11		0.97	0.02	0.78	0.01	0.03	
Capital (C)	0.99	0.00	0.75	0.00	0.01		0.98	0.00	0.73	0.00	0.01		0.99	0.00	0.77	0.00	0.01	
Pensions (P)	0.78	0.13	0.14	0.01	0.03		0.74	0.15	0.16	0.02	0.04		0.79	0.11	0.10	0.01	0.02	
Social transfers (ST)	0.65	0.11	0.00	0.00	0.00		0.68	0.08	0.06	0.00	0.01		0.63	0.13	-0.01	0.00	0.00	
Private transfers (PT)	0.99	0.00	-0.02	0.00	0.00		0.99	0.00	0.15	0.00	0.00		0.99	0.00	-0.09	0.00	0.00	
Total income (Y)				0.43	1					0.43	1					0.43	1	

Source: HFCS and authors' calculations.

Notes: G is the Gini coefficient for each income source, S is the share of each income source in total income, R is the correlation coefficient of each income source with total income, and C is the contribution of each income source to the total income Gini.

the distribution of years in which inheritances/gifts were received).

Table 3.5: Robustness – Different wealth return rates

	3% capitalisation	6.3% capitalisation
Gini total wealth (G_W)	0.65	0.65
Gini transfer wealth (G_T)	0.91	0.90
Gini non-transfer wealth (G_{NT})	0.69	0.70
Share of transfers in total wealth (S_T)	0.19	0.20
Correlation transfers with total wealth (R_T)	0.69	0.70
Correlation non-transfers with total wealth (R_{NT})	0.95	0.94
Contribution of transfer wealth to Gini total wealth (C_T)	0.12	0.13
Contribution of non-transfer wealth to Gini total wealth (C_{NT})	0.53	0.53
Relative contribution of transfers to Gini total wealth ($\frac{C_T}{G_W}$)	0.18	0.19
Implied % change in Gini total wealth for 1% increase in transfer wealth: $(\frac{G_T R_T}{G_W} - 1) \cdot S_T \cdot 100$	-0.59	-0.58

Source: HFCS and authors' calculations.

Notes: Each inheritance/gift is capitalised as follows: $\text{value}_t \cdot (1 + \text{rate})^{(2020-t)}$

We run two additional robustness checks. First, we run the decomposition considering only inheritances and gifts received after 1995.²³ Results – shown in Table 3.6 – are similar to what we get from the benchmark specification, confirming that the main finding was not driven by some inheritances or gift that were under-reported because they were received a long time ago or misreported due to currency changes. Second, we replicate the analysis using data from the first wave of HFCS for Ireland (2013) instead of the 2020 wave and find a similar and consistent result. The estimated implied percentage change in Gini total wealth following a 1 per cent increase in transfer wealth in -0.67, compared to -0.79 estimated from most recent data (Table 3.7).

Finally, although we cannot infer from HFCS data what households do with their inheritances and gifts at the time of receipt, as a further robustness we assume that they immediately consume part of it. To be as data-driven as possible we use the historical median consumption rate for Ireland (53 per cent, source: OECD).²⁴ Table 3.8 shows the results, without and with capitalisation at the real

²³HFCS asks households about the three main inheritances and gifts received. The 25th percentile of the year of receipt is 1995 for first and third group and 1997 for the second group. For this robustness check, we set to zero all the inheritances and gifts received prior to this threshold. Given that we do not drop these households from the sample but rather assume they did not receive the inheritance/gift, the Gini coefficient for total wealth remains unchanged.

²⁴We use household spending as percentage of GDP from OECD's Household Accounts ([link](#)) over the period 1970-2020. Both median and mean are about 53 per cent, with the historical maximum being 69.7 per cent in 1970 while the historical minimum 24.9 in 2020.

Table 3.6: Robustness – Different time sample

	Full sample	1995–2020
Gini total wealth (G_W)	0.65	0.65
Gini transfer wealth (G_T)	0.91	0.93
Gini non-transfer wealth (G_{NT})	0.67	0.67
Share of transfers in total wealth (S_T)	0.12	0.09
Correlation transfers with total wealth (R_T)	0.67	0.63
Correlation non-transfers with total wealth (R_{NT})	0.98	0.98
Contribution of transfer wealth to Gini total wealth (C_T)	0.07	0.05
Contribution of non-transfer wealth to Gini total wealth (C_{NT})	0.58	0.60
Relative contribution of transfers to Gini total wealth ($\frac{C_T}{G_W}$)	0.11	0.08
Implied % change in Gini total wealth for 1% increase in transfer wealth: $(\frac{G_T R_T}{G_W} - 1) \cdot S_T \cdot 100$	-0.79	-0.91

Source: HFCS and authors' calculations.

Notes: Estimations refer to the baseline “without capitalisation” framework.

Table 3.7: Robustness – Different HFCS waves

	2020 HFCS	2013 HFCS
Gini total wealth (G_W)	0.65	0.75
Gini transfer wealth (G_T)	0.91	0.94
Gini non-transfer wealth (G_{NT})	0.67	0.77
Share of transfers in total wealth (S_T)	0.12	0.12
Correlation transfers with total wealth (R_T)	0.67	0.75
Correlation non-transfers with total wealth (R_{NT})	0.98	0.98
Contribution of transfer wealth to Gini total wealth (C_T)	0.07	0.09
Contribution of non-transfer wealth to Gini total wealth (C_{NT})	0.58	0.66
Relative contribution of transfers to Gini total wealth ($\frac{C_T}{G_W}$)	0.11	0.12
Implied % change in Gini total wealth for 1% increase in transfer wealth: $(\frac{G_T R_T}{G_W} - 1) \cdot S_T \cdot 100$	-0.79	-0.67

Source: HFCS and authors' calculations.

Notes: Estimations refer to the baseline “without capitalisation” framework.

return rate of 6.3 per cent. Both specifications deliver similar results to the main one.

Table 3.8: Robustness – Consumption of inheritance/gift at time of receipt

	Without capitalisation	With capitalisation
Gini total wealth (G_W)	0.65	0.65
Gini transfer wealth (G_T)	0.91	0.91
Gini non-transfer wealth (G_{NT})	0.66	0.67
Share of transfers in total wealth (S_T)	0.06	0.12
Correlation transfers with total wealth (R_T)	0.66	0.69
Correlation non-transfers with total wealth (R_{NT})	0.99	0.97
Contribution of transfer wealth to Gini total wealth (C_T)	0.04	0.07
Contribution of non-transfer wealth to Gini total wealth (C_{NT})	0.61	0.57
Relative contribution of transfers to Gini total wealth ($\frac{C_T}{G_W}$)	0.06	0.12
Implied % change in Gini total wealth for 1% increase in transfer wealth: $(\frac{G_T R_T}{G_W} - 1) \cdot S_T \cdot 100$	-0.50	-0.36

Source: HFCS and authors' calculations.

3.8 Conclusion

Micro-data from the Household Finance and Consumption Survey (HFCS) provide a detailed overview on the inheritances and gifts received by Irish households at any point in time up to 2020 alongside information on the distribution of household wealth in Ireland. By 2020, over one-third of households had received an inheritance or gift. For these households, the cumulative real value of inherited wealth by 2020 stood at €97 billion, accounting for approximately one sixth of household total net wealth (assets minus debts). The value of inherited wealth in Ireland has been rising over time, with a greater proportion of households in 2020 inheriting wealth in the past 20 years than any time prior to this. Households that received inheritances or gifts are substantially wealthier and own more homes and businesses than households that did not inherit any wealth. Notwithstanding these stylised facts, we find that inheritances and gifts contribute little to the overall distribution of wealth in Ireland. Moreover, inheritances may actually have reduced overall wealth inequality over time, as their contribution to net wealth is higher for households in the middle of the wealth distribution than for households at the top. These results are consistent with Nolan et al. (2021), with Ireland notably more similar to Britain than euro area countries. This is not particularly surprising given the similarities in economic and institutional setups in the two countries.

Absent a clear identification strategy to examine the characteristics of house-

holds before and after receipt of inherited wealth, which is not possible using HFCS, the available data can say little on the precise nature of the causal mechanisms driving our findings from the wealth Gini decomposition. However, the decomposition in conjunction with the stylised facts, suggests three plausible, candidate mechanisms. First the predominant form that inheritances take in Ireland – medium sized transfers of property assets – and the portfolio choices of households – highly concentrated in property assets – suggests that transfers of property assets to large parts of the middle of the net wealth distribution underscores both the importance of transfers in acquiring important assets (property) and the inequality enhancing nature of transfers (middle wealth households accruing relatively larger transfers, on average). Second, and consistent with evidence on the primacy of property ownership in explaining wealth inequality in Ireland, the value of inheritances is strongly correlated with property values (Horan, Lydon, and McIndoe-Calder, 2020). This means that the rising tide (property prices) has raised all ships (70 per cent of households in Ireland are home owners). Third, we provide tentative evidence that inheritor households may substitute employee for rental income, reducing the ability for income flows from property ownership in additional wealth acquisition. This implies that inheritance does not contribute to differential wealth accumulation between inheritors and non-inheritors but rather allows inheritors to substitute away from labour income whilst maintaining spending.

Our analysis provides relevant insights for fiscal policy. Our findings that the inheritance contribution to wealth inequality is rather small and potentially equalising could itself be related to how Ireland taxes inheritances and gifts. Recent academic research point out that large transfers are unequalising while small ones serve as equaliser of the wealth distribution (Morelli, Nolan, et al., 2023). Thus, tax free thresholds are recommended.²⁵ Moreover, Stantcheva (2022) discusses the utility of cumulating the value of gifts and inheritances over the life cycle of the heir for tax purposes, alongside having progressive tax rates, to enhance equality. In fact, Ireland already implements both of these having a tax free threshold which is applied on the cumulative value of inheritances and gifts received at the individual level, after which inherited wealth is taxed at a rate of 33 per cent that gets frequently revised. But implications are not limited to fiscal policy and are more far reaching. For example, our findings from the third mechanism could be relevant to explore whether inheritors have higher shock absorption or insurance capacity compared to non-inheritors.

²⁵Their estimates range from around €430 thousand for France to €838 thousand in Italy, at the household level. The tax free threshold in Ireland is currently €335 thousand.

There are some caveats that the methodology and HFCS data cannot address. First, we cannot comment on the transfers of intangibles. There is evidence that human capital transfers across generations is persistent (Alesina et al., 2020) and that family environment is also important for these transfers (Black et al., 2020). Second, the HFCS does not measure contingent household assets well, including state pensions and defined benefit occupational pensions, which have been shown to be an important source of income-generating wealth in the United States, especially for lower income and wealth families (Jacobs et al., 2020). In addition, it is important to bear in mind that the effect we find for Ireland relates to households already in receipt of inherited wealth. This paper does not explore the likelihood of receiving an inheritance in the first place, nor does it speak to the effects on wealth inequality of changes in this likelihood across households or over time. Further, apart from inheritances there are numerous other structural drivers of wealth inequality.²⁶ Finally, the mechanisms generating changes in the distribution of net wealth within countries remain an area of on-going research endeavour and are not well understood. Although we acknowledge these limitations, we believe that our paper provides a relevant contribution to the literature and can serve as a benchmark for future research avenues.

²⁶Noted recently in remarks by Central Bank of Ireland Governor Gabriel Makhoul at Social Justice Ireland (Central Bank of Ireland, 2022).

Appendix 3.A Additional figures

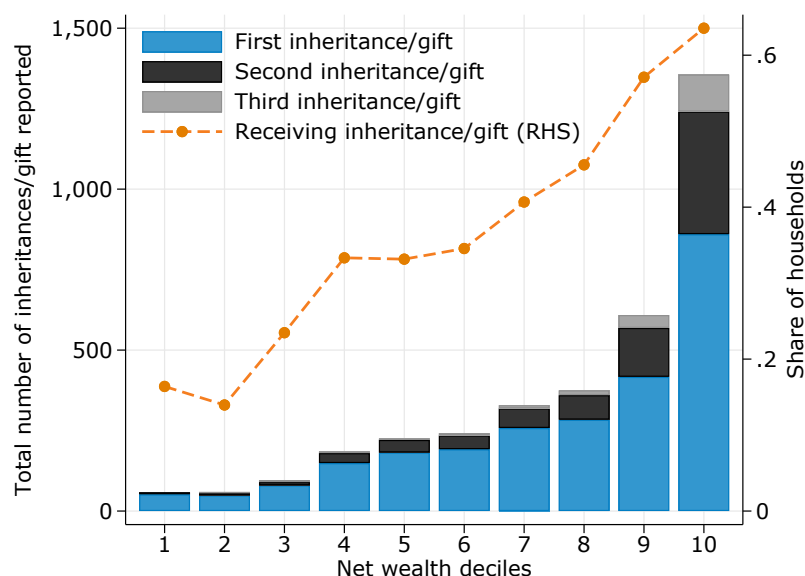


Figure 3.A.1: Number of inheritances/gifts reported

Source: HFCS and authors' calculations.

Notes: The bars indicate the total number of inheritances and gifts reported by households in each decile of net wealth, including each of the three largest received. The dashed line shows the number of households that have received at least one inheritance/gift.

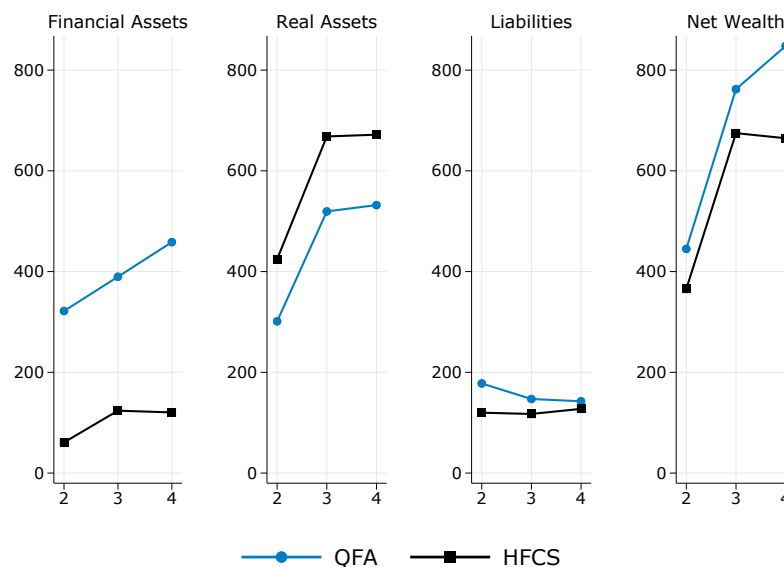


Figure 3.A.2: Comparison of wealth aggregates, HFCS vs QFA

Source: HFCS 2013 (2), 2017 (3), 2020 (4), Quarterly Financial Accounts and authors' calculations.

Notes: Nominal Euro billion. QFA data are averaged over the fieldwork period of each HFCS wave. HFCS gap in 2020 (average): Financial Assets -74% (-74%), Real Assets +26% (+32%), Liabilities -11% (-21%), Net wealth -22% (-17%). Note that there might be slight discrepancies in concept definitions between the two sources.

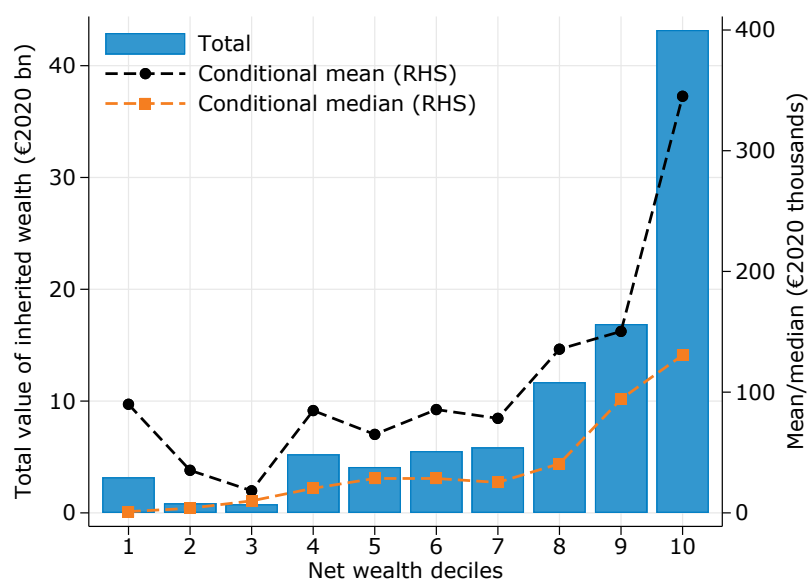


Figure 3.A.3: Inheritance value across the wealth distribution

Source: HFCS 2020 and authors' calculations.

Notes: Mean and median conditional on having received an inheritance or gift.

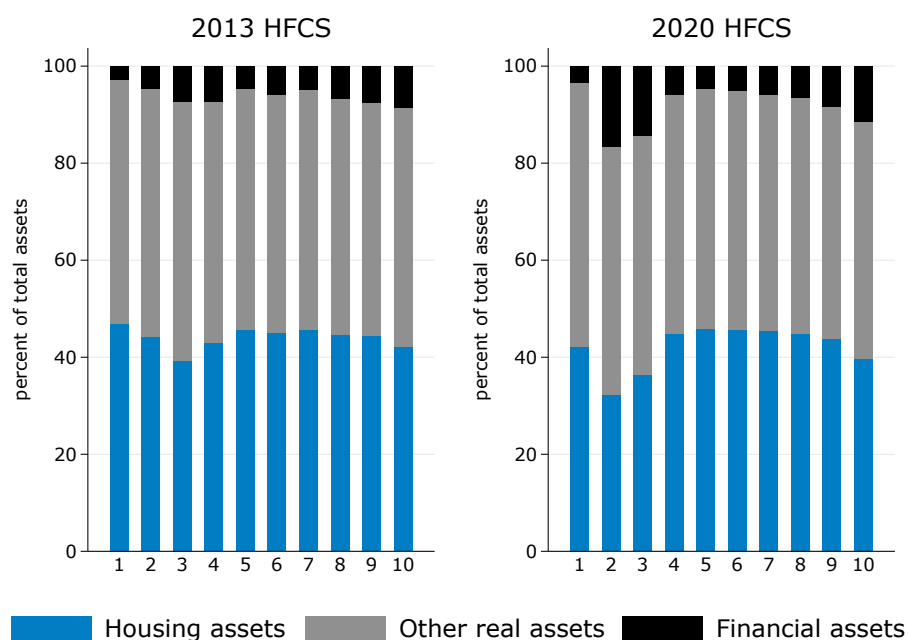


Figure 3.A.4: Households' assets composition

Source: HFCS 2013 and 2020, and authors' calculations.

Notes: Deciles of net wealth. For an overview of asset types see ECB (2021).

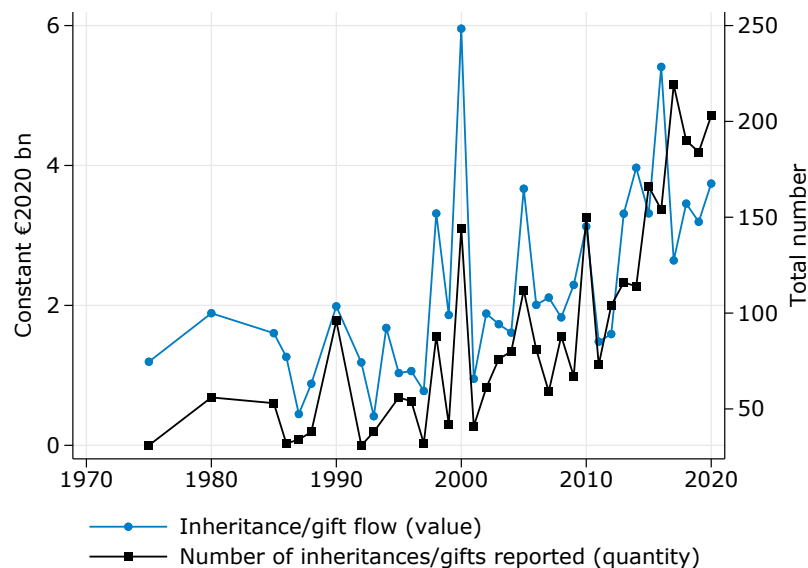


Figure 3.A.5: Inherited wealth, value vs quantity

Source: HFCS 2020, and authors' calculations.

Notes: The inherited wealth series is constructed from HFCS using the reported year of receipt, summing over the three main inheritances reported by each household, and adjusting for inflation using the Consumer Price Index (CPI). No return on inherited wealth or dismissal/reinvestment of it is assumed. Due to data confidentiality, years in which there are less than 30 observations are not visualised.

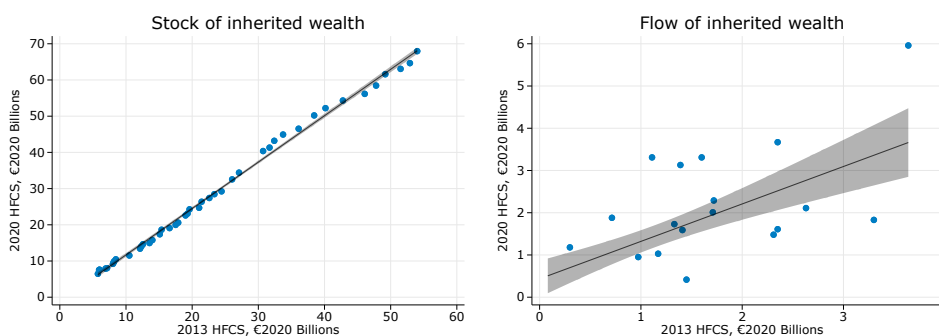


Figure 3.A.6: Inherited wealth, comparison between HFCS waves

Source: HFCS 2013 and 2020, and authors' calculations.

Notes: Due to data confidentiality, observations for the flows that are based on less than 30 observations are not plotted. However, these observations are included in the calculation of the linear fit. The correlation of the two flows considering all observations is 0.68. All observations are plotted for the stocks of inherited wealth as these are based on the cumulation of observations over time.

Appendix 3.B Additional tables

Table 3.B.1: Surveyed households

	(a) # Households in HFCS	(b) # Households in the country (millions)	% Households surveyed (a)/(b)
Luxembourg	1,616	0.23	0.714
Malta	1,004	0.19	0.596
Estonia	2,679	0.59	0.454
Cyprus	1,303	0.30	0.430
Finland	10,210	2.67	0.383
Ireland (Wave 4)	6,020	1.90	0.318
Ireland (Wave 3)	4,793	1.85	0.259
Slovenia	2,014	0.82	0.244
Hungary	5,968	3.99	0.149
Latvia	1,249	0.84	0.140
Portugal	5,924	4.11	0.144
Lithuania	1,664	1.29	0.129
Slovakia	2,179	1.85	0.118
Croatia	1,357	1.49	0.091
Austria	3,072	3.93	0.078
Greece	3,007	4.16	0.072
Belgium	2,329	4.88	0.048
France	13,685	29.23	0.047
Poland	5,858	13.36	0.044
Spain	6,413	18.54	0.035
Netherlands	2,556	7.78	0.033
Italy	7,420	25.52	0.029
Germany	4,942	40.19	0.012

Source: HFCS.

Notes: The total number of households per country is given by the sum of the representative weights in each country.

Table 3.B.2: Contribution to wealth inequality from transfer and non-transfer source

	IE	UK	FR	DE	IT	ES	US
Gini total wealth (G_W)	0.65	0.67	0.68	0.78	0.60	0.58	0.87
Gini transfer wealth (G_T)	0.91	0.89	0.89	0.89	0.85	0.89	0.95
Gini non-transfer wealth (G_{NT})	0.67	0.69	0.71	0.82	0.69	0.62	0.88
Share of transfers in total wealth (S_T)	0.12	0.12	0.17	0.28	0.29	0.15	0.09
Correlation transfers with total wealth (R_T)	0.67	0.73	0.78	0.87	0.72	0.66	0.85
Correlation non-transfers with total wealth (R_{NT})	0.98	0.97	0.96	0.95	0.88	0.94	0.99
Contribution of transfer wealth to Gini total wealth (C_T)	0.07	0.08	0.12	0.22	0.18	0.09	0.007
Contribution of non-transfer wealth to Gini total wealth (C_{NT})	0.58	0.59	0.56	0.56	0.42	0.49	0.80
Relative contribution of transfers to Gini total wealth ($\frac{C_T}{G_W}$)	0.11	0.12	0.17	0.28	0.29	0.15	0.08
Implied % change in Gini total wealth for 1% increase in transfer wealth: $(\frac{C_T R_T}{G_W} - 1) \cdot S_T \cdot 100$	-0.79	-0.30	0.32	-0.16	0.15	0.13	-0.60

Source: Nolan et al. (2021) for UK, France, Germany, Italy, Spain, and US. Authors' calculations for Ireland.

Notes: Results refer to the "without capitalisation" benchmark. Note that our estimates are based on the 2020 wave of HFCS, while the estimates from Nolan et al. (2021) comes from the first wave of HFCS (2010/11).

Table 3.B.3: HFCS variables - Income

HFCS code	Description	Details
DI1100	Employee income	Income received from regular wages or salaries, as well as any overtime pay, tips, bonuses, profit sharing benefits (unless part of the pension arrangements).
DI1200	Self-employment income	Net operating profit or loss that a self-employed household member makes out of his or her unincorporated enterprise (including farming).
DI1300	Rental income from real estate property	Income received from renting a property (for example renting a dwelling – not included in the profit/loss of unincorporated enterprises – , receipts from boarders or lodgers, or rent from land) after deducting costs such as mortgage interest repayments, minor repairs, maintenance, insurance and other charges.
DI1400	Income received from financial assets	Income from financial assets, gross of interest payments, and private business other than self-employment (profits from capital investment in unincorporated and incorporated not publicly traded private businesses less expenses incurred.)
DI1500	Income from pensions	Income received from public pension schemes (old age pensions, anticipated old age pensions, partial retirement pensions, survivor's pensions, disability pensions) and occupational or individual private pensions schemes.
DI1600	Regular social transfers (except pensions)	Income received from unemployment benefits (full and partial, early retirement for labour market reasons, vocational training allowance, mobility and resettlement, other cash benefits) and public transfers (e.g. maternity benefits, scholarships and other educational assistance from government).
DI1700	Regular private transfers	Income received from any regular transfer from private entities and/or other households on a regular basis (alimony and child support, payments from households in other countries, income support payments from other households, support received from non-profit institutions, strike pay from unions, scholarships from charitable trusts)
DI2000	Total income	Total gross annual household income aggregate. Sum of all the income sources.

Source: ECB (2021).

Notes: All income sources are reported gross of taxes.

Chapter 4

Who Gets the Flow? Financial Globalisation and Wealth Inequality

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Personal wealth has a crucial role in cushioning against life's uncertainties [...] and is a crucial determinant of what people can do at the beginning of their lives. For all these reasons, it is imperative that in the future we monitor the evolution of wealth in the same way that we have been monitoring the evolution of income.

Mario Draghi (2007)

4.1 Introduction

Starting from high levels of wealth inequality, the 20th century experienced a declining trend in the concentration of net wealth in advanced economies (Waldenström, 2021). This trend stopped and reversed towards an upward one around the 1980s.¹ As a result, the current distributions of wealth are more skewed towards top percentiles. Among other factors, this reversal broadly coincides with the period in which financial globalisation, the phenomenon of increasing global linkages through cross-border financial flows, intensified.

The goal of this paper is to shed light on the link between financial globalisation and the rise in wealth inequality. This remains an area of active policy and research

¹See Appendix Figure 4.A.1.

focus, not least because personal wealth is not straightforward to measure and allocate (Zucman, 2019). The absence of time series data on wealth inequality has hindered economists from studying the long-term dynamics behind it from a macroeconomic perspective. However, in particular following the publication of *“Capital in the Twenty-First Century”* (Piketty, 2014) and *“Inequality: What can be done?”* (Atkinson, 2015), there has been an increasing effort from various researchers in estimating series for wealth inequality (a non exhaustive list of papers includes Saez and Zucman, 2016; Piketty, Saez, and Zucman, 2018; Alvaredo, Atkinson, and Morelli, 2018; Alvaredo, Atkinson, Blanchet, et al., 2020; Garbinti, Goupille-Lebret, and Piketty, 2021; Bajard et al., 2021; Blanchet and Martínez-Toledano, 2021). Despite the data limitations, employing this data to address relevant macroeconomic questions, accompanied by economic judgement, can provide valuable insights. In this paper, I use this new wave of wealth inequality data to address the research question. To jointly maximise the historical data availability and the quality of the estimates on wealth inequality, I focus my study on the United States, France, and the United Kingdom.

The resulting policy implications are far reaching. One of the goals of globalisation, if not the main, is to foster prosperity for all rather than just a restricted group of individuals. A high concentration of wealth towards the top of the distribution has both economic and social consequences. As such, policymakers are underpinning solutions to achieve inclusive economic growth. Some examples are policy recommendations towards wealth taxes, such as those from the OECD, the IMF, and the World Bank (OECD, 2018; Brumby, 2021; Hebous et al., 2024), or advanced proposal, such as those from Senators Bernie Sanders and Elizabeth Warren in the United States.² Moreover, this paper could contribute to the topical discussion around capital account policies and capital flow management (Pasricha and Nier, 2022). Whether and how financial globalisation affects the distribution of wealth is relevant to develop targeted and efficient policies which favour a more inclusive society.

This paper builds on the literature that studies the link between financial globalisation and economic inequality. However, I deviate from this by studying the effect on wealth rather than income inequality. I do this for two reasons. On the one hand, this remains a matter that is largely unexplored in the literature, mostly due to data limitations. To the best of my knowledge, this paper aims to be a primer in exploring empirically and broadly the link between international financial

²According to the estimates, Senator Warren’s proposal would raise between \$2.2 (Tax Foundation estimates) and \$3 (Saez and Zucman, 2021) trillion of tax revenue over a decade, while Bernie Sanders’ plan would generate \$2.6 trillion over the same period (Tax Foundation estimates).

integration and the distribution of wealth. On the other hand, looking at wealth is interesting because of its differences with income. Wealth is more unequally distributed than income, and their drivers in an international framework can differ.³ The way international investments can transmit to income inequality is mainly through labour market dynamics (skills-wage mechanisms) and income substitution. Instead, the link to wealth inequality, at least theoretically, operates through an increase in access to investment opportunities and changes in asset prices. The implications are also different. While income is certainly important for individual decisions and welfare, personal wealth plays an even more crucial role in determining what individuals can do in life. Additionally, my contribution is to provide a cross-sectional analysis which adds to the literature, which has mainly focused on the United States or Nordic countries. While I acknowledge that the restricted country sample remains a limitation, the results of this paper can serve as a benchmark for future research.⁴ From a broader perspective, I create a bridge between the literature on international financial integration and the one on wealth inequality by studying the international drivers of wealth inequality, whereas the existing papers focus on domestic factors.

In this paper I use a fixed effects panel data model to estimate the effect of financial globalisation on the wealth distribution within the United States, France, and the United Kingdom. I proxy financial globalisation with the International Financial Integration index (IFI, hereafter), which is a widely used volume-based indicator summarising the amount of outstanding foreign assets and liabilities scaled by GDP (Lane and Milesi-Ferretti, 2001, 2003). I find that a one standard deviation increase in the growth rate of the IFI is associated with a positive change in the wealth share growth of the top 1% (the rich) by 0.22 percentage points (pp) and of the top 10% (upper middle-class) by 0.15 pp and a negative change in the wealth share growth of the bottom 50% (working class) of the distribution by 0.07 pp. To better appreciate the scale of the effect it is worth to interpret these numbers in monetary terms. Projecting the predicted shares following an average increase in the IFI on the average total net wealth – over the three countries and the time period of the analysis – results in an increase in the top 10% and top 1% aggregate net wealth by approximately \$1 trillion (+8%) and \$1.6 trillion (+30%), respectively.⁵

³Appendix Figure 4.A.2 compares the distributions of income and wealth.

⁴As a robustness check in this paper, I extend the sample to more countries. I discuss this in Section 4.6.5. However, a wider country sample has to be traded off against a shorter time horizon and lower data quality.

⁵These figures are computed as follows. First, I compute the average shares of net wealth by quantile over the three countries and the period of interest (1970-2019). The average share is 60.5% for the top 10% and 26.9% for the top 1%. Then, I use the estimated coefficients and the average

One significant advantage of using the IFI is the possibility to decompose the index by its functional categories. This is helpful because some categories such as portfolio investments or financial derivatives are more linked to the distribution of personal wealth than others (e.g., FDI). Estimates from the Federal Reserve suggest that in the US the top 1% wealthiest owns 53.7% of corporate equities while the bottom 50% only owns 0.6%.⁶ In fact, I find that the main driving components of my results appear to be portfolio equities and financial derivatives. Another advantage is that, using Balance of Payments statistics, it is possible to disentangle a flow and a valuation component of the IFI. By doing this, I find that the increase in wealth inequality following the acceleration in financial globalisation is driven by the flow. This means that the wealthy get richer due to an expansion of their international portfolios, through new purchases or reinvestment of capital gains, rather than just a market value gain on their existing stock of wealth. Complementary to this result, although they have an economically meaningful effect, the main drivers of valuation effects (exchange rate, share prices, and house prices) do not seem to play a significant role. Finally, the main finding is strengthened during a systemic banking crisis. An explanation is that this reflects a mismatch in recovery times between the wealthy and the poor. People at the top of the distribution have access to a wider range of financial instruments and investments opportunities, which makes them more likely to recover their lost wealth faster than people at the bottom of the distribution.

The remainder of the paper is organised as follows. Section 4.2 reviews the literature and highlights how the paper contributes to it. Section 4.3 summarises the evolutionary patterns of financial globalisation and wealth inequality. Section 4.4 provides a description of the data. Section 4.5 explains the empirical methodology. Section 4.6 discusses the results, related transmission channels, and robustness checks. Section 4.7 concludes.

4.2 Related literature

The main focus of the existing literature, both theoretical and empirical, has been

change in the IFI (1970-2019 over all countries: 12.8 pp) to compute the predicted change in the net wealth shares. The new net wealth shares are 65.6% for the top 10% and 34.6% for the top 1%. Next, I take the total personal net wealth value (source: WID, in current US dollars, 2021) across the three countries over the time horizon 1970-2019, i.e. \$43.5 trillion for the United States, \$8.4 trillion for France, and \$9.4 trillion for the United Kingdom. Finally, I project the new wealth shares on the total net wealth and compare this figure with the one computed using the initial shares. Considering the 95% confidence interval on estimates, the top 10% increase would be between \$0.6 and \$1.4 trillion, while the top 1% between \$1 and \$2.3 trillion.

⁶Source: Fed's Distributional Financial Accounts (DFA), 2022 Q1. FRED IDs: WFRBST01122, WFRBSB50203.

on the link between financial globalisation and income inequality (Mah, 2002; Das and Mohapatra, 2003; Ang, 2010; Jaumotte, Lall, and Papageorgiou, 2013; Delis, Hasan, and Kazakis, 2014; Asteriou, Dimelis, and Moudatsou, 2014; Furceri and Loungani, 2018; Li and Su, 2020; Carrera et al., 2024). The findings from these papers are mixed. Increases in cross-border investments can impact domestic inequality both positively and negatively. Theoretical predictions on the direction of the effects are also not clear-cut (Demirgüç-Kunt and Levine, 2009). Example of factors at play are the effect of finance on credit constraints (Beck, Demirgüç-Kunt, and Levine, 2007) and the access to formal financial sector (Greenwood and Jovanovic, 1990). Empirical evidence finds that net effect depends on the strength of underlying dynamics that can push in different directions. Examples of such dynamics are the level of financial depth of a country (Bumann and Lensink, 2016), the direction of capital flows (outflows or inflows – Liu, Spiegel, and Zhang, 2023), the composition of foreign investments (Eichengreen et al., 2021), or the country sample (advanced economies or emerging markets). Heimberger (2020) carries out a quantitative meta-analysis on a sample of 123 papers and finds that globalisation, on average, has an inequality-increasing effect. Specifically, the effect associated with financial globalisation is larger than that of trade globalisation.

Should we expect the same for wealth inequality? While many have focused on studying the consequences of financial globalisation on income inequality, the effect on wealth inequality is little documented. This scarcity is primarily due to the greater availability and the lower estimation uncertainty of data on income inequality. However, exploring wealth inequality is compelling due to the importance of wealth for economic and power opportunities and due to differing transmission channels compared to income. Wealth encompasses more than the mere accumulation of income flows over time. It involves additional dynamics, such as increased access to investment opportunities and fluctuations in asset prices, even when income from these assets is not realised. Hence, the connection between financial globalisation and wealth inequality extends beyond skill-wage mechanisms and income type substitution dynamics, which are typically at the core of studies on income inequality.

Financial wealth is more concentrated than real wealth, as participation in financial assets and its relevance increases with net wealth (Kuhn, Schularick, and Steins, 2020; Diwan, Duzhak, Mertens, et al., 2021; Smith, Zidar, and Zwick, 2022). Thus, access to international investment opportunities is also more skewed towards the top of the distribution. When financial integration is high, it is easier for the rich to shift shares of their wealth in tax havens, where they can

accumulate it further thanks to the lower tax rates. Assets held by households in tax havens account for 8 to 10% of global financial wealth (Zucman, 2013; Alstadsæter, Johannesen, and Zucman, 2018). Further on the investment access inequality, foreign individuals are likely to invest in successful companies which are owned by people at the top of the wealth distribution. One can think about companies like Tesla, Meta, or Microsoft, whose owners are all part of the top 0.00025% wealthiest (Saez and Zucman, 2021). This will benefit rich domestic investors, who own a large share of total equities, while there will be small or no benefits for the poorest. Additionally, they are likely to invest abroad to diversify their portfolios, while participation in financial assets at the bottom of the distribution is low.

For these reasons, financial globalisation can be a driver of within-country wealth inequality. This adds on the other relevant factors that the literature has identified, such as heterogeneity in portfolio composition and wealth returns (Smith, Zidar, and Zwick, 2022; Xavier, 2021), savings inequality (Fagereng, Holm, et al., 2019; Mian, Straub, and Sufi, 2020; Auclert, Malmberg, et al., 2021), tax progressivity (Saez and Zucman, 2019; Jakobsen et al., 2020; Hubmer, Krusell, and Smith Jr, 2021; Smith, Yagan, et al., 2021), demographics (Jakobsen et al., 2020; Smith, Zidar, and Zwick, 2022), inheritances (Alvaredo, Garbinti, and Piketty, 2017; Morelli, Nolan, et al., 2021; Arrigoni, Boyd, and McIndoe-Calder, 2024), mortgage debt and housing ownership (Horan, Lydon, and McIndoe-Calder, 2021). Understanding the drivers of wealth inequality is crucial, as recent studies have emphasised its role in key macroeconomic dynamics such as economic growth, the transmission of monetary policy, gains from financial inflows, and welfare costs (Lee, 2021; Zhang, 2022a; Jeong and Shim, 2022; Matusche and Wacks, 2023).

In summary, I contribute to the existing literature providing novel insights on the link between financial globalisation and wealth inequality, expanding beyond income inequality and offering a cross-sectional analysis beyond traditional country scopes.

4.3 Stylised facts

4.3.1 Evolution of financial globalisation

Financial globalisation, the phenomenon of increasing global linkages through cross-border financial flows, is relatively recent, dating back to the end of the Bretton Woods System between 1971 and 1973 (Calomiris and Neal, 2013). In

fact, from the 1970s, and increasingly in the 1980s, countries worldwide started to remove capital controls and to implement financial deregulation policies, at different levels and with different paces. During the 1990s, following the collapse of the Iron Curtain (1989) and the end of the Cold War (1991), financial globalisation experienced a marked acceleration (Lane and Milesi-Ferretti, 2001, 2003).

Figure 4.1 compares cumulative changes in foreign assets and liabilities. External positions in 1970 were rather limited, with levels close to 15% of GDP for the United States and France, and close to 60% for the United Kingdom.⁷ Following capital liberalisations, in 1990 the stock of external assets (normalised by GDP) had already increased by a factor of around 2.5 for the United States and the United Kingdom, and almost 4 for France. After this fast paced period of high globalisation, cross-border flows experienced first a sudden stop and then a deceleration following the Global Financial Crisis (Lane and Milesi-Ferretti, 2018). In 2019 France recorded foreign assets and liabilities which were respectively 20.4 and 24.7 times larger than they were in 1970. This growth factor was 8.3 and 16.3 for the United States, while 8.4 and 9.6 for the United Kingdom.

In the 1970s, debt – other investments and portfolio debt – had a predominant role, accounting for the vast majority of the stock of foreign assets and liabilities (Appendix Figure 4.A.3). Although we have observed a declining trend, debt remains the largest category of external positions. During the 1980s and 1990s, we have assisted to an increase in the importance of Foreign Direct Investments (FDI) and portfolio equity, respectively. This continued into the 2000s, decade in which financial derivatives were introduced and took over a consistent share of external positions, especially in the United Kingdom. The years following the Global Financial Crisis are characterised by a reduction in the stock of debt, while FDI and portfolio investments stocks increased again after an initial sudden stop.

4.3.2 Evolution of wealth inequality

As it is the standard in the literature, net wealth is defined as the total market value of assets net of debt (Piketty and Zucman, 2014; Alvaredo, Atkinson, Blanchet, et al., 2020). In the last 50 years, the average level of per-adult national wealth in advanced economies has shown an increasing trend, benefiting from frequent periods of prosperity and peace (Chancel et al., 2021). However, the data tell us that wealth inequality does exist. For the three countries in my sample as well as for the median advanced economy, the top 10% of the wealth distribution owns

⁷As a remark, one should note that the high level of external positions for the United Kingdom is due to its intrinsic nature of being an on-shore financial centre.

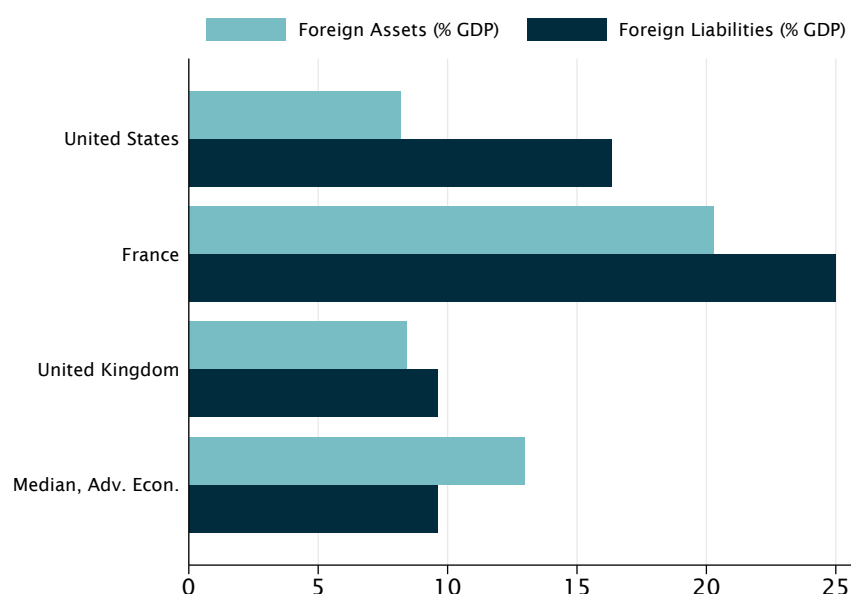


Figure 4.1: Cumulative changes in foreign assets and liabilities, 1970=1

Notes. Source: External Wealth of Nations (EWN). Advanced economies: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Israel, Italy, Japan, Korea, Latvia, Lithuania, New Zealand, Norway, Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States. I exclude financial centres selected on the base of assessments by the IMF, World Bank, and Eurostat: Ireland, Luxembourg, Netherlands, Singapore, Hong Kong, Cyprus, Malta.

more than half of total net wealth in 2019 (Figure 4.2).⁸ The remaining is shared by the entire bottom 90%, with the bottom 50% only owning a negligible share (the median share in advanced economies is about 6%). Zooming into the top 10%, in several countries the top 1% share is quite pronounced. In the United States it is over 30% of total wealth, the highest in the sample of advanced economies, whose median is about 25%.

Figure 4.2 documents the high level of current wealth inequality, but it does not provide an historical perspective. Figure 4.3 shows cumulative changes in wealth shares for different quantiles since 1980 and provides evidence that wealth inequality has been on the rise since then.⁹ Individuals in the top 1% (i.e., the rich) have seen their share of total wealth increase substantially, especially in the United States and France (+51.9% and +45.2%, respectively). The top 10% (upper

⁸For the United Kingdom I use data from Alvaredo, Atkinson, and Morelli (2018). The latest observation is 2012 and series are only available for the top 10% and 1%. No data are available for the bottom 50% and 50%-90%.

⁹For this chart I use 1980 instead of 1970 as a reference year given that prior to 1980 wealth inequality in all three countries was experiencing a long lasting decreasing trend which reversed in the 1980s. See Appendix Figures 4.A.1 and 4.A.4.

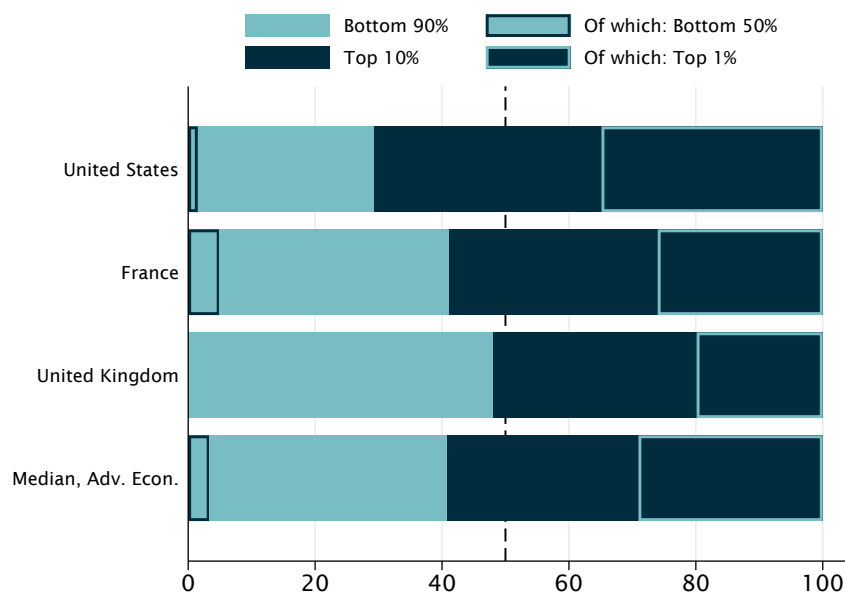


Figure 4.2: Net wealth shares, % of total wealth, 2019 or latest available

Notes. Source: World Inequality Database (WID). Quantiles of net wealth. For consistency with the series I use in the analysis (Alvaredo, Atkinson, and Morelli, 2018), the latest observation for the United Kingdom is 2012 and series are only available for the top 10% and 1%. See the footnote of Figure 4.1 for the full list of countries in the sample of advanced economies.

middle class) has experience a similar increasing trend, but of lower magnitude. On the opposite, the share of wealth going to the bottom 50% (working class) and the middle class (50%-90%) has shrunk. In percentage terms, the former are those who missed out the most, given that their share was already rather small in 1980.

To summarise the evidence motivating this work, in the past five decades financial globalisation has intensified and wealth inequality within advanced economies has risen.

4.4 Data

4.4.1 Financial globalisation

I collect stocks of external assets and liabilities, and related functional categories (portfolio equities, FDI, debt, and financial derivatives), from the *External Wealth of Nations Database* (EWN, hereafter – Lane and Milesi-Ferretti, 2007b, 2018). This database provides time series starting in 1970 which are mainly based on official statistics from the *International Monetary Fund*, and it is widely used by researchers working in the field of international macroeconomics.

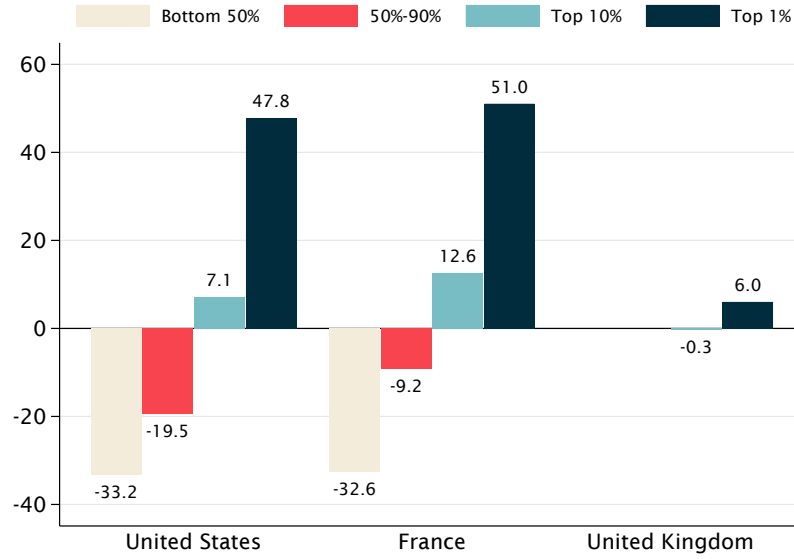


Figure 4.3: Changes in wealth shares since 1980, percent

Notes: Source: World Inequality Database (WID). Shares of net wealth as a percentage of country total net wealth. Latest observation is 2019 for United States and France, 2012 for the United Kingdom. For consistency with the series I use in the analysis (Alvaredo, Atkinson, and Morelli, 2018), the latest observation for the United Kingdom is 2012 and series are only available for the top 10% and 1%.

I construct a measure of *de-facto* financial globalisation following Lane and Milesi-Ferretti (2001, 2003). The index of International Financial Integration (IFI) is a summary volume-based measure of international financial integration, computed as follows:

$$IFI_{i,t} = \frac{FA_{i,t} + FL_{i,t}}{GDP_{i,t}} \quad (4.1)$$

where $FA_{i,t}$ and $FL_{i,t}$ are the stocks of foreign assets and liabilities of country i vis-à-vis the rest of the world at time t . To account for the size of the country and given that these are nominal variables, valued at market prices, the measure is scaled by nominal GDP. Figure 4.4 shows the historical evolution of the IFI. Compared to 1970 this measure in 2019 was 11 times larger for the United States, 22 times for France, and 9 times for the United Kingdom.

There exist multiple measures of financial globalisation, which we can divide into *de-jure* and *de-facto* indicators. The former are compiled from evaluations of legal frameworks and capital account reforms (restrictions and liberalisations), while the latter are quantity measures reflecting the intensity of actual international flows. For my analysis I use a *de-facto* index, the IFI, for three reasons. First,

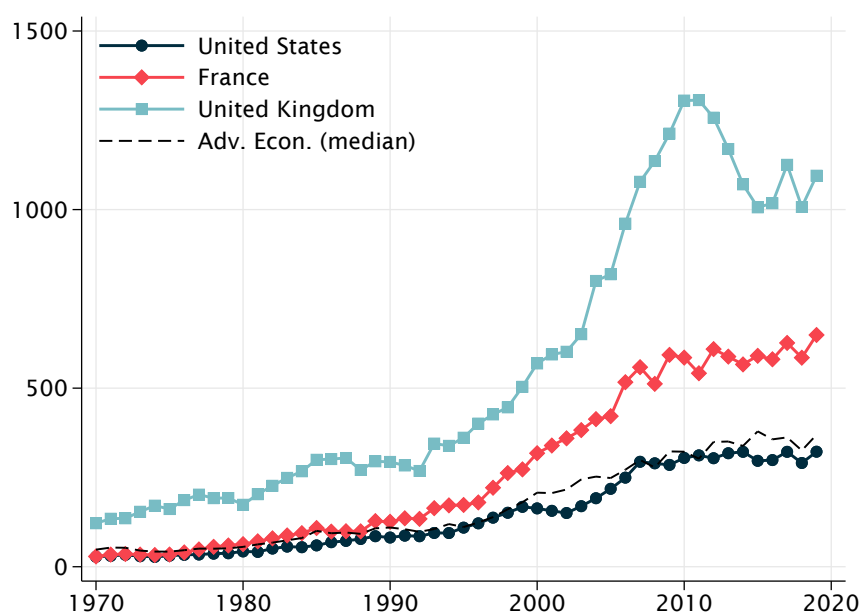


Figure 4.4: IFI, Percentage of GDP

Notes. For the list of advanced economies see Figure 4.1. Author's calculations on External Wealth of Nations (EWN).

a conceptual reason. This proxy captures the overall impact of all factors related to financial globalisation, rather than reflecting a single factor, that is the country's regulatory environment (Gräbner et al., 2021). *De-jure* indices do not vary much over time, they stabilise after a full liberalisation, and are usually dominated by one or more specific policy dimensions. As such, many times these indices show low or negative correlations with the IFI and among each others. Moreover, *de-facto* measures of inequality seems to be largely driving *de-jure* ones (Furceri, Loungani, and Ostry, 2019). Second, a methodological reason. The IFI allows to have a breakdown of underlying components. The majority of existing studies either do not provide any breakdown or just look at FDI (Avdjiev and Spasova, 2022). Third, a data availability reason. External positions from the EWN are available since 1970 for all countries of interest. As opposite, each of the most commonly used *de-jure* indices presents limitations both on the historical and geographical availability.¹⁰ In Section 4.6.5, I conduct and discuss a robustness exercise using alternative indicators.

However, the IFI carries some limitations as well. The main one is that both IMF and EWN provide cross-border data collected on the basis of the so called

¹⁰Chinn-Ito index (Chinn and Ito, 2008) is constant for the United States, indices from Fernández et al. (2016) only start in 1995, data from Quinn (1997) and Abiad, Detragiache, and Tressel (2010) provide a historical perspective but end in 2009 and 2005 respectively.

residency criterion. With this criterion, capital flows are allocated according to the country in which the final recipient is based. This method does not allow to pick up offshore financial exposure in tax havens, which is where global firms often own foreign subsidiaries and where the wealthy can shift shares of wealth. A new wave of research estimates international investment positions according to the *nationality* (or *consolidated*) criterion, and thus allocating capital flows according to the nationality of the specific entity receiving it rather than the one of the parent company (BIS, 2015; Coppola et al., 2021; Sanchez Pacheco, 2022; Bénétrix and Sanchez Pacheco, 2023).¹¹ The estimates based on the *nationality* criterion suggest that the level of foreign assets and liability is substantially different, but the trends are consistent with the ones registered with the *residency* methodology.¹² Yet, this data is either available for a rather short time horizon or rely on a specific asset type (e.g., portfolio flows) or sector, which implies that it cannot currently be used for the purpose of this paper.

4.4.2 Wealth inequality

Although there are a variety of sources available for income inequality, way less data is available for wealth inequality. In my analysis I use data from the *World Inequality Database* (WID, hereafter).¹³ This database is the result of a collective effort of various academic researchers, building on the seminal work by Piketty (2014) and Saez and Zucman (2016). Wealth series are based on Financial Accounts data expressed at market value and then distributed to all adult individuals. This makes the distributional series consistent with aggregate wealth from official balance sheets. Moreover, as the definition of adult remains fixed, using equal-split adults allows for comparability of inequality series over

¹¹For example, imagine a wealthy individual from the United States buys a French company for \$2 billion, financing 50% of the purchase using their funds in a tax haven and 50% taking a loan from a French bank in France. With the *nationality* criterion we would see a \$2 billion increase in US foreign assets, a \$1 billion increase in US foreign liabilities, a \$2 billion increase in French liabilities, and a \$1 billion increase in French foreign assets. Instead, with the *residency* approach only the two cross-border transactions would be recorded, not the loan made in France. Specifically, we would see two recordings between US and tax haven (\$1 billion increase in US foreign assets and a \$1 billion increase in tax haven external liabilities) and two recordings between tax haven and France (\$1 billion increase in external assets and a \$1 billion increase in foreign liabilities). The difference for this paper is that, whilst the increase in wealth for the individual would be the same, the stock of foreign assets and liabilities would evolve differently.

¹²Abstracting from any economic reasoning, from a purely econometric standpoint this means that results should remain fairly unchanged when using one or the other criterion.

¹³Methodology and relevant papers: Alvaredo, Chancel, et al. (2018), Alvaredo, Atkinson, Blanchet, et al. (2020), Bajard et al. (2021), Blanchet and Martínez-Toledano (2021), Chancel et al. (2021). United States: Saez and Zucman (2020a). France: Garbinti, Goupille-Lebret, and Piketty (2021), Piketty, Saez, and Zucman (2018). United Kingdom: Alvaredo, Atkinson, and Morelli (2018).

time and across countries. Given that the wealth distribution is rarely observed directly in administrative tax data and the coverage of wealth surveys is more limited than for income, the allocation is estimated using indirect methods that combine various sources. Examples of such methods are the Mixed Income Capitalisation-Survey (MICS), which combines capitalised income flows from tax data with survey-based estimates for assets that do not generate taxable income (Garbinti, Goupille-Lebret, and Piketty, 2021), or the estate multiplier method (Alvaredo, Atkinson, and Morelli, 2018).¹⁴

A new update of the WID has recently been released, following the publication of the World Inequality Report 2022 (Chancel et al., 2021). The update extends available data to a wider panel of countries starting in 1995. However, in this paper, I focus on the United States, France, and the United Kingdom, for three reasons. First, the goal of this paper is to estimate the effect of financial globalisation on wealth inequality. Thus, it is crucial to have data dating back to the beginning of this process. These three countries have wealth inequality series that start in 1970. Second, as explained above, data on wealth inequality are estimates and rely on the availability of micro-information, such as administrative, tax, and survey data. The WID itself publishes the Inequality Transparency Index (ITI hereafter), a country-level proxy for the availability and quality of this microdata. The index ranges from a minimum of 0 to a maximum achievable of 20, with a median of 1 and a mean of 3.5. This means that for most countries, the quality of the estimates is limited by definition. However, the three countries in this paper rank in the top 5 percent of the distribution of the ITI (see Appendix Figure 4.A.5). Third, this sample allows to harmonise the explanations of potential transmission channels, which would likely differ for emerging markets. To summarise, the selection of the country sample is designed to jointly maximise historical dynamics and data quality. In Section 4.6.5 I conduct a robustness exercise extending the country sample using information from the ITI and show that the main result is robust.

The advantages of using this data source are twofold. First, the WID provides consistent and comparable time series that go back to the twentieth century. Second, the WID provides data in quantiles (i.e., bottom 50%, next 40%, top 10%, top 1%) rather than a single summary Gini index, as used in the majority of empirical studies. A summary measures such as the Gini index does not allow

¹⁴With the MICS method, for example, financial assets are linked to interests payments, corporate equities to dividends and capital gains, business assets to business profits, and so on (Saez and Zucman, 2016; Alvaredo, Atkinson, Blanchet, et al., 2020). Instead, the estate multiplier method consists in taking the wealth-at-death reported on estate tax returns, compute mortality rates over demographic characteristics and then weight wealth-at-death by the inverse of mortality rate (Alvaredo, Atkinson, and Morelli, 2018).

to disentangle changes in different parts of the distribution and the direction inequality is arising from (Deaton and Case, 2020). Notice that for the United Kingdom only data for the top 10% and top 1% are available for this long time span (Alvaredo, Atkinson, and Morelli, 2018).

Due to the need of assumptions and indirect estimations, as discussed above, wealth series from the WID suffer from some methodological limitations. However, the authors are clear on what these limitations are and provide reasonable justification for how they address them. Moreover, when comparing the series with other available sources I find that the data are slightly different in levels but are fully comparable in trends. Taking the United States, for example, Figure 4.5 compares series from the WID with those from the Fed's Distributional Financial Accounts (DFA), the Global Wealth Report from Credit Suisse, Smith, Zidar, and Zwick (2022) (SZZ), and the SCF+. ¹⁵ The latter are based on survey data from the Fed's Survey of Consumer Finances (SCF) extended historically by Kuhn, Schularick, and Steins (2020). Although the data are not identical, all the series confirm that wealth inequality has been on the rise since the 1980s and show high pairwise correlation with the WID. In particular, it is worth to notice the high co-movement between WID and SCF+, which is the benchmark series for distributional analysis in the United States. This figure also motivates my choice to use data from the WID, as these are the longest and most detailed series, in addition to providing a cross-country dimension.

4.5 Empirical methodology

As the focus of this paper is to study the link between financial globalisation and wealth shares, the baseline OLS panel model is specified as follows: ¹⁶

$$\Delta W_{i,t}^q = \alpha + \beta \Delta IFI_{i,t-1} + \Gamma \Delta X_{i,t-1} + \eta_i + \theta_d + \varepsilon_{i,t} \quad (4.2)$$

where $W_{i,t}^q$ is the share of net wealth owned by quantile q (i.e., bottom 50%, 50%-90%, top 10%, top 1%) in country i and year t , IFI is the index of International Financial Integration, and $X_{i,t-1}$ is a set of controls. The main coefficient of interest is β . Following the literature discussed in the previous Section, I expect β to have

¹⁵For details on how the estimates from the Federal Reserve differ from those from the WID see Saez and Zucman (2020a).

¹⁶The justification for using a linear model is based on the assessment that, although the relationship between financial globalisation and wealth inequality may not be strictly linear, a linear approximation can effectively capture the general direction of this relationship. Considering the limited extent of the empirical literature and the constraints posed by data limitations, employing a linear model is the most suitable approach to provide initial insights that are both easily comprehensible and interpretable. These results can serve as a benchmark for future research expansions to include nonlinearity.

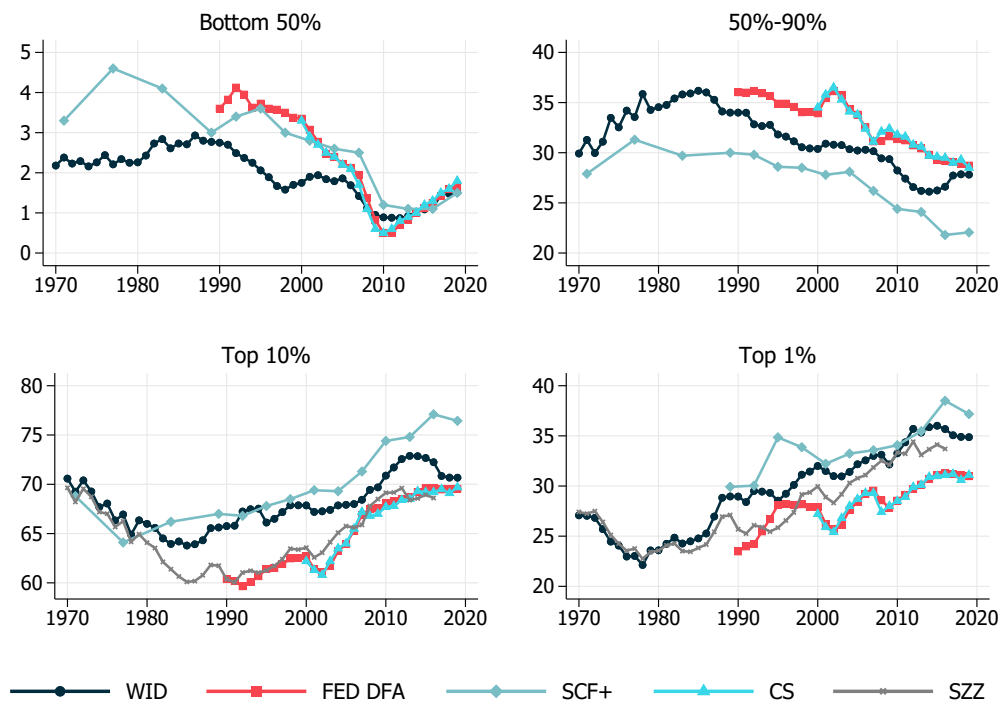


Figure 4.5: Net wealth shares, United States

Notes. Percentage of total net wealth. Quantiles of net wealth. Sources: World Inequality Database (WID), Fed's Distributional Financial Accounts (FED DFA), Kuhn, Schularick, and Steins (2020) (SCF+), Credit Suisse Global Wealth Report 2021 (CS), and Smith, Zidar, and Zwick (2022) (SZZ). Note that the reference unit (e.g. equal-split adults, households) can differ across sources.

a positive sign for the top wealth shares and a negative sign for the rest of the distribution.

Due to the presence of non-stationarity in the series and to avoid spurious correlation driven by common trends, I take annual changes in both the independent variable and the regressors.¹⁷ The stationarity of first-differenced variables is tested using the augmented Dickey–Fuller test for unit root. Results reported in Appendix Table 4.A.1 show that both the independent and dependent variables are stationary once annual changes are taken. Moreover, to mitigate the fear of endogeneity, I use the lagged value of both the explanatory variable and controls. The set of control variables $X_{i,t-1}$ needs to be meaningfully defined in order to clean the estimation from effects which are due to con-founder policies and broad drivers that affects wealth inequality but are not related to financial globalisation. I selected control variables based on the existing literature. To control for business

¹⁷The implementation of an instrument, constructed using *de-jure* indices of financial globalisation, is not a feasible option due to the limited time availability of these time series. I provide robustness checks using *de-jure* indices in Appendix Figure 4.A.10.

cycle fluctuations I include real GDP per capita in local currency, to account for changes in exchange rates as well. To proxy fiscal and monetary policies I include the debt to GDP ratio, short and long term interest rates.¹⁸ I expect that higher income and debt contribute positively to the wealth share of the rich and negatively to those of the rest of the distribution, suggesting that increases in GDP are unequally distributed and that debt is held by people at the very top of the distribution, which are those that can effectively lend their money. Moreover, in line with results from Mian, Straub, and Sufi (2020, 2021), I expect interest rates to be negatively correlated with top shares and positively correlated with bottom shares. As outlined by Jaumotte, Lall, and Papageorgiou (2013), empirical analysis on inequality should take into account technological, trade, and financial changes. As such I include Total Factor Productivity (TFP) and trade openness.¹⁹ International trade is usually associated with improvements in inclusive growth (Jaumotte, Lall, and Papageorgiou, 2013; Bacchetta et al., 2021). From a theoretical standpoint, productivity growth is a factor benefiting the lower side of the distribution, which is more dependent on labour income. Finally, I control for ageing population by means of the Old Age Dependency Ratio (OADR).²⁰ Modigliani's life-cycle theory (Modigliani, 1970) predicts that individuals change their spending decisions over the course of life, taking into account the resources they currently have available as well as their future income expectations. As such, young people accumulate debt while middle-age people save more. Complementing this theoretical prediction with empirical evidence that many people at the top of the wealth distribution are older (Jakobsen et al., 2020; Smith, Zidar, and Zwick, 2022), I expect that the ageing of society is a factor that exacerbates wealth inequality. For sources and details for all the variables see Appendix Table 4.A.2.

I estimate the model using a fixed effect estimator.²¹ As it is the case for most

¹⁸Alternatively, fiscal policy could be proxied with taxation. However, the first-best option would be wealth taxation, which no country in the sample has in place. As a robustness exercise, I have included two sets of second-best tax rates in the model. First, the top marginal income tax rate. Second, the effective tax rate on capital and labour. While the coefficients associated with tax rates are economically significant, they are not statistically significant. The addition of these controls does not affect the magnitude and significance of the IFI coefficient. Although it is plausible that such a policy change could affect income inequality, its transmission to wealth inequality is less clear. Results are available upon request.

¹⁹Trade openness is the sum of imports and exports of goods and services over GDP.

²⁰The OADR is constructed by dividing the population aged over 65 by the population aged 15-64.

²¹I estimate the model using OLS because the panel dimension is characterised by a *large T* and a *small N*. A widely used alternative, the GMM estimator, is designed for panels with a *small T* and a *large N*. Instead, when *T* is *large* and *N* is *small*, as in my case, a fixed-effects estimator is preferred for three reasons (Roodman, 2009). First, the dynamic panel bias – which arises from the demeaning process – becomes insignificant with a *large T* (Nickell, 1981). Second, the

analyses that use macroeconomic data collected for different countries over time, this is the best option as countries' specific characteristics have an effect on the regressors. Macro panel models are estimated assuming independence of the errors. Thus, the presence of cross-sectional dependence (that is, residuals across entities are correlated) can bias the results (Baltagi, 2008). I test for cross-sectional dependence and results in Appendix Table 4.A.3 shows that panels are not correlated, meaning that the model assumption holds and results will not be biased. The model includes country (η_i) and time (θ_d , decade) fixed effects.²² Standard errors are clustered at the country level. The time sample of the analysis is 1970-2019.

Despite the careful specification of the model, some limitations persist. One limitation is the possibility of reverse causality. Toda and Walsh (2020) document that income inequality can predict excess stock returns and risk premium in the United States. de Ferra, Mitman, Romei, et al. (2021) provide evidence of capital flowing from equal to unequal countries. I believe that the lagged structure of the model mitigates this issue. From a more narrative perspective, the direction of the relationship proposed in this paper can be justified as follows. First, this paper examines aggregate stock positions concerning the rest of the world and the country of interest, rather than the domestic impact of inequality. Second, the countries analysed are all advanced economies that would fall under the "unequal" definition. This implies that, in this setting, the transmission channel from inequality to globalisation should be constrained. Instead, the access to new investment opportunities abroad can influence domestic inequality, irrespective of the foreign country the capital is invested in. Furthermore, the decision to liberalise capital accounts is unlikely to be influenced by the level of inequality, at least within the time frame considered in this paper. However, given the aforementioned factors and the size of the sample, it is advised to interpret the

number of instruments for the GMM is larger than the number of variables in the model and can explode. Third, with a *small N* the reliability of standard errors and the Arellano-Bond test for autocorrelation is compromised.

²²The choice of using period fixed effects rather than year fixed effects is justified, on the one hand, by the fact that both globalisation and wealth dynamics are slow-paced phenomena, whose changes take time to evolve. On the other hand, this parsimonious approach allows preserving degrees of freedom, which is particularly important due to the small sample size. Time-specific changes that are common to all three countries as well as time trends are, at least partially, accounted for as annual changes inherently capture the within-year variation without having to estimate further parameters. We can interpret two of the exercises I carry out as implicit robustness checks. First, the model in Section 4.6.2 includes world share and house prices, which are global variables reflecting time trends. The IFI coefficient remains robust to this inclusion. Second, the model in Section 4.6.3 includes a financial crisis dummy, common among the countries but unrelated to a time trend, and shows that the results are robust. Moreover, given the limited country sample, having year fixed effects on top of country fixed effects and control variables could absorb too much of the relevant variation for the analysis.

results as correlational evidence rather than inferring causality.

4.6 Results

Table 4.1 shows the results from the model described in Equation 4.2. The coefficient associated with the IFI is statistically significant and has the expected sign: positive for top wealth shares, negative for the rest of the distribution. Specifically, an increase in the annual change of the IFI by 1 percentage point (pp) at time $t-1$ is associated with an increase in the change of wealth shares at time t of the top 10% and 1% by 0.004 and 0.006 percentage points respectively. Instead, the same change in the IFI is linked to a decrease in the change of wealth shares of the bottom 50% by 0.002 percentage points.²³ Alternatively, the wealth shares of the top 1% and top 10% would increase by 0.22 pp and 0.15 pp respectively, following a one standard deviation increase in the annual change of the IFI. The bottom 50% share decreases by 0.07 pp.

To understand the magnitude of these results one can use the estimated β coefficients associated with the IFI to compare the predicted change in wealth shares with the realised one. As a starter, take the United States. Since 1980 the increase in the IFI has been 279 pp. The model would predict an increase in the wealth shares of the top 1% and 10% by 1.67 pp and 1.12 pp, respectively, and a decrease for the bottom 50% by 0.56 pp. These numbers explain respectively 14%, 17%, and 80% of the realised change in wealth shares. For France, the same exercise finds that predictions can explain 43%, 49%, and 56% respectively.²⁴ Thus, the model suggests that financial globalisation played a non negligible role in explaining the rise in wealth inequality. To complement these figures, one can estimate the effect of an average increase in financial globalisation on wealth shares in US Dollars terms. Projecting the predicted shares, following an average increase in the IFI, on the average total net wealth, over the three countries and the period of time of the analysis, results in an increase in the top 10% and top 1% aggregate net wealth by approximately \$1 trillion (+8%) and \$1.6 trillion (+30%), respectively.²⁵

Although most of them are not statistically significant, the sign of coefficients associated with control variables are in line with the expectations and the interpretation outlined in the previous section.

²³Given the differences in observation between columns 1-2 and columns 3-4, I refrain from comparing bilaterally results for the top shares with those for the bottom shares.

²⁴Average change in the IFI for France 1980-2019: 586 pp. Predicted changes in wealth shares: top 1% 3.51 pp, top 10% 2.34 pp, bottom 50% 1.17 pp.

²⁵See footnote 5 for details on the calculations of these figures.

Table 4.1: Empirical model – Main specification

	Dependent variable: Δ Wealth Share _{<i>t</i>}			
	(1) Bottom 50%	(2) 50%-90%	(3) Top 10%	(4) Top 1%
Δ IFI _{<i>t-1</i>}	-0.002*** (0.000)	-0.003 (0.002)	0.004*** (0.000)	0.006*** (0.001)
Δ Real GDP per capita _{<i>t-1</i>}	-0.016 (0.044)	-0.022 (0.028)	0.009 (0.134)	0.222* (0.073)
Δ Debt to GDP ratio _{<i>t-1</i>}	-1.501* (0.182)	-5.855** (0.164)	-1.750 (7.579)	2.378 (6.343)
Δ Short-term interest rate _{<i>t-1</i>}	-0.021 (0.020)	0.025 (0.023)	-0.053 (0.066)	-0.001 (0.040)
Δ Long-term interest rate _{<i>t-1</i>}	0.035 (0.018)	0.077 (0.021)	-0.269 (0.162)	-0.148 (0.155)
Δ TFP _{<i>t-1</i>}	1.728 (0.882)	4.388 (4.639)	-21.588 (20.717)	-11.343 (9.651)
Δ Trade openness _{<i>t-1</i>}	0.012 (0.004)	-0.047 (0.023)	-0.004 (0.020)	-0.038 (0.016)
Δ OADR _{<i>t-1</i>}	-0.172 (0.034)	0.200 (0.201)	0.297 (0.242)	0.430 (0.200)
Constant	0.045 (0.027)	0.061 (0.033)	-0.076 (0.113)	-0.199 (0.099)
Country FE	✓	✓	✓	✓
Decade FE	✓	✓	✓	✓
Observations	96	96	137	137
R ²	0.291	0.242	0.201	0.236

Notes: Clustered standard errors in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The Bottom 50% and 50%-90% include the United States and France, while the top 1% and 10% include the United Kingdom as well. The panel is unbalanced as the latest observation for the United Kingdom is 2012.

The following sections dig deeper into the understanding of the main results, exploring transmission channels and shock dynamics. Section 4.6.5 provides a set of robustness checks.

4.6.1 Decomposition of the IFI

A big advantage of using the IFI is that foreign assets and liabilities can be broken down by different functional categories. These might have different distributional effects to the extent that their sectoral distribution is heterogeneous (Eichengreen et al., 2021). Portfolio equities (PE) and financial derivatives (FD), for instance, are likely linked to the households sector.²⁶ Thus, these are the

²⁶Given that financial derivatives became relevant as a functional category only later in time (end of 1990s), data are available from 1994 for France, 2004 for the United Kingdom and 2005

type of instruments that are most related to the distribution of personal wealth. Given the highly selective nature of these financial instruments, their ownership is highly concentrated towards the top of the wealth distribution. Currently, in the United States the top 1% owns 53.7% of all corporate equities and mutual fund shares. The historical average is 47.7%. The same average figure for real estate assets is just 13.7%, which is not too different, and even lower, from what the bottom 50% owns in housing (14.6%).²⁷ This reflects that the left tail of the distribution of wealth builds on housing assets while the right tail is more reliant on financial instruments (Kuhn, Schularick, and Steins, 2020; Smith, Zidar, and Zwick, 2022; Diwan, Duzhak, Mertens, et al., 2021). Debt instruments (D), including portfolio debt and other investments, is as well linked to households, but it does also include positions from the banking and sovereign sectors. Foreign Direct Investments (FDI) are likely to have the highest heterogeneity in sectoral decomposition.

To study the heterogeneous distributional effect of functional categories behind the IFI, I decompose the index as follows:²⁸

$$IFI_{i,t}^{PE} = \frac{PE_{i,t}^A + PE_{i,t}^L}{GDP_{i,t}} \quad (4.3)$$

$$IFI_{i,t}^{FD} = \frac{FD_{i,t}^A + FD_{i,t}^L}{GDP_{i,t}} \quad (4.4)$$

$$IFI_{i,t}^{FDI} = \frac{FDI_{i,t}^A + FDI_{i,t}^L}{GDP_{i,t}} \quad (4.5)$$

$$IFI_{i,t}^D = \frac{D_{i,t}^A + D_{i,t}^L}{GDP_{i,t}} \quad (4.6)$$

$$IFI_{i,t} = IFI_{i,t}^{PE} + IFI_{i,t}^{FD} + IFI_{i,t}^{FDI} + IFI_{i,t}^D \quad (4.7)$$

I estimate the model in Equation 4.2 substituting the aggregate IFI with the sub-indices:

$$\Delta W_{i,t}^q = \alpha + \sum_{s \in S} \beta_s \Delta IFI_{i,t-1}^s + \Gamma \Delta \mathbf{X}_{i,t-1} + \eta_i + \theta_d + \varepsilon_{i,t} \quad S = \{PE, FD, FDI, D\} \quad (4.8)$$

for the United States. In estimating equation 4.8 I replace missing values with zero to preserve the number of observations and the balance of the panel. Also, this ensures consistency with the definition of the IFI as financial derivatives enter the index only later.

²⁷Source: Fed's DFA, 2022 Q4. FRED IDs: WFRBST01122, WFRBSB50203, WFRBST01110, WFRBSB50191. Averages are computed over the period 1989-2021, according to data availability.

²⁸Note that, while these enter the calculation of the overall IFI, I do not compute an IFI for reserves as these represents a particularly low fraction of total stocks and do not have a liability counterpart.

The functional categories IFIs are included together to control for simultaneous changes and re-allocations across instruments.²⁹ Results in Table 4.2 suggest that positive changes in the ownership of portfolio equities and financial derivatives are associated with positive and statistically significant changes in the wealth shares of the top 10% and 1%. In line with the prior, this is likely related to the unequal distribution of the ownership of these instruments, which is due to the uneven access to financial markets. Intuitively, this affects the financial buffers that people across the wealth distributions have at their disposal when a crisis occurs. The rich, having a wider access to financial markets and owning a larger and more diversified stock of cross-border financial instruments, are more prone to suffer the consequences of a crisis in a more moderate way and for a shorter horizon than the poor. This reasoning links to the analysis in Section 4.6.3.

4.6.2 Flows and valuation effects

The change in wealth shares can be seen as the sum of two components. On the one hand, a *flow* component which is related to changes in wealth that comes from newly generated wealth (i.e., the acquisition of new assets). On the other hand, a *valuation* component which is related to changes in the value of wealth coming from alterations in the market value of assets that individuals owned already.

The analyses in the previous section show that the top of the wealth distribution is affected by international finance. Another useful advantage of using a *de-facto* measure of financial globalisation is that it is possible to decompose it into a flow and a valuation component. This is a standard accounting framework in the international macroeconomics literature, which defines the change in the net international investment position as the sum of the current account and a residual component that proxies valuation changes (Lane and Milesi-Ferretti, 2007a; Bénétrix, Lane, and Shambaugh, 2015; Allen, 2019; Bergant, 2021). I adapt this identity as follows:

$$IFI_{i,t} - IFI_{i,t-1} = Flow_{i,t} + SFA_{i,t} \quad (4.9)$$

$$Flow_{i,t} = \sum_{s \in S} Assets Flow_{i,t}^s + \sum_{s \in S} Liabilities Flow_{i,t}^s \quad S = \{PE, FD, FDI, D\} \quad (4.10)$$

²⁹ Although these variables are highly correlated in levels, correlation in annual changes is low. For this reason, there is no concern arising from multicollinearity when including them jointly in the model.

Table 4.2: Decomposition of the IFI

	Dependent variable: Δ Wealth Share _t			
	(1)	(2)	(3)	(4)
	Bottom 50%	50%-90%	Top 10%	Top 1%
$\Delta \text{IFI}_{t-1}^{PE}$	-0.004 (0.001)	-0.024** (0.002)	0.027** (0.005)	0.032** (0.007)
$\Delta \text{IFI}_{t-1}^{FD}$	-0.005 (0.002)	-0.006 (0.011)	0.007* (0.002)	0.009** (0.002)
$\Delta \text{IFI}_{t-1}^{FDI}$	-0.000 (0.002)	-0.000 (0.008)	-0.008 (0.014)	-0.005 (0.013)
$\Delta \text{IFI}_{t-1}^D$	-0.002 (0.001)	0.007 (0.005)	-0.004 (0.004)	-0.002 (0.005)
Δ Real GDP per capita _{t-1}	-0.005 (0.055)	-0.019 (0.103)	-0.029 (0.168)	0.185 (0.119)
Δ Debt to GDP ratio _{t-1}	-1.404 (0.254)	-6.244** (0.490)	-2.066 (8.752)	2.277 (7.356)
Δ Short-term interest rate _{t-1}	-0.025 (0.022)	0.020 (0.004)	-0.063 (0.087)	-0.009 (0.048)
Δ Long-term interest rate _{t-1}	0.036 (0.017)	0.069 (0.050)	-0.238 (0.143)	-0.119 (0.138)
Δ TFP _{t-1}	0.874 (0.578)	5.596 (10.229)	-20.482 (19.865)	-10.540 (8.675)
Δ Trade openness _{t-1}	0.017 (0.004)	-0.040 (0.051)	-0.007 (0.010)	-0.038 (0.023)
Δ OADR _{t-1}	-0.160 (0.044)	0.209 (0.113)	0.250 (0.191)	0.407* (0.135)
Constant	0.039 (0.031)	0.032* (0.003)	-0.021 (0.151)	-0.149 (0.117)
Country FE	✓	✓	✓	✓
Decade FE	✓	✓	✓	✓
Observations	96	96	137	137
R ²	0.313	0.271	0.221	0.266

Notes: Clustered standard errors in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The Bottom 50% and 50%-90% include the United States and France, while the top 1% and 10% include the United Kingdom as well. The panel is unbalanced as the latest observation for the United Kingdom is 2012.

where SFA_t is the stock-flow adjustment term, which proxies the net capital gain on the holdings of external assets and liabilities.³⁰ Inflows and outflows are available from the IMF's Balance of Payments statistics (Financial Account), which are at the base of EWN stock data. Given that these statistics do not provide a disaggregation of assets and liabilities for the flow of financial derivatives, for

³⁰Other than revaluation changes, the SFA also captures data revisions or changes in reporting standards. See Curcuru, Thomas, and Warnock (2009) for a discussion. Assets flow includes reserve assets as well.

this exercise I exclude them and consider a narrower version of the IFI. Similar to the IFI, flows and SFA are expressed in percentage of national GDP.

Figure 4.6 plots the evolution of the flow component and the SFA, cumulated since 1970. The flow component is the main driver of the IFI in term of size. However, in line with the findings from the capital flows literature, the SFA contributes positively and increasingly to the evolution of the IFI. In the aftermath of the Global Financial Crisis the SFA slowed down the evolution of the IFI for France and the United Kingdom. The United States were an exception as they experienced a steady increase in the valuation component during the last decade in the sample.

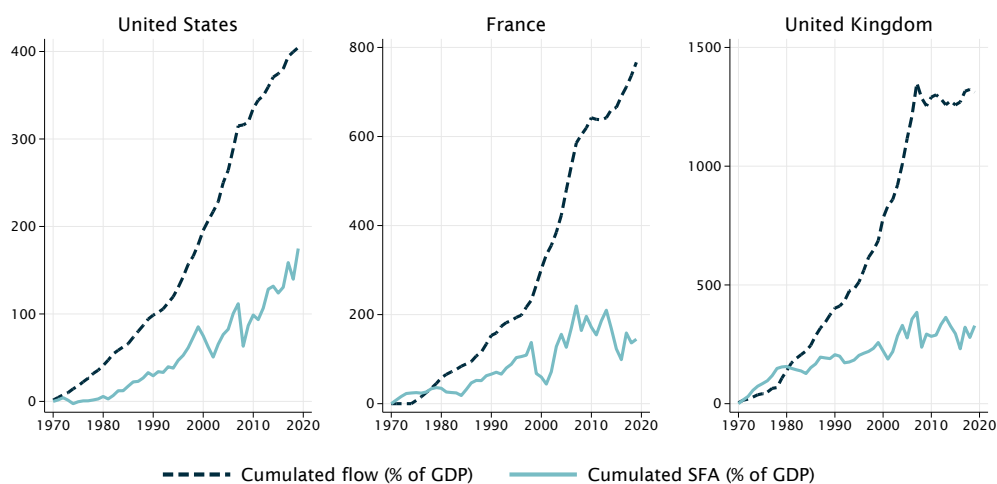


Figure 4.6: Cumulative flow vs SFA, percent of GDP

Notes. Percentage of GDP at time t . Calculations exclude financial derivative, as the disaggregation between assets and liabilities flows is not available. Source: author's calculation, External Wealth of Nations (EWN), International Monetary Fund (IMF).

Table 4.3 summarises the results from estimating Equation 4.2, substituting the change in IFI with the flow and the SFA. Overall, it emerges that the increase in top wealth shares following an acceleration in financial globalisation is driven by the flow component, while SFA does not have a significant impact on the distribution of net wealth. Given that with this exercise I am disentangling flow and valuation from the IFI side, rather than wealth, this suggests that the index itself is largely reflecting the flow component. By definition, as positions are expressed at market value, the stock already accounts for potential capital gains reinvestment in new financial wealth. This result does not necessarily suggest that capital gains from foreign investments are not relevant for the wealth accumulation process. Instead, it could reflect the fact that their reinvestment is what amplifies wealth inequality, while from a long-run perspective pure revaluations of initial financial

investments is around zero on average.³¹

Table 4.3: Valuation effects – Flow and SFA

	Dependent variable: Δ Wealth Share _t			
	(1) Bottom 50%	(2) 50%-90%	(3) Top 10%	(4) Top 1%
Flow _{t-1}	-0.001 (0.001)	-0.000 (0.000)	0.013* (0.004)	0.012* (0.004)
SFA _{t-1}	-0.000 (0.000)	-0.003 (0.003)	-0.002 (0.003)	-0.000 (0.004)
Controls	✓	✓	✓	✓
Country FE	✓	✓	✓	✓
Decade FE	✓	✓	✓	✓
Observations	96	96	137	137
R ²	0.259	0.242	0.223	0.249

Notes: Clustered standard errors in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The Bottom 50% and 50%-90% include the United States and France, while the top 1% and 10% include the United Kingdom as well. The panel is unbalanced as the latest observation for the United Kingdom is 2012.

To better understand the finding above and to analyse the main factors that can trigger valuation, I include three additional variables to the main specification, based on the findings of the related literature. First, the nominal effective exchange rate (NEER), a weighted exchange rate reflecting the role of a local currency vis-à-vis a panel of trade partner countries. Bénétrix, Lane, and Shambaugh (2015) find that during the crisis in 2008, the United Kingdom was the largest winners in terms of net currency related valuation effect (+\$945.8 billion), while the United States were the second biggest loser (-\$772.5 billion). Given that the focus here is on financial globalisation, the best option would be to use a debt-weighted exchange rate, such as the one developed by the Bank for International Settlements (BIS). However, the time coverage is too short and country availability is more limited. Instead, the BIS NEER is available for all the countries and for the entire time span I consider in my analysis. Visual correlation of the two indices is high. Second, equity prices (Share Price) to reflect potential valuation effects for the top of the distribution. I use the share price index of all shares from the OECD. Third, house prices (House Price) to reflect potential valuation effects for the bottom of the distribution. I use the the BIS nominal house prices index. I include both

³¹This last point is consistent with recent research using disaggregated security level data for the euro area (Arrigoni, Bénétrix, et al., 2024).

domestic and global price variables.³² Domestic prices determine the value of external liabilities, as the performance of local markets influences the decision of foreign investors to purchase local assets. Conversely, global prices impact the asset side by influencing domestic investors' choices towards foreign instruments. The updated model is specified as follows:

$$\begin{aligned} \Delta W_{i,t}^q = & \alpha + \beta \Delta IFI_{i,t-1} + \delta \Delta NEER_{i,t-1} + \zeta \Delta Share Price_{i,t-1} \\ & + \psi \Delta House Price_{i,t-1} + \tau \Delta Share Price_{t-1}^{World} + \phi \Delta House Price_{t-1}^{World} \\ & + \Gamma \Delta X_{i,t-1} + \eta_i + \theta_d + \varepsilon_{i,t} \end{aligned} \quad (4.11)$$

Table 4.4 shows the results. The sign of coefficients is consistent with findings from the literature. Gains in share prices benefit the wealth shares of the top of the distribution, while gains in house prices benefit those of the bottom of the wealth distribution. An increase in the NEER indicates an appreciation of the local currency against the weighted basket of currencies of its trading partners. Given that the rich have easier access to foreign markets, when the local currency appreciates they are negatively affected. As opposite, people in the left tail of the distribution do not own a consistent amount of financial assets and most of what they owned is invested domestically and thus denominated in local currency. As such when the currency appreciates, they experience positive wealth gains. Most of these effects appear to be statistically insignificant, building further on the results from the previous exercise. However, we see that global share prices are positively linked to the top 1% wealth share and domestic house prices are negatively linked to the top 10% wealth share.

4.6.3 Banking crises

Furceri and Loungani (2018) discuss that the effect of the likelihood of financial crisis could work in both directions on inequality. On the one hand, financial crises are associated with a fall in asset prices and a rise in bankruptcies rates. As a consequence, the wealthiest are hit harder and thus we could observe a reduction in inequality. On the other hand, while the rich can recover quite fast from recessions, given that they have access to a wider range of means to generate new wealth, it is harder for the working class to regain the lost wealth. As a consequence, inequality may rise. In fact, during the Global Financial Crisis (GFC) the turmoil in the currency markets led to positive exchange rate induced valuation effects (Bénétrix, Lane, and Shambaugh, 2015), which impacted the

³²World share and house prices are computed by taking the average price across the full sample of available countries. Results remain robust when using the median price.

Table 4.4: Valuation effects – Drivers of the SFA

	Dependent variable: Δ Wealth Share _{<i>t</i>}							
	(1) Bottom 50%	(2) Bottom 50%	(3) 50%-90%	(4) 50%-90%	(5) Top 10%	(6) Top 10%	(7) Top 1%	(8) Top 1%
Δ IFI _{<i>t-1</i>}	-0.002** (0.000)	-0.003* (0.000)	-0.001 (0.000)	-0.001 (0.001)	0.004 (0.001)	0.003 (0.001)	0.006** (0.001)	0.005** (0.001)
Δ NEER _{<i>t-1</i>}	0.002 (0.001)	0.003 (0.002)	0.021 (0.009)	0.020 (0.008)	0.001 (0.019)	0.001 (0.019)	-0.004 (0.015)	-0.004 (0.015)
Δ Share Price _{<i>t-1</i>}	0.004 (0.002)	0.001 (0.006)	-0.011 (0.003)	-0.005 (0.003)	0.006 (0.012)	0.002 (0.017)	0.005 (0.013)	-0.006 (0.020)
Δ Share Price ^{World} _{<i>t-1</i>}		0.005 (0.009)		-0.007 (0.006)		0.002 (0.010)		0.015** (0.002)
Δ House Price _{<i>t-1</i>}	0.006 (0.003)	0.005 (0.005)	0.028 (0.010)	0.031 (0.013)	-0.028* (0.008)	-0.031* (0.010)	-0.004 (0.018)	-0.009 (0.021)
Δ House Price ^{World} _{<i>t-1</i>}		-0.020 (0.012)		0.004 (0.061)		0.020 (0.038)		-0.028 (0.054)
Δ Real GDP per capita _{<i>t-1</i>}	-0.042 (0.051)	-0.052 (0.018)	-0.096* (0.015)	-0.074 (0.016)	0.101 (0.076)	0.090 (0.062)	0.223 (0.115)	0.195 (0.108)
Δ Debt to GDP ratio _{<i>t-1</i>}	-0.739 (0.328)	-0.756 (0.176)	-4.962 (1.503)	-5.073 (1.673)	-1.907 (7.162)	-1.831 (7.122)	2.546 (6.328)	2.780 (6.244)
Δ Short-term interest rate _{<i>t-1</i>}	-0.017 (0.020)	-0.010 (0.012)	0.032** (0.002)	0.030 (0.015)	-0.050 (0.060)	-0.055 (0.066)	-0.002 (0.032)	0.009 (0.044)
Δ Long-term interest rate _{<i>t-1</i>}	0.031 (0.026)	0.023 (0.017)	0.024 (0.017)	0.030** (0.001)	-0.250 (0.180)	-0.251 (0.199)	-0.136 (0.184)	-0.157 (0.188)
Δ TFP _{<i>t-1</i>}	1.587 (0.522)	1.338 (1.205)	6.632 (6.040)	6.024 (7.588)	-22.473 (20.546)	-21.970 (21.085)	-11.625 (9.074)	-11.985 (9.265)
Δ Trade openness _{<i>t-1</i>}	0.009* (0.001)	0.012 (0.004)	-0.012 (0.018)	-0.016 (0.024)	-0.017 (0.027)	-0.016 (0.026)	-0.045 (0.036)	-0.038 (0.035)
Δ OADR _{<i>t-1</i>}	-0.184 (0.039)	-0.135 (0.059)	0.228 (0.160)	0.227*** (0.001)	0.256 (0.304)	0.182 (0.287)	0.409 (0.253)	0.479 (0.167)
Constant	0.034 (0.023)	0.084 (0.034)	-0.002 (0.058)	-0.022 (0.190)	-0.040 (0.103)	-0.066 (0.112)	-0.192 (0.083)	-0.110 (0.054)
Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Observations	96	96	96	96	137	137	137	137
R ²	0.322	0.347	0.290	0.292	0.207	0.208	0.237	0.241

Notes: Clustered standard errors in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The Bottom 50% and 50%-90% include the United States and France, while the top 1% and 10% include the United Kingdom as well. The panel is unbalanced as the latest observation for the United Kingdom is 2012.

market value of net wealth denominated in foreign currency. Moreover, the GFC halted the growth in external positions (Milesi-Ferretti and Tille, 2011; Lane and Milesi-Ferretti, 2018), due to diminished cross-border activity, especially banking related. However, this was an heterogeneous phenomena. While, portfolio instruments and other investments decreased, FDI continue to grow. The decline in international banking linkages did not significantly halted international lending (McCauley et al., 2019).

To test this empirically, I include the occurrence of systemic banking crises in the model using the crisis dummy by Laeven and Valencia (2020), which

takes value 1 during the entire length of such episodes and 0 elsewhere.³³ To understand the role of international financial linkages during and following crises, I include an interaction term between the crisis dummy and the IFI:

$$\begin{aligned} \Delta W_{i,t}^q = & \alpha + \beta \Delta IFI_{i,t-1} + \delta Crisis_{i,t-1} + \zeta (Crisis_{i,t-1} \times \Delta IFI_{i,t-1}) \\ & + \Gamma \Delta X_{i,t-1} + \eta_i + \theta_d + \varepsilon_{i,t} \end{aligned} \quad (4.12)$$

Three messages emerge from results reported in Table 4.5. First, the sign of the coefficient associated with financial globalisation is robust and still statistically significant, suggesting that main results in Table 4.1 are not driven by what happens during crises in the sample. Second, during the entire length of a systemic banking crisis we observe a positive and significant wealth effect at the top of the distribution. Third, the coefficient of the interaction term suggests that, when the crisis hits, an increase in the IFI will increase wealth inequality by decreasing even more the wealth share of the bottom 50%.

The last two results are consistent with the theory that there exist a mismatch in recovery timing between the top and the bottom of the distribution. As the rich recover faster, they are able to build up new wealth. The poor bear the cost of the recession for longer and the recovery in the level of financial globalisation amplifies the negative effect of the crisis, as access to market is unequal. Blanchet, Saez, and Zucman (2022) find that during the GFC, which is the main episode in my analysis, it took almost twelve years for the bottom 50% pre-tax income to reach back its pre-crisis level, compared to four years on average. Morelli (2018) provides evidence that an initial reduction in income inequality when a systemic banking crisis hits the United States can be quickly reabsorbed during the time horizon of the crisis itself. However, as the interaction coefficients is not statistically significant for the top wealth shares, alternative interpretations remain possible.

4.6.4 Additional channels

So far I have explored direct effects of financial globalisation on wealth inequality. However, financial globalisation can impact the distribution of wealth in an indirect way too, by affecting some of those that have been identified as potential drivers of wealth inequality in the literature. In this section, I test two of the potential indirect transmission channels.

³³Note that except for the United States where another crisis happened in 1988 (1 year length), the dummy is solely reflecting the GFC. However, the length was heterogeneous across countries: 2007-2011 for the United States and the United Kingdom, 2008-2009 for France. The results are robust to the exclusion of the 1988 crisis.

Table 4.5: Systemic banking crises

	Dependent variable: Δ Wealth Share _t			
	(1) Bottom 50%	(2) 50%-90%	(3) Top 10%	(4) Top 1%
Δ IFI _{t-1}	-0.001* (0.000)	-0.001 (0.000)	0.004 (0.001)	0.007* (0.002)
Crisis _{t-1}	-0.186 (0.160)	-0.398 (0.170)	0.611** (0.081)	0.407** (0.073)
Crisis _{t-1} × Δ IFI _{t-1}	-0.003* (0.000)	-0.005 (0.003)	-0.002 (0.006)	-0.004 (0.005)
Δ Real GDP per capita _{t-1}	-0.007 (0.051)	-0.008 (0.028)	0.060 (0.197)	0.270* (0.074)
Δ Debt to GDP ratio _{t-1}	-0.422 (1.101)	-3.624 (0.605)	-3.949 (7.009)	1.280 (6.031)
Δ Short-term interest rate _{t-1}	-0.021 (0.019)	0.026 (0.028)	-0.068 (0.071)	-0.011 (0.043)
Δ Long-term interest rate _{t-1}	0.039 (0.022)	0.083 (0.021)	-0.252 (0.148)	-0.134 (0.146)
Δ TFP _{t-1}	0.566 (0.235)	2.091 (4.838)	-20.895 (23.004)	-11.627 (11.566)
Δ Trade openness _{t-1}	0.011** (0.001)	-0.047 (0.015)	-0.010 (0.031)	-0.045 (0.018)
Δ OADR _{t-1}	-0.220 (0.058)	0.105 (0.193)	0.339 (0.186)	0.445 (0.191)
Constant	0.052 (0.020)	0.078 (0.047)	-0.140 (0.117)	-0.247* (0.084)
Country FE	✓	✓	✓	✓
Decade FE	✓	✓	✓	✓
Observations	96	96	137	137
R ²	0.354	0.262	0.211	0.242

Notes: Clustered standard errors in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The Bottom 50% and 50%-90% include the United States and France, while the top 1% and 10% include the United Kingdom as well. The panel is unbalanced as the latest observation for the United Kingdom is 2012. The dummy for systemic banking crisis cover the entire length of each crisis.

4.6.4.1 Wealth returns

Greenwald et al. (2021) construct a model to compare repriced and compensated financial wealth distributions using observed portfolio durations. They find that when faced with lower interest rates and returns on wealth, wealthier households increase their savings to keep up their planned levels of consumption and this lead to a rise in wealth inequality. On the opposite, low-wealth households (mostly younger individuals) are harmed by low rates due to timing of excess consumption. However, this result is not clear cut as in the last decade billionaires

have been performing well on the market even with flat interest rates. This would suggest that there is a role for the heterogeneous returns channel alongside the interest rate one.

To test whether financial globalisation contributed to reduce wealth returns and thus indirectly increase wealth inequality I adapt my empirical framework as follows:

$$Return_{i,t} = \alpha + \beta \Delta IFI_{i,t-1} + \Gamma \Delta X_{i,t-1} + \eta_i + \theta_d + \varepsilon_{i,t} \quad (4.13)$$

where $Return_{i,t}$ is an array of wealth returns by asset class from Jordà, Schularick, and Taylor (2017).

The EWN methodology used to construct stocks of assets and liabilities, portfolio equities in particular, cumulates annual flows and then infer the market value by adjusting this for fluctuations in stock prices (Lane and Milesi-Ferretti, 2018). This means that a regression framework with the IFI as a regressor for wealth returns present an endogeneity issue. As such, while I still report the main results for the IFI which signal a statistically significant reduction in the rate of returns of equities following a positive change in the IFI, Appendix Table 4.A.4 shows the results of independent regressions using the sub-indices from Section 4.6.1 which, excluding equity, are less prone to suffer from the endogeneity problem.

In general, a negative relationship between financial globalisation and returns is present for the many types of return and IFI types, particularly those related to financial instruments. This finding, jointly interpreted with those in Sections 4.6.1 and 4.6.2, would suggest that the IFI is transmitting to wealth inequality via the flow channel (i.e., accumulation of new equities) rather than the valuation one.

It is worth noticing that, given that these returns are not differentiated by quantile, the interpretation of results is based on the assumption that returns on wealth are homogeneous across the wealth distribution. Although individual assets returns are heterogeneous across wealth groups (Fagereng, Guiso, et al., 2020; Bach, Calvet, and Sodini, 2020; Xavier, 2021), new research points out that this reflects variation in income flows (Bauluz, Novokmet, and Schularick, 2022).

4.6.4.2 Savings

Recent research has identified private savings as one of the drivers of income – and, potentially indirectly, wealth – inequality (Mian, Straub, and Sufi, 2020; de Ferra, Mitman, Romei, et al., 2021). I proceed in two steps to test this theory with my empirical specification.

First, I check whether financial globalisation is linked to an increase in gross savings, investment, and consumption. Appendix Figure 4.A.6, and more precisely Appendix Table 4.A.5 which includes the set of controls, suggests that there is no significant correlation between changes in the IFI and gross savings, investments, and consumption. Second, based on theoretical reasoning, I use my empirical specification to study whether an increase in gross savings affects wealth shares and if the effect differs according to the level of financial globalisation (interaction term):

$$\Delta W_{i,t}^q = \alpha + \beta \Delta IFI_{i,t-1} + \delta \text{Gross Savings}/GDP_{i,t-1} + \zeta (\text{Gross Savings}/GDP_{i,t-1} \times \Delta IFI_{i,t-1}) + \Gamma \Delta X_{i,t-1} + \eta_i + \theta_d + \varepsilon_{i,t} \quad (4.14)$$

Results in Appendix Table 4.A.6 suggest that an increase in gross savings has a positive effect on the top wealth shares – although not significant – and a negative effect on the bottom 50% wealth share. However, as countries increase their level of foreign ownership, an increase in savings is attenuating this negative effect. The interpretation of these results is not clear cut, so at the current stage this should be seen more as a correlation exercise. Moreover, savings here are assumed to be homogeneous across different wealth quantiles. Fagereng, Holm, et al. (2019) use micro-data for Norway and show that saving rates net of capital gains are approximately homogeneous, independently of the level of wealth.

4.6.5 Robustness checks

Control variables. Given the limited size of the data, the first robustness test I conduct is to check that results are not driven by the addition of single control variables. To check this I individually run separate regressions of the dependent variable ($\Delta W_{i,t}^q$) against the main regressor ($\Delta IFI_{i,t-1}$) and all possible combinations of control variables. Appendix Figure 4.A.7 plots the distribution of the coefficient associated with $\Delta IFI_{i,t-1}$ in each regression and shows that the sign of the coefficient for every wealth quantile is robust to different specifications of the model. Appendix Figure 4.A.8 plots the distribution of the absolute value of the t-statistic associated with $\Delta IFI_{i,t-1}$ in each regression and shows that also the statistical significance of the coefficient for every wealth quantile does not depend of any *ad-hoc* regression design.

Alternative country samples. As the goal of this paper is to explore the role of financial globalisation since its inception, the country sample is limited by the availability of wealth inequality series, as explained in detail in previous sections. However, if we restrict the time horizon to start in the 1990s, it is possible to test the robustness of the empirical framework on a wider unbalanced panel of

countries. To maintain a good level of quality for the wealth inequality series, I select additional countries using the WID's Inequality Transparency Index (ITI) as discussed in Section 4.4. The three additional country samples include the United States, France, and the United Kingdom and gradually add (i) countries in the top 5% of the ITI distribution, (ii) countries in the top 10% of the ITI distribution, and (iii) Japan and China. The enlarged samples include both global creditors and debtors. Appendix Figure 4.A.9 compares the coefficient associated with $\Delta IFI_{i,t-1}$ of the main specification with those estimated from running the model on the extended samples. Both sign and significance of the estimates are strongly robust. The magnitude reduces with more countries included, potentially indicating that the main estimates are upper bounds of the effect. However, including more countries increasingly reduces the time horizon. Compared to the paper sample, the fourth sample covers half of the years, on average. For this reason, I carried out this exercise as a robustness and a preliminary evidence for future research, while the paper focuses on the long-run dynamics of financial globalisation and the distribution of wealth.

Alternative sources for wealth inequality. For the United States, alternative series to the WID are available and used in the literature (Figure 4.5). Although all of them have a shorter historical availability, as a robustness I run a country specific version of the model as follows:

$$\Delta W_t^q = \alpha + \beta \Delta IFI_{t-1} + \Gamma \Delta X_{t-1} + \theta_d + \varepsilon_t \quad (4.15)$$

Appendix Table 4.A.7 shows that the sign of the coefficients is robust to specifications using different series. Statistical significance is less stable, but one would expect this given that the number of observations for many of the alternative series is particularly low. However, the two series which offers the largest number of observations (WID and Smith, Zidar, and Zwick, 2022) display very similar results for both sign and significance. Series from the WID remain those offering the largest number of observations and percentile coverage.

Alternative measures of financial globalisation. In Section 4.4 I discussed the differences between *de-facto* and *de-jure* indices of financial globalisation and explained in details why I use the IFI as the benchmark measure in my analyses. As a robustness to the main results, I estimate the model substituting the IFI index with alternative *de-jure* indices, one by one in separate regressions as the main explanatory variable. To allow comparisons in magnitude other than sign, of coefficients I standardise all the indices. Gräbner et al. (2021) show that findings and implications derived from using different indices can lead to heterogeneous outcomes. Thus, when interpreting the results the reader should keep in mind

the caveats on time and geographical availability previously discussed as well as the fact that indices are not fully comparable as they are based on different definitions. Indeed, specifically for this reason, one would not necessarily expect all coefficients to have a robust sign across indicators. Appendix Figure 4.A.10 compares the coefficients associated with each index for the four wealth quantiles. Interestingly, looking at the top 1%, both magnitude and size of coefficients are consistent with the main specification.

Finally, Appendix Table 4.A.8 shows that results are consistent when looking at foreign assets and liabilities on their own instead of aggregating them.

4.7 Conclusion

Over the last 50 years, advanced economies such as the United States, France, and the United Kingdom experienced a significant increase in wealth inequality within their population. The rise in financial globalisation, which we observed over the same time horizon, could explain at least part of this. The discussion on the causes of these trends is at the forefront of the debate in the literature.

This paper studies the link between financial globalisation and wealth inequality, using a fixed effects panel data model for the United States, France, and the United Kingdom. The main result points towards a significant positive link between the increase in financial globalisation – proxied with the International Financial Integration index, IFI – and changes in the top 1% (the rich) and 10% (upper middle-class) wealth shares and a significant negative link with changes in the wealth share of the bottom 50% of the distribution (working class). These results imply that considering the average change in the IFI during the period 1970-2019, the effect on wealth shares would be in the magnitude of approximately \$1 trillion and \$1.6 trillion, for the top 10% and 1% respectively.

Decomposing the IFI using functional categories of external assets and liabilities I find that the main driving components of this result appear to be portfolio equities and financial derivatives. By disentangling the valuation component from the accumulation of flows, I find that the increase in inequality following the acceleration in financial globalisation is driven by the flow. The wealthy get richer due to an expansion of their international portfolios, through new purchases or reinvestment of capital gains, rather than just a market value gain on their existing stock of wealth. On the same line, although they have an economically meaningful effect, the main drivers of valuation effects (exchange rate, share prices, and house prices) do not seem to play a significant role. Finally, the main finding is strengthened in the event of a systemic banking crisis. An explanation

is that this reflects a mismatch in recovery times between the wealthy and the poor. People at the top of the distribution have access to a wider range of financial instruments and investments opportunities, which makes them more likely to recover their lost wealth faster than people at the bottom of the distribution.

Financial globalisation can also affect wealth inequality via an indirect effect toward other economic dynamics. I find that financial globalisation played a potential significant role in reducing wealth returns, contributing to push up precautionary savings and increasing wealth inequality. Moreover, positive changes in the IFI are associated with positive (but not significant) changes in gross savings to GDP, which then is correlated with positive wealth gains at the top of the distribution.

There are multiple policy implications stemming from these results. Two are the most immediate and directly emerging from the framework itself. On the one hand, capital account policies and capital flow management, including macro-prudential measures, could help mitigate the inequality-enhancing effect by targeting access to financial instruments. The discussion around these policies is very topical (Pasricha and Nier, 2022). On the other hand, progressive taxation of capital and wealth could be used to redistribute gains from the top to the bottom. Both academics and policymakers have been studying the optimal design and implementation of such taxes (OECD, 2018; Scheuer and Slemrod, 2021; Hebous et al., 2024). However, these policies should be carefully evaluated against implications for the growth rate of the economy and the overall welfare, to avoid undesired side effects such as sudden stops in capital flows and profit shifting. But policy implications are even more far-reaching. The promotion of financial literacy would help more people in gaining access to global markets. Policies aimed at financial stability would help reduce the effect of financial crises on inequality.

This paper aims to take the first step in empirically studying the direct dynamics of financial globalisation on the distribution of wealth from a cross-country perspective. However, some limitations persist. The existing data, extensively discussed in the paper, do not allow for the analysis of a wide range of countries for the full period covering the advent of financial globalisation to present days. Moreover, these limitations extend to the feasibility of models that can be estimated in this context. As such, researchers must make choices regarding sampling and modelling. While I acknowledge this limitation, robustness exercises, conducted by enlarging the sample – albeit at the expense of historical depth – confirm the main finding. Given the current state of data availability and quality, conducting a broader analysis remains a key avenue for future research,

which will aim to extend and validate the main results of this paper.

Appendix 4.A Additional figures and tables

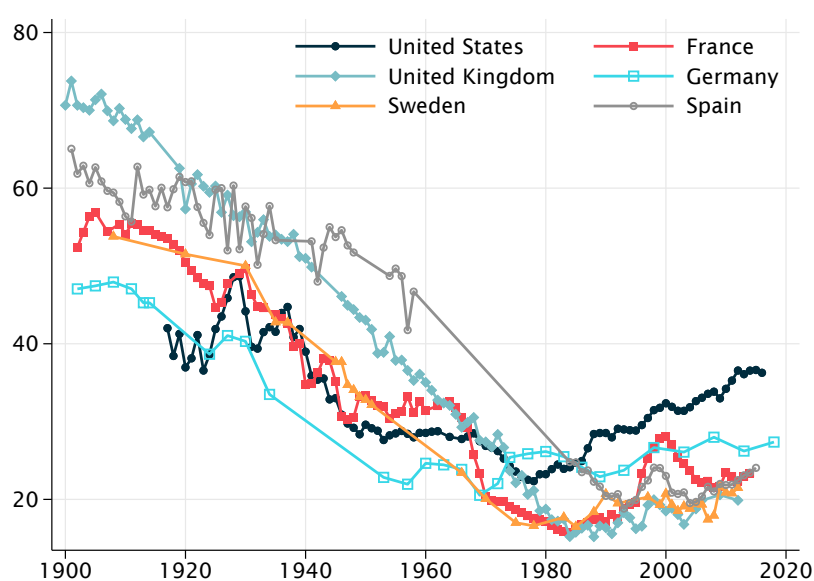


Figure 4.A.1: Top 1% wealth shares, percentage of total net wealth

Notes. See Waldenström (2021) for definitions and details on data sources. Sources: France: Garbinti, Goupille-Lebret, and Piketty (2021), Piketty, Postel-Vinay, and Rosenthal (2006); Germany: Albers, Bartels, and Schularick (2020); Spain: Martínez-Toledano (2020); Sweden: Roine and Waldenström (2009), Lundberg and Waldenström (2018); United Kingdom: Alvaredo, Atkinson, and Morelli (2018); United States: Saez and Zucman (2016), Saez and Zucman (2020b).

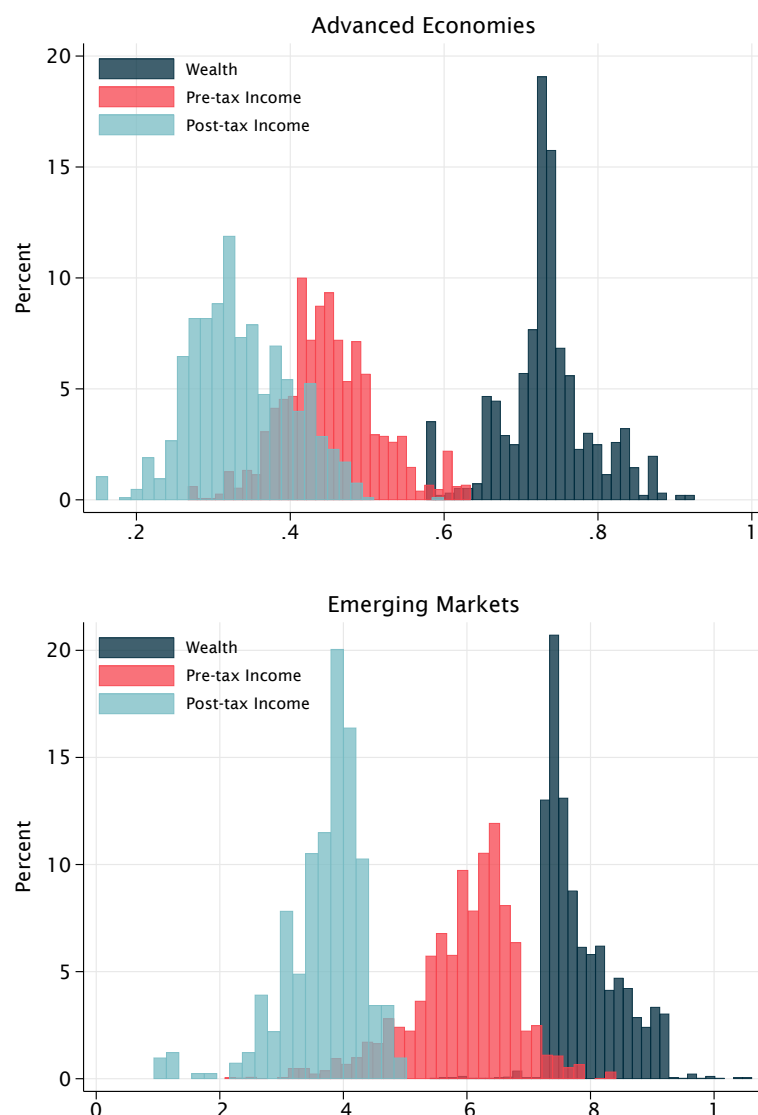


Figure 4.A.2: Distribution of Gini coefficients, over all years

Notes. 1995-2019 (1970-2019 for United States and France). Advanced economies: Australia, Austria, Belgium, Canada, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Iceland, Ireland, Israel, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States. Emerging Markets: Afghanistan, Albania, Algeria, Angola, Argentina, Armenia, Azerbaijan, Bahamas, Bahrain, Bangladesh, Belarus, Belize, Benin, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Brunei, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo-Brazzaville, Congo-Kinshasa, Costa Rica, Cote d'Ivoire, Croatia, Cuba, Djibouti, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Georgia, Ghana, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, India, Indonesia, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyzstan, Laos, Lebanon, Lesotho, Liberia, Libya, Macao, Macedonia, Madagascar, Malawi, Malaysia, Maldives, Mali, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Nigeria, North Korea, Oman, Pakistan, Palestine, Panama, Papua New Guinea, Paraguay, Peru, Poland, Qatar, Romania, Russia, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sri Lanka, Sudan, > Suriname, Swaziland, Syria, Taiwan, Tajikistan, Tanzania, Thailand, Timor-Leste, Togo, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, Uruguay, Uzbekistan, Venezuela, Vietnam, Yemen, Zambia, Zanzibar, Zimbabwe. Source: World Inequality Database (WID).

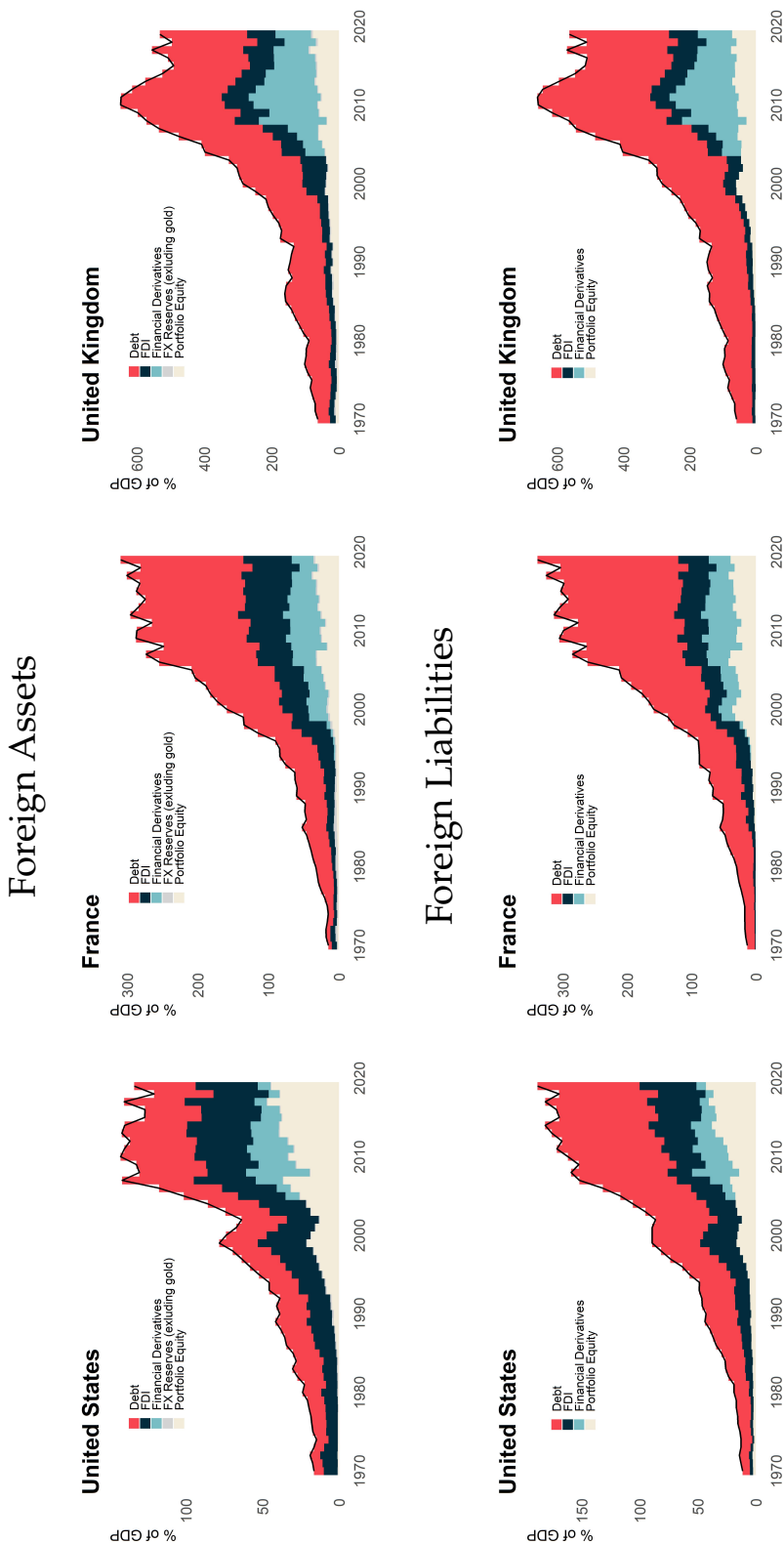


Figure 4.A.3: Composition of external assets and liabilities
Notes. Source: External Wealth of Nations (EWN).

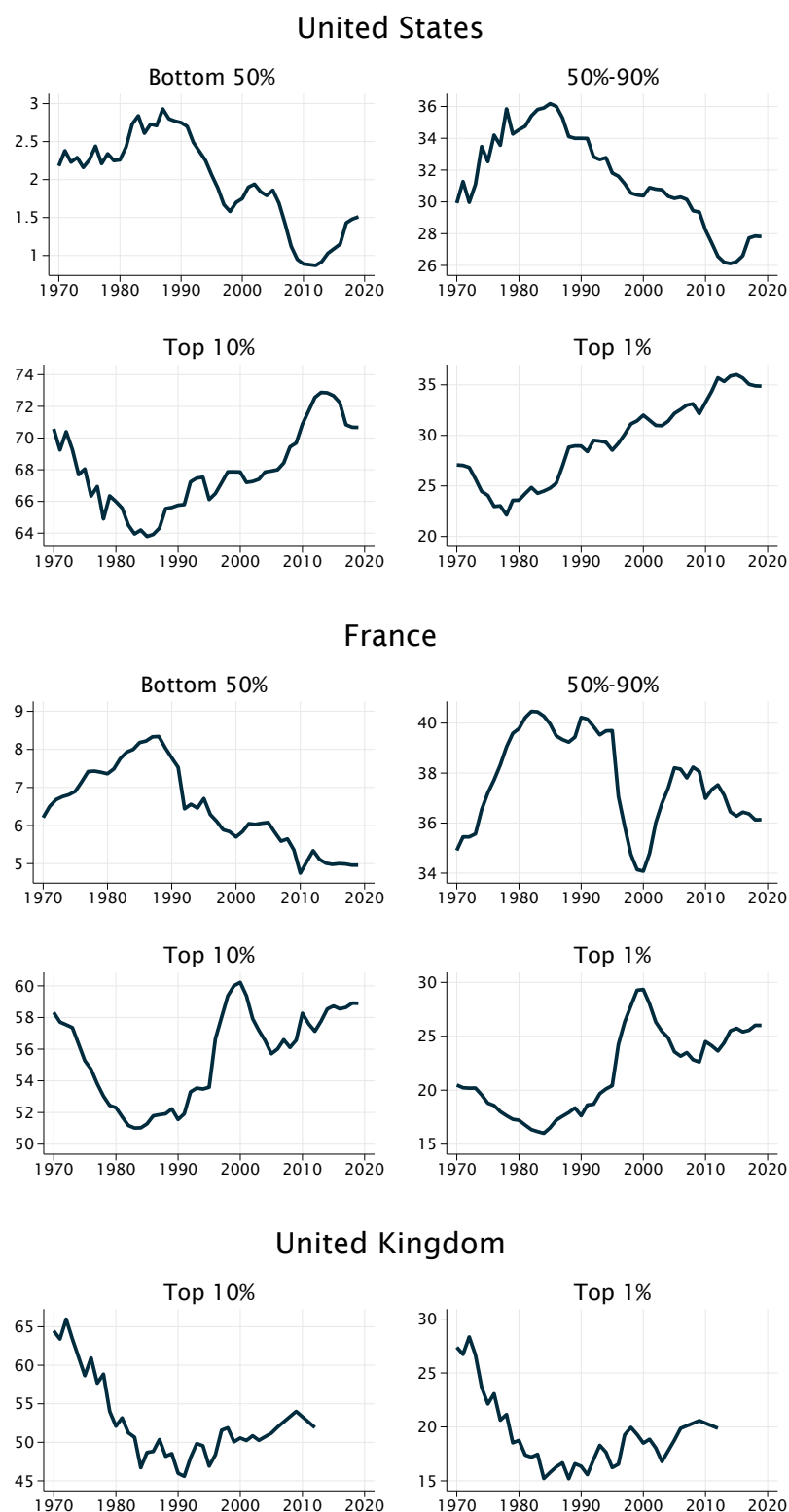


Figure 4.A.4: Net wealth shares, percentage of total net wealth

Notes. Share of net wealth owned by each quantile as a percentage of the total net wealth of the country. Latest observation is 2019 for the United States and France, 2012 for the United Kingdom. Missing data for the UK are linearly interpolated. Source: World Inequality Database (WID).

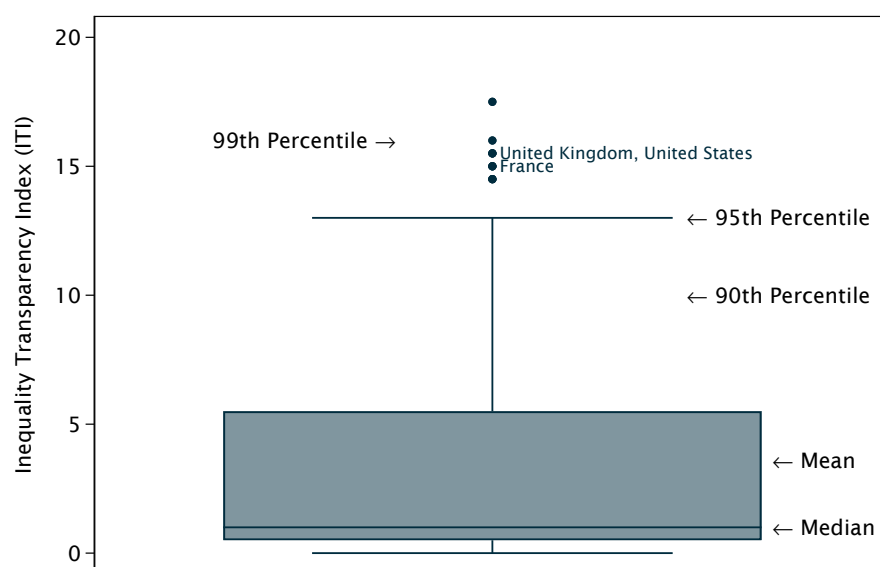


Figure 4.A.5: WID's Inequality Transparency Index (ITI)

Notes. Source: World Inequality Database (WID). The ITI is a country-level proxy for the availability and quality of the microdata (admin and survey data) used to compute the wealth inequality series. The index ranges from 0 to 20. Summary statistics: minimum 0, maximum 17.5, median 1, mean 3.5, standard deviation 4, 95th percentile 13, 5th percentile 0. Data for 2022. For more information on the ITI see here: <http://wid.world/transparency/>.

Table 4.A.1: Stationarity, Dickey–Fuller test for unit root

Variable	Standard			Trend			Drift		
	US	FR	UK	US	FR	UK	US	FR	UK
Δ IFI	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Δ Wealth Share ^{B50}	0.00	0.00		0.00	0.00		0.00	0.00	
Δ Wealth Share ^{50–90}	0.00	0.00		0.00	0.01		0.00	0.00	
Δ Wealth Share ^{T10}	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Δ Wealth Share ^{T1}	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
Δ Real GDP per capita	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Δ Debt to GDP ratio	0.01	0.00	0.02	0.06	0.01	0.08	0.00	0.00	0.00
Δ Short term interest rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Δ Long term interest rate	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Δ TFP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Δ Trade openness	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Δ OADR	1.00	0.83	0.43	1.00	0.76	0.61	0.95	0.23	0.05

Notes: The table reports MacKinnon approximate p-values for $Z(t)$ resulting from performing augmented Dickey–Fuller tests. With a p-value lower than 0.1 we can reject the null hypothesis that the variable contains a unit root, i.e. the variable is generated by a stationary process. The test is performed in the standard form, as well as including a trend and a drift term.

Table 4.A.2: Data sources and description

<i>Variable</i>	<i>Description</i>	<i>Source</i>
Wealth shares	Shares of net personal wealth, equal-split among all adult individuals Alternative sources for the United States	World Inequality Database (WID) Fed's Distributional Financial Account (retrieved via FRED), Credit Suisse Global Wealth Report 2021, Kuhn, Schularick, and Steins (2020), Smith, Zidar, and Zwick (2022).
International Investment Positions	External assets and liabilities, and related sub-components	External Wealth of Nations (EWN)
Capital flows	Financial account, credit and debit entries	International Monetary Fund (IMF – BOP)
GDP and GDP per capita	Nominal and real national GDP in US Dollars and local currency	International Monetary Fund (IMF), World Bank (WB)
Debt to GDP	Public debt to GDP ratio	Abbas et al. (2010) updated October 2020, International Monetary Fund (IMF – WEO)
Short term interest rates	Nominal, percent	OECD (EO), Jordà, Schularick, and Taylor (2017) release R.6, IMF (IFS) for EMEs
Long term interest rates	Nominal long-term government bond yields (10-year), percent	Organisation for Economic Co-operation and Development (OECD – MEI), retrieved via FRED
Total Factor Productivity	TFP at constant national prices	Feenstra, Inklaar, and Timmer (2015), retrieved via FRED
Imports and Exports	Including both goods and services, nominal	Jordà, Schularick, and Taylor (2017) release R.6
OADR	Old Age Dependency Ratio: share, population >65 over population aged 15-64	World Bank (WB), retrieved via FRED
Banking crises	Systemic banking crises, full length	Laeven and Valencia (2020)
NEER	Nominal Effective Exchange Rate, trade weighted	Bank for International Settlements (BIS), retrieved via FRED
Share prices	Share price index, all shares, 2015=100	Organisation for Economic Co-operation and Development (OECD – MEI), retrieved via FRED
House prices	Nominal residential property prices, index 2010=100	Bank for International Settlements (BIS), retrieved via FRED
Wealth returns	Nominal returns, by type of asset, local currency	Jordà, Schularick, and Taylor (2017), Jordà, Knoll, et al. (2019) release R.6
Gross savings	Gross savings (% GDP, Y-C-NT)	World Bank (WB)
Gross investments	Gross fixed capital formation (% GDP)	World Bank (WB)
Consumption	Final consumption expenditure (% GDP)	World Bank (WB)
Household consumption	Households and NPISHs final consumption expenditure (% GDP)	World Bank (WB)
Government consumption	General government final consumption expenditure (% GDP)	World Bank (WB)
Fernández et al.	Overall capital restrictions index (all asset categories, 1995-2017)	Fernández et al. (2016)
Chinn-Ito	Chinn-Ito index of financial openness (1970-)	Chinn and Ito (2008)
Abiad et al.	Index of financial reforms (1973-2005)	Abiad, Detragiache, and Tresselt (2010)
Quinn	Quinn index of capital account openness (1970-2007)	Quinn (1997)
KOF	Index of <i>de-jure</i> financial globalisation (1970-)	Dreher (2006), Gygli et al. (2019)

Table 4.A.3: Tests for cross-sectional independence

	(1)	(2)	(3)	(4)
	Bottom 50%	50%-90%	Top 10%	Top 1%
<i>H₀ = Residuals are not correlated (cross-sectional independence)</i>				
	Breusch-Pagan LM			
Test statistic	0.421	0.067	2.916	0.266
Pr	0.517	0.927	0.405	0.966
	Pesaran			
Test statistic	0.528	0.404	0.364	0.325
Pr	0.193	0.686	0.716	0.7445
	Frees			
Test statistic	-0.024	-0.030	-0.051	-0.069
Pr	1.442	1.531	1.702	1.844

Notes: Tests are executed post estimation of the model in Equation 4.2. The Breusch-Pagan LM tests is the preferred one as $T > N$ in the case of my model (De Hoyos and Sarafidis, 2006). However, I also report results for the Pesaran and Frees tests and they are robust. Based on the p-values, the null hypothesis should not be rejected.

Table 4.A.4: Wealth returns

	Wealth	Equity			Housing				Bond
	(1) TR	(2) TR	(3) DR	(4) CGR	(5) TR	(6) CGR	(7) RR	(8) RYR	(9) TR
ΔIFI_{t-1}	-0.027 (0.011)	-0.103*** (0.007)	-0.007*** (0.000)	-0.096*** (0.008)	-0.004 (0.008)	-0.003 (0.009)	-0.001 (0.001)	-0.001 (0.001)	-0.015 (0.027)
R ²	0.341	0.187	0.748	0.168	0.495	0.493	0.804	0.818	0.247
ΔIFI_{t-1}^{PE}	0.014 (0.026)	-0.235** (0.048)	-0.022* (0.005)	-0.213** (0.043)	0.124** (0.024)	0.119** (0.022)	0.005 (0.002)	0.001 (0.001)	0.042 (0.045)
R ²	0.325	0.179	0.752	0.160	0.525	0.523	0.806	0.817	0.247
ΔIFI_{t-1}^{FD}	-0.025* (0.007)	0.047 (0.017)	0.003** (0.001)	0.044 (0.017)	-0.054* (0.017)	-0.053* (0.015)	-0.001 (0.002)	0.000 (0.001)	-0.055 (0.042)
R ²	0.307	0.349	0.617	0.353	0.558	0.572	0.860	0.896	0.280
ΔIFI_{t-1}^{FDI}	-0.006 (0.014)	-0.208** (0.039)	-0.015 (0.005)	-0.194** (0.034)	0.101 (0.058)	0.099 (0.051)	0.002 (0.007)	-0.001 (0.005)	-0.049 (0.058)
R ²	0.325	0.174	0.739	0.155	0.508	0.507	0.804	0.817	0.247
ΔIFI_{t-1}^D	-0.017 (0.006)	-0.152** (0.030)	-0.006 (0.002)	-0.146** (0.028)	0.029* (0.008)	0.030* (0.008)	-0.001 (0.001)	-0.002 (0.001)	-0.000 (0.025)
R ²	0.328	0.189	0.740	0.171	0.502	0.502	0.804	0.818	0.246
Controls	✓	✓	✓	✓	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Decade FE	✓	✓	✓	✓	✓	✓	✓	✓	✓
Observations	144	144	144	144	144	144	144	144	144

Notes: Clustered standard errors in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. TR = total return, DR = dividend return, CGR = capital gain return, RR = rent return, RYR = rent yield return. Returns in percent. For the regression on derivatives IFI observations are 51.

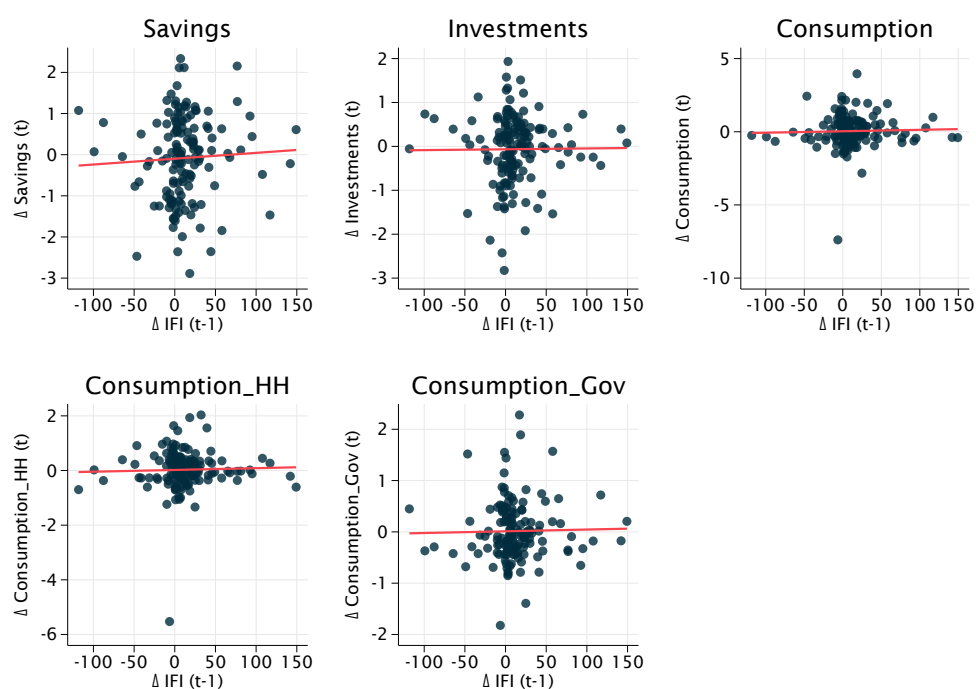


Figure 4.A.6: Correlations, without controls

Notes. Sources: International Monetary Fund (IMF), External Wealth of Nations (EWN), World Bank (WB), author's calculations.

Table 4.A.5: Savings, Investments, Consumption

	Δ Dependent variable (all scaled by GDP, time t)				
	(1) Savings	(2) Investments	(3) Consumption	(4) Cons HH	(5) Cons Gov
ΔIFI_{t-1}	0.0038 (0.002)	0.0022 (0.002)	0.0003 (0.004)	0.0015 (0.002)	-0.0013 (0.002)
Controls	✓	✓	✓	✓	✓
Country FE	✓	✓	✓	✓	✓
Decade FE	✓	✓	✓	✓	✓
Observations	140	143	144	144	144
R ²	0.261	0.345	0.243	0.118	0.384

Notes: Clustered standard errors in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Gross savings and investments. Data from the World Bank.

Table 4.A.6: Savings and wealth

	Dependent variable: Δ Wealth Share _t			
	(1) Bottom 50%	(2) 50%-90%	(3) Top 10%	(4) Top 1%
ΔIFI_{t-1}	-0.002** (0.000)	-0.003 (0.001)	0.005 (0.002)	0.006** (0.001)
Δ Gross Savings/GDP _{t-1}	-0.039** (0.001)	-0.138** (0.007)	-0.041 (0.239)	0.066 (0.126)
$\Delta IFI_{t-1} \times \Delta$ Gross Savings/GDP _{t-1}	0.001*** (0.000)	0.000 (0.003)	0.003 (0.004)	-0.000 (0.001)
Controls	✓	✓	✓	✓
Country FE	✓	✓	✓	✓
Decade FE	✓	✓	✓	✓
Observations	91	91	132	132
R ²	0.314	0.246	0.204	0.237

Notes: Clustered standard errors in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

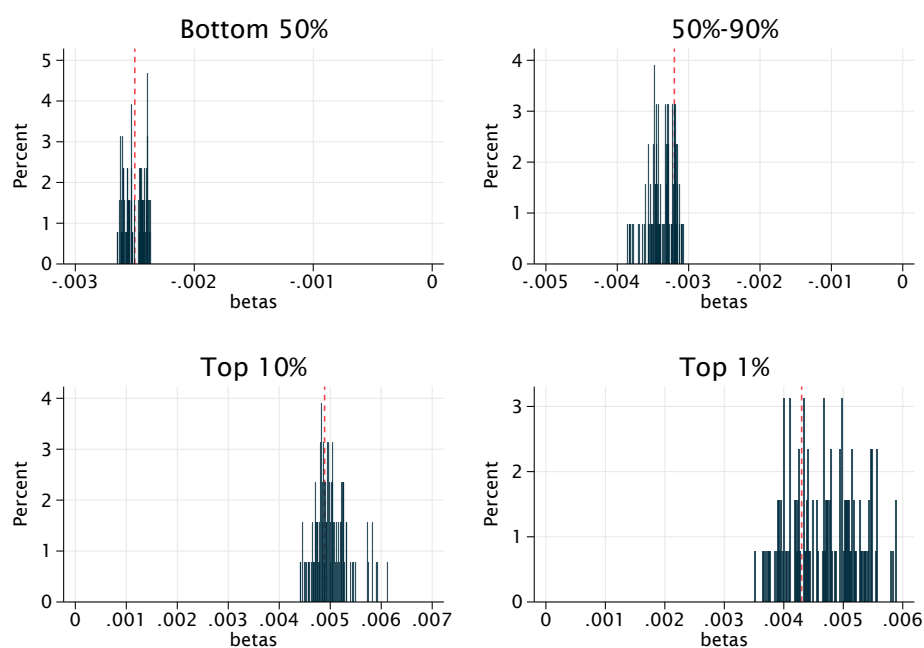


Figure 4.A.7: Coefficients resulting from 128 permutations of the model

Notes. Betas of individual regressions of the wealth share against all possible combinations of regressors. The red dashed line is the coefficient of the model including all controls and country fixed effects. Due to technical reasons, the permutations exclude decade fixed effects. Although the magnitude is slightly smaller, this does not particularly affect the sign nor the statistical significance of the main baseline model (Equation 4.2).

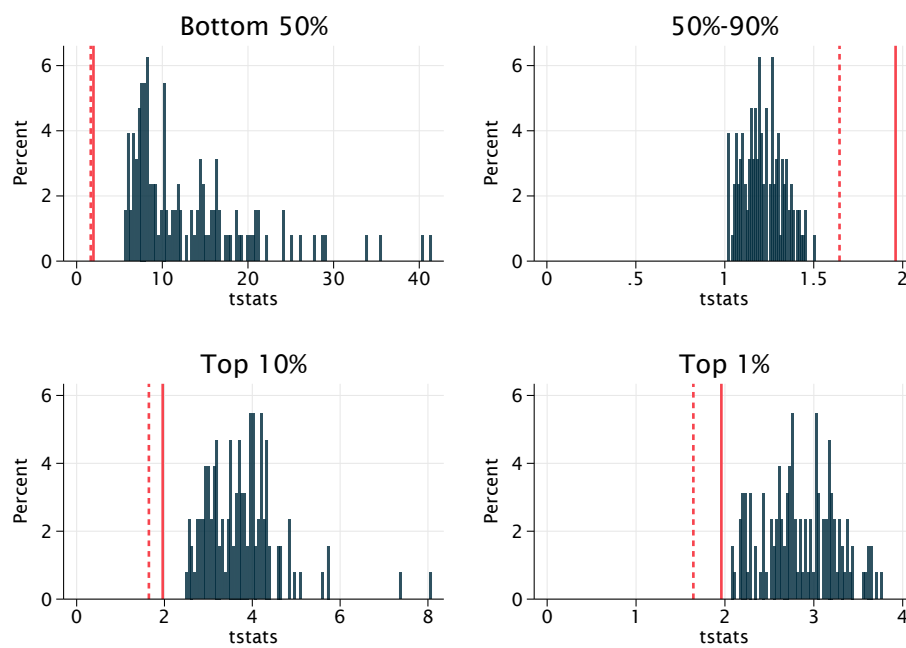


Figure 4.A.8: T statistics resulting from 128 permutations of the model

Notes. t statistics of individual regressions of the wealth share against all possible combinations of regressors. The red solid line is the critical value for 95% statistical significance (1.96). The red dashed line is the critical value for 90% statistical significance (1.645). Due to technical reasons, the permutations exclude decade fixed effects. Although the magnitude is slightly smaller, this does not particularly affect the sign nor the statistical significance of the main baseline model (Equation 4.2).

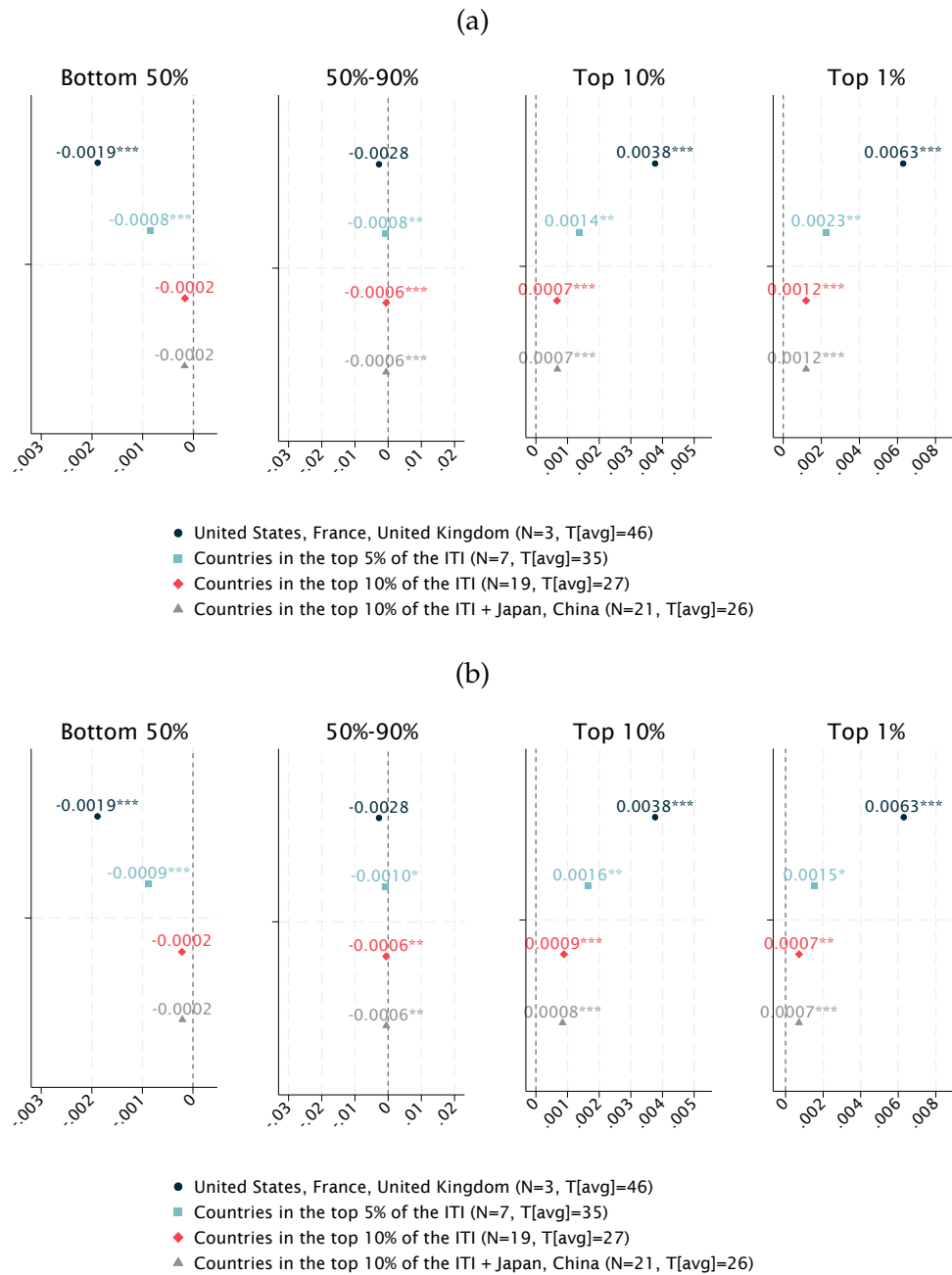


Figure 4.A.9: Robustness to country samples

Notes. Estimated coefficient of the IFI. The country samples are cumulative. The first sample is the main one of the paper. The second sample adds Netherlands, Norway, Spain, Sweden. The third sample adds Austria, Belgium, Colombia, Denmark, Finland, Germany, Ireland, Italy, Korea, New Zealand, Portugal, Switzerland. The fourth sample adds Japan and China. Panel (a) shows results as in the main model specification, with decade fixed effects. Panel (b) shows results with year fixed effects instead of decade fixed effects, except for the first sample which remains referenced as in the main specification. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 4.A.7: United States – Alternative data sources

	$\Delta W_t^q = \alpha + \beta \Delta IFI_{t-1} + \Gamma \Delta X_{t-1} + \theta_d + \varepsilon_t$				
	(1)	(2)	(3)	(4)	
	Bottom 50%	50%-90%	Top 10%	Top 1%	N
WID (Benchmark)	-0.002 (0.001)	-0.007 (0.006)	0.013* (0.007)	0.020*** (0.006)	48
Smith et al. (2022)			0.022** (0.011)	0.030*** (0.009)	45
Fed's DFA	-0.000 (0.003)	-0.016* (0.009)	0.018** (0.008)	0.006 (0.011)	29
Credit Suisse	-0.000 (0.002)	-0.000 (0.016)	0.000 (0.014)	-0.011 (0.016)	19
SCF+	-0.007*** (0.001)	-0.022 (0.012)	0.029* (0.011)	0.012 (0.002)	12
Controls	✓	✓	✓	✓	
Decade FE	✓	✓	✓	✓	

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Robust standard errors in parenthesis. Each line represent a different regression as specified in the equation on top of the table, in which a different data source for wealth shares is used each time. The coefficient reported is the one associated with the explanatory variable ΔIFI_{t-1} .

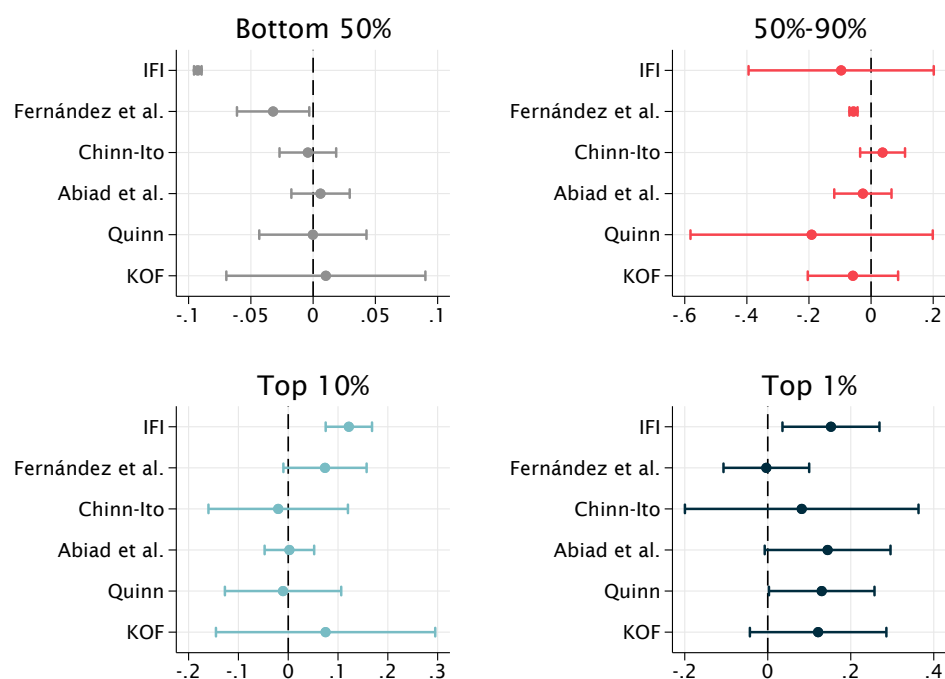


Figure 4.A.10: Different proxies of financial globalisation

Notes. Coefficient of individual regressions of the wealth share against each (standardised) index of financial globalisation. 90% confidence bands. Note that opposite to all other measures, the index by Fernández et al. (2016) concerns restrictions to capital. Thus, the interpretation of its coefficient sign is opposite as the others. See Table 4.A.2 for sources, definitions, and time coverage.

Table 4.A.8: Robustness – Assets and Liabilities

	Dependent variable: Δ Wealth Share _{<i>i</i>}							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Bottom 50%	50%-90%	Top 10%	Top 1%	Bottom 50%	50%-90%	Top 10%	Top 1%
Δ FA/GDP _{<i>t-1</i>}	-0.003*** (0.000)	-0.006 (0.004)	0.009** (0.002)	0.014*** (0.001)				
Δ FL/GDP _{<i>t-1</i>}					-0.004** (0.000)	-0.005 (0.003)	0.006** (0.001)	0.011*** (0.001)
Δ Real GDP per capita _{<i>t-1</i>}	-0.017 (0.046)	-0.024 (0.030)	0.010 (0.132)	0.225* (0.072)	-0.014 (0.041)	-0.021 (0.028)	0.011 (0.138)	0.221* (0.075)
Δ Debt to GDP ratio _{<i>t-1</i>}	-1.509* (0.183)	-5.853** (0.197)	-1.905 (7.796)	2.256 (6.481)	-1.497* (0.195)	-5.862** (0.115)	-1.559 (7.369)	2.571 (6.184)
Δ Short-term interest rate _{<i>t-1</i>}	-0.021 (0.021)	0.025 (0.021)	-0.053 (0.065)	-0.001 (0.038)	-0.021 (0.018)	0.026 (0.025)	-0.054 (0.066)	-0.002 (0.041)
Δ Long-term interest rate _{<i>t-1</i>}	0.036 (0.018)	0.078 (0.021)	-0.269 (0.160)	-0.148 (0.152)	0.034 (0.017)	0.075 (0.021)	-0.268 (0.163)	-0.147 (0.158)
Δ TFP _{<i>t-1</i>}	1.857 (0.624)	4.558 (4.977)	-21.994 (20.983)	-11.979 (9.915)	1.584 (1.119)	4.254 (4.468)	-21.348 (20.612)	-10.856 (9.433)
Δ Trade openness _{<i>t-1</i>}	0.012 (0.006)	-0.047 (0.025)	-0.005 (0.021)	-0.039 (0.014)	0.012 (0.003)	-0.047 (0.021)	-0.003 (0.018)	-0.036 (0.018)
Δ OADR _{<i>t-1</i>}	-0.169 (0.031)	0.201 (0.198)	0.302 (0.253)	0.429 (0.197)	-0.175 (0.038)	0.200 (0.205)	0.285 (0.227)	0.423 (0.201)
Constant	0.041 (0.028)	0.059 (0.033)	-0.080 (0.110)	-0.198 (0.098)	0.049 (0.025)	0.061 (0.036)	-0.067 (0.116)	-0.194 (0.100)
Country FE	✓	✓	✓	✓	✓	✓	✓	✓
Decade FE	✓	✓	✓	✓	✓	✓	✓	✓
Observations	96	96	137	137	96	96	137	137
R ²	0.281	0.243	0.204	0.240	0.300	0.242	0.199	0.230

Notes: Clustered standard errors in parenthesis. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The Bottom 50% and 50%-90% include the United States and France, while the top 1% and 10% include the United Kingdom as well. The panel is unbalanced as the latest observation for the United Kingdom is 2012.

Chapter 5

Beyond Borders, Within Societies: Inequality and the Global Transmission of US Monetary Policy

Some foreign policymakers were too willing, at least in public pronouncements, to accept the idea that countries other than the United States were the purely passive objects of the effects of Fed policy decisions, with little ability or responsibility to improve their own economic situations or to help make the international system work better.

Ben S. Bernanke (2015)

Central banks are fully aware of the growing prominence of inequality in the public debate. Inequality is part of the environment in which monetary policy is set, and central bankers have to reflect it in their decisions.

Agustín Carstens (2021)

5.1 Introduction

The Federal Reserve's (Fed) monetary policy actions transmit beyond the borders of the United States (US). This reflects the global role of the US in international finance, trade, and payments, as well as the increased co-movement of macro-financial variables on a global scale and the relevance of financial linkages (Rey, 2013, 2016; Bruno and Shin, 2015a; Miranda-Agrippino and Rey, 2020b; Jiang, Krishnamurthy, and Lustig, 2024). The existing literature suggests that, on average, a US monetary policy tightening contracts foreign economic activity (Dedola, Rivolta, and Stracca, 2017; Iacoviello and Navarro, 2019). In standard theory, this effect is attributed to the negative impact on domestic demand due to

higher interest rates and the shift from domestic to foreign goods caused by the appreciation of the US dollar.¹

Monetary policy affects and is affected by macroeconomic dynamics. Several contributions in the literature document that spillover effects are conditional on relevant country-specific characteristics, such as capital controls, bank lending, and exchange rate regimes. Economic inequality could complement these conditioning factors, by emphasising the role of within-country differentials in consumption-saving patterns (Ahn et al., 2018; McKay and Wolf, 2023). Inequality in disposable income displays significant variation, both across countries and over time. In particular, disposable income is more unequally distributed in emerging market economies (EMEs) than in advanced economies (AEs). On average, the Gini coefficient is around 10 percentage points higher in EMEs, with the standard deviation being almost twice that of advanced economies.² This is attributable to various factors, including the structure of the economic environment, skill levels, labour market conditions, and the strength of institutions.

While there is growing interest in the interplay between macroeconomic policies and household heterogeneity, evidence on how monetary policy affects and is affected by inequality is still scarce. In this paper, I contribute to the discussion by studying whether household heterogeneity affects the transmission of monetary policy. Specifically, I investigate how income inequality within foreign countries influences the extent to which US monetary policy spills over to their economic activity (i.e., GDP).

I first address the research question empirically. As changes in the interest rate are endogenous to domestic and global economic conditions, I identify a time series of US monetary policy shocks following the approach of Iacoviello and Navarro (2019). This methodology generates a variable that measures exogenous increases in the US policy rate that could not have been predicted by domestic and global developments. Then, I estimate the effects of a US monetary policy tightening on real foreign economic activity (GDP) for a panel of 87 countries by means of local projections *à la* Jordà (2005). Once I have assessed traditional monetary policy spillovers, I introduce income inequality into the framework. I use state-dependent local projections as in Cloyne, Jordà, and Taylor (2023). This methodology, which exploits the Kitagawa-Blinder-Oaxaca decomposition, allows for conditioning the effect of the shock on the outcome based on the level of

¹Section 5.2 will offer a more detailed explanation of the relevant transmission channels through which monetary policy affects economic conditions in the rest of the world.

²These summary statistics are calculated for the sample of countries analysed in this paper, using data from the Standardized World Income Inequality Database for the period 1966-2020.

a state variable. In the case of this paper, the latter is disposable income inequality within each country, measured by the Gini index.

The empirical findings corroborate the existing evidence in the literature. Specifically, I validate that a US monetary policy tightening significantly depresses real output in both advanced and emerging market economies. In addition, I uncover new facts. The novel contribution of this paper is to provide evidence on how income inequality in the recipient country affects the intensity of these spillovers. First, I find that higher income inequality amplifies the negative effect of US monetary tightening on the real economy. At its trough, GDP growth contracts nearly two to three times more when inequality is at the 75th and 90th percentiles compared to when it is at its average level. Second, I show that while this result holds for advanced economies, it is reversed for emerging market economies, where higher inequality mitigates the negative spillovers on real output. These results are robust to different local projection specifications, such as binary state-dependence or comparative approaches by group.

To rationalise the transmission channels behind these results and to elucidate why there is heterogeneity in the direction of the relationship between AEs and EMEs, I turn to a theoretical model. I build on the three-country open-economy model of Eichenbaum, Johannsen, and Rebelo (2021) and include household heterogeneity (Campbell and Mankiw, 1989; Galí, López-Salido, and Vallés, 2007; Bilbiie, 2008). Each economy features two types of households: financially constrained and unconstrained. The former have labour income as their only source of income and consume all of it as they do not have access to financial markets. The latter receive labour income and decide their consumption–savings pattern as they can invest in domestic and international financial markets.³ Other than households, each economy includes competitive producers, retailers, a government, and the central bank. I use the model to study how the real economy and household behaviour in the two foreign countries is affected by a monetary policy shock originating in the United States.⁴

There are two key takeaways. First, the theoretical model produces responses

³In interpreting the model, constrained households are assumed to represent poor households, as they rely on a single source of income and do not save, while unconstrained households serve as proxies for rich households, given their access to multiple income sources.

⁴The choice of a Two-Agent New Keynesian (TANK) model over a Heterogeneous Agents New Keynesian (HANK) is justified by the focus of this paper being to study the dynamics of the aggregate distribution rather than those of the distribution within agents, for which the latter would be more appropriate. Moreover, TANK models are more parsimonious and provide a simpler interpretation of the aggregate distribution. Debortoli and Galí (2024) show that TANK models distinguishing between two types of households, *hand-to-mouth* and unconstrained, effectively capture the overall effects of household heterogeneity and related mechanisms.

to the shock that qualitatively replicate the empirical findings. Second, it suggests that the key factor shaping the direction in which inequality affects the transmission of US monetary policy to foreign economies is their level of participation in international financial markets. This determines how much unconstrained households lose or gain from holding foreign bonds, specifically US ones, after the shock. In general, higher inequality contributes to strengthening the negative effects of US monetary policy. When the shock hits, unconstrained households invest in US bonds rather than domestic ones or consumption, generating a capital outflow and negatively impacting the domestic economy. However, when accounting for the higher cost of foreign bond holding in EMEs, I find that higher inequality reduces the negative spillovers to the real economy. This is because, even in the presence of high household heterogeneity, if unconstrained households do not have easy access to foreign markets, it is not possible for them to re-balance their portfolio from domestic to foreign bonds. As a consequence, the negative effect on domestic financial conditions that would be generated by this capital outflow is reduced. I test the interaction between inequality and financial openness empirically and provide confirmation of this mechanism in the data.

Related literature. The contribution of this paper is threefold. First, I contribute to the extensive literature on the global transmission of US monetary policy. A non-exhaustive list of recent relevant studies includes Passari and Rey (2015), Ammer et al. (2016), Georgiadis (2016), Dedola, Rivolta, and Stracca (2017), Gerko and Rey (2017), Dées and Galesi (2021), Iacoviello and Navarro (2019), Miranda-Agrippino and Rey (2020b), Degasperi, Hong, and Ricco (2023), Miranda-Agrippino and Ricco (2021), Ca' Zorzi et al. (2023), Georgiadis and Jarociński (2023), and Kalemli-Özcan and Unsal (2024). The key general takeaway is that, given the global role of the US, the Fed's monetary policy significantly affects real and financial conditions in the rest of the world. Among the channels identified behind this result, the existence of a global financial cycle, global financial conditions, and the financial channel in general are the main ones.⁵ Moreover, the international transmission of monetary policy depends on country-specific characteristics, including capital controls, exchange rate regimes, trade

⁵Numerous studies have explored the effects of US monetary policy transmitted via the global financial cycle, financial markets, and risk taking. Examples are Craine and Martin (2008), Ehrmann and Fratzscher (2009), Wongswan (2009), Hausman and Wongswan (2011), Bekaert, Hoerova, and Duca (2013), Rogers, Scotti, and Wright (2014), Rey (2013), Chen et al. (2016), Banerjee, Devereux, and Lombardo (2016), Fratzscher, Lo Duca, and Straub (2018), Gilchrist, Yue, and Zakrajšek (2019), Viccondoa (2019), Albagli et al. (2019), Ha (2021), and Kearns, Schrimpf, and Xia (2023). Global financial conditions, through the effect on the US dollar, are identified as relevant for example in Rey (2016), Gourinchas, Rey, and Sauzet (2019), Obstfeld (2020), and Miranda-Agrippino and Rey (2022).

exposure, and levels of economic development.⁶ While the findings are generally consistent, there is heterogeneity in the spillover effects between conventional and unconventional monetary policies.⁷

This study makes a dual contribution to the above literature. On the one hand, it validates existing findings regarding monetary spillovers for a wide panel of advanced and emerging market economies. On the other hand, it assesses how these effects vary when responses are conditioned on different levels of inequality.

Second, this paper contributes to the literature examining how economic inequality influences the transmission of monetary policy. Although this is a relatively new and smaller area of research, primarily focused on domestic transmission rather than international effects, it is fascinating and highly relevant. It sheds light on how inequality shapes the effectiveness of monetary policy and how monetary and fiscal policies can internalise this indirect effect. McKay and Wolf (2023) provide a comprehensive discussion of the role of household heterogeneity in monetary policy transmission, emphasising interest rate refinancing and differential consumption responses as key channels.

Theoretical papers establish a direct link between inequality and the effectiveness of monetary policy.⁸ Higher inequality weakens monetary policy transmission and reduces welfare (Areosa and Areosa, 2016; Ma, 2023). Auerclert (2019) finds that redistribution channels, namely earnings heterogeneity, unexpected inflation, and interest rate exposure, amplify the effect of monetary policy. Acharya and Pesenti (2024) and Acharya and Challe (2024) emphasise

⁶The literature studying the transmission through country-specific characteristics finds that relevant dimensions which affect monetary policy spillovers are the exchange rate regime (Frankel, Schmukler, and Servén, 2004; Shambaugh, 2004), the currency of trade invoicing (Zhang, 2022b), capital controls and their interaction with domestic monetary policy responses to foreign shocks (Miniane and Rogers, 2007; Chang, Liu, and Spiegel, 2015; Liu and Spiegel, 2015; Wu, Xie, and Zhang, 2024), domestic and cross-border bank lending as well as non-bank lending (Obstfeld, Ostry, and Qureshi, 2019; Lindner et al., 2019; Lopez, Rose, and Spiegel, 2020; Albrizio et al., 2020; Spiegel, 2022; Elliott, Meisenzahl, and Peydró, 2024), the state of the business cycle (Arbatli-Saxegaard et al., 2024), international trade and exchange rate pass-through (Bluedorn and Bowdler, 2011; Iacoviello and Navarro, 2019), and international coordination in the conduct of monetary policy (Caldara et al., 2024).

⁷Initially, the literature has focused on the effects of conventional monetary policy by implementing two-country VAR models. Relevant papers include Kim and Roubini (2000), Kim (2001), Faust et al. (2003), Canova (2005), and Maćkowiak (2007). While the focus remained on conventional policy measures, at a later stage, more complex empirical specifications that featured identified monetary policy shocks were employed. Within this wave belong many of the papers discussed previously. Additional relevant contributions include Miranda-Agrippino, Nenova, and Rey (2020), Cesa-Bianchi and Sokol (2022), Jarociński (2022), and Pinchetti and Szczepaniak (2023). At the same time, unconventional monetary policy and its spillover effects started attracting the attention of the literature (Tillmann, 2016; Rogers, Scotti, and Wright, 2018; Miranda-Agrippino and Rey, 2020a; Bhattarai, Chatterjee, and Park, 2021; Miranda-Agrippino and Nenova, 2022).

⁸For more details on the papers discussed in this paragraph and a comparison of results, see Table 5.A.1 in Appendix 5.A.

the role of household heterogeneity in shaping optimal monetary policy and spillovers, showing that heterogeneous consumption behaviours amplify monetary policy trade-offs and spillover effects compared to representative-agent models. Empirical contributions vary by methodology, country sample, type of monetary policy, and measures of economic inequality (e.g., income, wealth, debt). For instance, Silva et al. (2022) and Matusche and Wacks (2023) employ state-dependent local projections, similar to this paper. The former concludes that higher income inequality obstructs the transmission of monetary policy. This is in line with findings in Domonkos, Fisera, and Siranova (2023), derived from a panel data model. The latter shows that in regimes of higher wealth inequality, the real effects of monetary policy are stronger. Ampudia et al. (2018), using data from the Household Finance and Consumption Survey (HFCS), demonstrate that the direct effects of policy rate changes differ between *hand-to-mouth* and other households. This finding is particularly relevant to the dynamics of the theoretical model in this paper. Voinea, Lovin, and Cojocaru (2018) show that lower inequality enhances the effectiveness of monetary policy transmission. In summary, the key finding across these papers is that inequality significantly influences the domestic transmission of monetary policy, with high inequality weakening this transmission and translating to stronger real effects.

With the exception of two theoretical studies, the papers discussed above focus on the domestic transmission of monetary policy. The novelty of my contribution is to explore how income inequality influences the transmission of US monetary policy to the rest of the world. This paper is, to the best of my knowledge, the first to examine how income inequality affects US monetary policy spillovers.

Third, this paper contributes to the literature that models distributional channels within theoretical frameworks. This is a fast growing area of research that departs from the concept of a representative agent to highlight the differential dynamics of consumption and savings at the household level. Key advancements from the Representative Agent New Keynesian (RANK) model include simpler tractable models like the Two-Agent New Keynesian (TANK – Campbell and Mankiw, 1989; Galí, López-Salido, and Vallés, 2007; Bilbiie, 2008; Broer et al., 2020), as well as more sophisticated ones such as the Heterogeneous Agent New Keynesian model (HANK – Kaplan, Moll, and Violante, 2018; Auclert, Rognlie, and Straub, 2020; Alves et al., 2020; Auclert, Rognlie, and Straub, 2024; Acharya and Pesenti, 2024). In this paper, I integrate features of a TANK model into an open-economy framework to analyse how monetary policy decisions in one country affect consumption and savings decisions differently for constrained and unconstrained households in other countries.

The remainder of the paper is organised as follows. Section 5.2 details the framework of the paper. Section 5.3 presents the data. Section 5.4 outlines the empirical methodology and discusses the results. Section 5.5 presents the theoretical model and its predictions. Section 5.6 integrates the empirical and theoretical findings, examining responses on consumption and the non-linear relationship between inequality and financial openness. Section 5.7 concludes and discusses policy implications.

5.2 Framework

This section presents the idea of the framework of this paper and discusses how it differs from standard studies on the transmission of monetary policy.

5.2.1 Traditional monetary policy transmission

Before introducing the concept and role of inequality, I review the common transmission channels through which monetary policy tightening in the United States (the *origin* country) propagates to foreign economies (the *recipient* countries). The empirical and theoretical literature on this topic identifies two main channels, which are visually summarised in Figure 5.1.

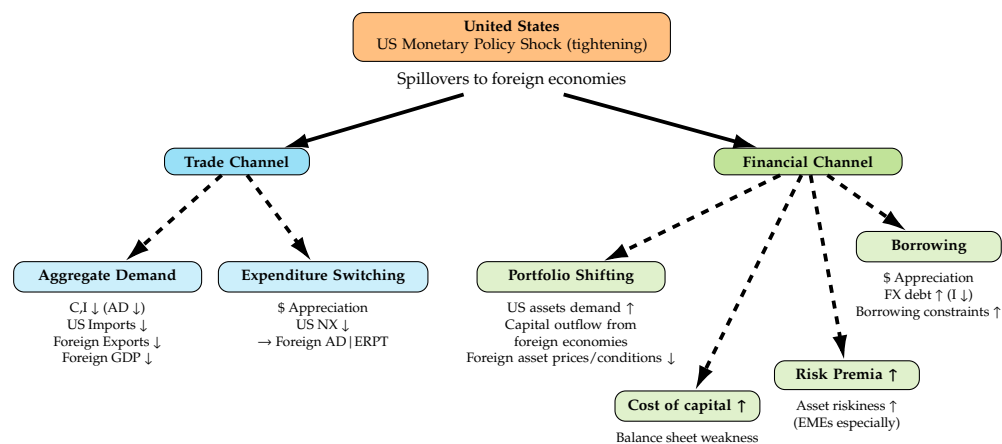


Figure 5.1: Transmission of US monetary policy to foreign economies

Source. Author's own elaboration.

Trade channel. The effects coming from this channel can be divided into two components. First, the *aggregate demand* channel: a contractionary monetary policy in the origin country (United States) reduces consumption and investments domestically, i.e. it reduces domestic aggregate demand. As a consequence, the demand for imported goods falls, depressing the exports of recipient countries

that trade with the US. This drags down output in the foreign economy. However, the effect on US net exports and aggregate demand in recipient countries is not clear-cut, as imports decline in both the US and its trading partners (Georgiadis and Jarociński, 2023). Second, the *expenditure-switching* channel: as a result of the monetary policy tightening in the US, the dollar appreciates against foreign currencies. This translates into a change in the relative price of imported over domestically produced goods and a switch from US imports to domestic goods, i.e. a reduction in net exports for the origin country (United States). This affects aggregate demand in the recipient economies. However, the extent to which net exports fall depends on the level of the exchange rate pass through (ERPT) which in turns depends on the currency of pricing regime, i.e. producer-currency pricing (PCP), local-currency pricing (LCP), dominant-currency pricing (DCP). The latter has become particularly common, with the dollar being the dominant currency of trade invoicing (Boz et al., 2022).

Financial channel. The financial channel has several facets. First, what we can call a *portfolio shifting* channel: a monetary policy tightening affects financial conditions and translate into US assets becoming more attractive as they offer a higher return. As a consequence, the demand for financial assets issued by the US increases and international investors shifts their portfolios, i.e. capital outflow in the recipient country, capital inflow in the US. This negatively affects asset prices and domestic conditions in the recipient country. Second, a *borrowing* channel: if households and firms in the recipient country hold debt in US dollars, the appreciation of the dollars makes the cost of funding onerous and tightens borrowing constraints. This is particularly relevant for emerging markets, which own a non-negligible part of their debt in US dollars (Bénétrix, Gautam, et al., 2019). Overall, as summarised by Kalemli-Özcan and Unsal (2024), the transmission via the financial channel works through a combination of an increase in the *cost of capital* (higher safe rates globally) and an increase in *risk premia* (on riskier assets, such as EMEs).

Alongside trade and financial channels, country-specific characteristics play a significant role in amplifying or reducing monetary policy spillovers. This serves as a background for examining inequality as one of these conditioning factors, given its substantial variation across countries.

5.2.2 Household heterogeneity and monetary policy spillovers

The framework of this paper builds upon the described mechanism and incorporates the element of household heterogeneity. Specifically, within-country

disposable income inequality.⁹ Figure 5.2 provides a visual illustration. Different levels of income inequality in the recipient country will influence the intensity with which the channels (financial, trade, and so on) transmit the effects of US monetary policy to that country's real economy. As previously discussed, this literature is still in its early stages, and there is no unique interpretation on how household heterogeneity affects monetary policy transmission. Considering that the literature has focused on domestic effects of monetary policy, the role of household heterogeneity for global spillovers is even more opaque. While the empirical framework in Section 5.4 will introduce the main findings coming from the data, the theoretical model in Section 5.5 will rationalise these results in line with the stylised framework highlighted in this Section.

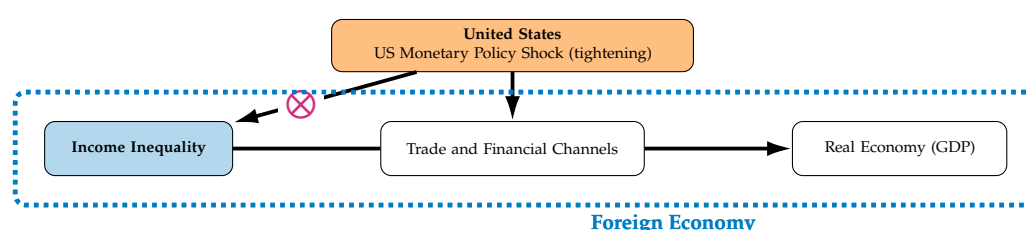


Figure 5.2: This paper – Inequality and US monetary policy spillovers
Source. Author's own elaboration.

Many of the theoretical models featuring heterogeneous agents incorporate strong changes in consumption following income gains (Kaplan, Moll, and Violante, 2018). This means that a monetary policy tightening reduces consumption through income compression (but also wealth and credit channels), further reducing demand. The higher the inequality, the more the transmission relies on households that are not liquidity constrained. These households generally have a high income, hold financial assets, and have a lower marginal propensity to consume compared to the rest of the distribution. As a consequence, the drop in consumption is expected to be stronger in countries with higher inequality levels. Another transmission channel that can be influenced by household heterogeneity is the financial one, especially in relation to financial participation and financial asset holdings. Richer agents are more active in international financial markets and, as a result, tend to hold assets in foreign currencies as well. Following a monetary policy tightening in the US, these agents will tend to buy US bonds and equities, and sell domestic ones. The more polarised the income distribution, the stronger this mechanism is. As highlighted in Figure 5.2, the assumption

⁹As a distinction used throughout this paper, within-country inequality refers to differences among households within a single country, while between-country inequality refers to differences among households across different countries.

in the framework is that the US monetary policy shock does not affect the level of inequality in foreign economies. In Section 5.4 I will test and validate this assumption.

5.3 Data

I collect data from several sources covering the period from 1966 to 2020 for an unbalanced panel of countries.¹⁰ The resulting sample of analysis consists of 87 countries. Of these, 34 are advanced economies and 53 are emerging market economies.¹¹ Tables 5.B.1 and 5.B.2 in Appendix 5.B provide further details on the sources, country sample, and time span of data availability.

5.3.1 US monetary policy shock

There exists a plethora of US monetary policy shocks in the macroeconomics literature. Each series differs according to the identification strategy, the angle of the monetary policy of interest, and the level of refinement.

Most of the early literature studying the effects of monetary policy surprises uses either two-country VARs (Kim and Roubini, 2000; Kim, 2001; Faust et al., 2003; Canova, 2005; Maćkowiak, 2007), or construct monetary policy shocks using techniques such as narrative approach (Romer and Romer, 2004) or factors extraction from the Fed Funds futures (Barakchian and Crowe, 2013). At a later stage, more sophisticated identification of monetary policy shocks marked a major step in the field, exploiting high-frequency changes in interest rates in a narrow window around the Fed's monetary policy announcements (Kuttner, 2001; Cochrane and Piazzesi, 2002; Gürkaynak, Sack, and Swanson, 2005; Gertler and Karadi, 2015).¹² More recently, with the rise of large language model applications in economics, new research proposes using natural language processing techniques to identify monetary policy shocks (Aruoba and Drechsel, 2024).

In this paper I want to leverage the cross-country heterogeneity in income inequality across a large panel of countries over an extended time span. Most of

¹⁰Given that publication of inequality data is slow paced and that for emerging market economies time series are not regularly updated, the data sample stops in 2020. However, being the time span of the analysis particularly long this does not represent an empirical issue.

¹¹Country classification is based on the IMF definition as outlined in the World Economic Outlook.

¹²While the identification idea is common to all, high-frequency shock series differs in the level of advancement and in the definition of the “surprise” they are capturing. Among some of the major methodological refinements we find Nakamura and Steinsson (2018), Cieslak and Schrimpf (2019), Jarociński and Karadi (2020), Swanson (2021), Inoue and Rossi (2021), Miranda-Agrippino and Ricco (2021), Bauer and Swanson (2023), Lewis (2023), Jarociński (2024).

the shock series discussed above are either not available before the 1990s or are not updated to recent years. Therefore, I focus on the interest rate channel and employ a methodology that leverages the longest time horizon to estimate the US monetary policy shock.¹³ Specifically, I follow the methodology developed in Iacoviello and Navarro (2019), which identifies shocks using the residual (u_t^{US}) of a regression of the federal funds rate (FFR_t) on a set of explanatory variables (X_t):

$$FFR_t = \alpha + \beta X_t + u_t^{US} \quad (5.1)$$

I estimate the model using quarterly data for the United States, as in the reference paper, for the time frame starting in 1966:Q1 and ending in 2020:Q1. The vector of variables X_t includes contemporaneous and lagged values of inflation, corporate spread, the log of real GDP, the foreign real GDP index, the federal funds rate, and linear and quadratic time trends.¹⁴ To account for unconventional monetary policy and the zero lower bound, I substitute the federal funds rate with the shadow rate by Wu and Xia (2016) for the period 2009–2015.

This approach allows me to interpret the estimated shock series as a measure of changes in US interest rates that are unlikely to correlate with domestic and global economic conditions, and are therefore exogenous. Figure 5.3 compares the FFR with our identified monetary policy shock series. The correlation between the extended series I estimate and the original one by Iacoviello and Navarro (2019) is 97.7%.¹⁵ The very small difference is due to tiny deviations in the underlying series.

5.3.2 Inequality

For the purposes of this paper, income, consumption, and wealth inequality are all relevant. Theoretically, we can model one or the other according to the transmission channels and priors to be tested. Empirically, data on consumption inequality are available for only a few countries and a short time span. While we have estimates for income and wealth inequality, the choice depends on data

¹³Swanson (2024) finds that interest rate shocks have a stronger impact on the US economy than shocks from forward guidance or large-scale asset purchases (LSAPs).

¹⁴I follow the original data and source selection of Iacoviello and Navarro (2019) to closely replicate their measure. Inflation is proxied by the quarter-on-quarter change in the GDP deflator. US corporate spread is computed as the difference between the Moody's corporate bond yield and the 10 year government benchmark yield. As the Moody's series was discontinued in 2016:Q3, I chained it with Bank of America ICE BBB US Corporate Index starting from 2016:Q4 till the latest data point. The correlation between the two series is 98.6%. The foreign real GDP index is computed cumulating the average quarter-on-quarter GDP growth of foreign countries (excluding US) using real US\$ GDP as aggregation weight.

¹⁵Figure 5.B.1 in Appendix 5.B compares graphically my replication and the original series from Iacoviello and Navarro (2019).

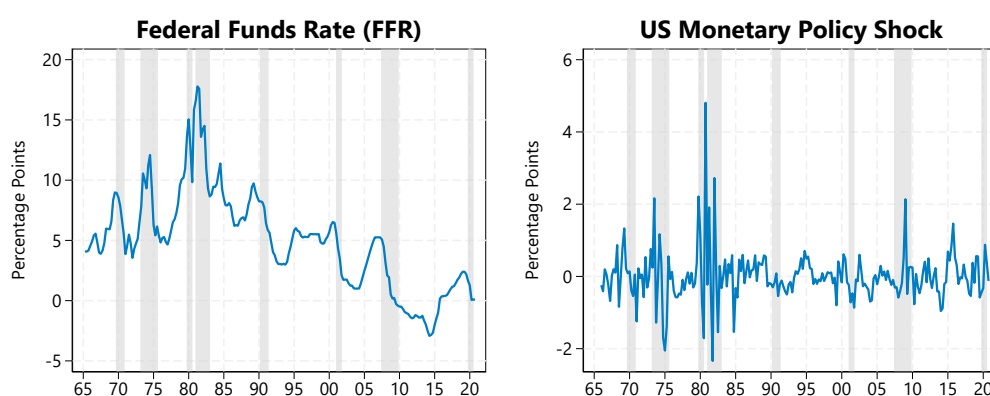


Figure 5.3: FFR and US monetary policy shock

Notes. Shaded areas represent NBER recessions. For the period 2009–2015 I substitute the federal funds rate with the Wu-Xia shadow rate to account for unconventional monetary policy and the zero lower bound. The shocks are calculated as the residuals of a regression of the federal funds rate on contemporaneous and lagged values of inflation, log US GDP, corporate spreads, log foreign GDP, as well as lagged values of the federal funds rate, and linear and quadratic time trends. The sample covers 1966:Q1–2020:Q4. **Source.** Board of Governors of the Federal Reserve System (FFR) and author’s calculations (shock).

availability and, most importantly, quality. Although notable efforts have been made to estimate wealth inequality time series over the past decade (saez2016; e.g., Kuhn, Schularick, and Steins, 2020; Smith, Zidar, and Zwick, 2022; Chancel et al., 2021; Albers, Bartels, and Schularick, 2022; Blanchet and Martínez-Toledano, 2023; Acciari, Alvaredo, and Morelli, 2024), cross-country data over time remain limited compared to income inequality. Moreover, the estimates are still prone to substantial uncertainty, as the wealth distribution is rarely observed directly in administrative tax data, and wealth survey coverage is more limited than that of income.

For these reasons, measures of income inequality provide a more reliable proxy for economic inequality, with broader space-time availability, while remaining highly relevant to the framework of this paper. For my analysis, I use data from the *Standardized World Income Inequality Database* (SWIID – Solt, 2009, 2016, 2020). The SWIID is widely used in economics research and provides standardised measures of income inequality by incorporating multiple data sources to minimise reliance on problematic assumptions by using as much information as possible from proximate years within the same country. These sources include the Luxembourg Income Study, the OECD Income Distribution Database, the CEDLAS/World Bank’s Socio-Economic Database for Latin America, Eurostat, the World Bank’s PovcalNet, the UN Economic Commission for Latin America and the Caribbean, national statistical offices around the world, and academic

studies. The standardisation of the data across countries is particularly helpful for this paper given that I exploit variation in inequality levels between countries. The SWIID provides estimates of the Gini coefficients for both market (i.e., pre-tax) and disposable (i.e., post-tax) income.¹⁶ To account for redistribution policies, I use the latter as the benchmark measure of income inequality in my analyses.

To provide a snapshot of the data, Figure 5.4 compares the average Gini coefficient for the sample of countries in this paper. There is considerable variation in income inequality both between groups, as EMEs are generally more unequal than AEs, and within groups. For example, South-America is on average more unequal than Asia, and Western-Southern Europe is more unequal than Scandinavian countries.

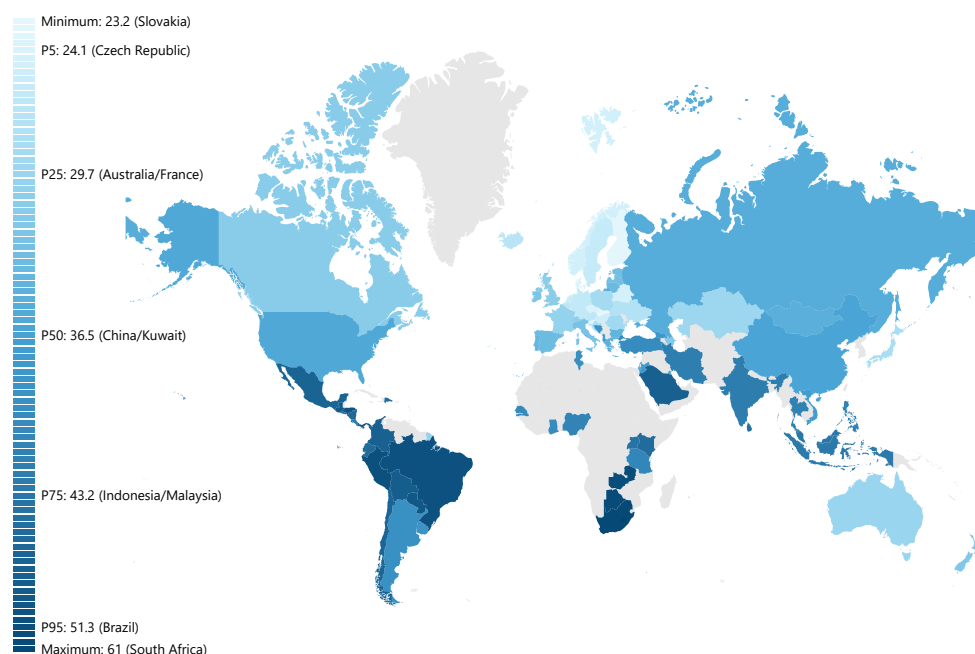


Figure 5.4: Within-country inequality in disposable income

Notes. Average Gini for disposable income by country over the period 1966–2020. The map and related summary statistics are based on the sample of 88 countries (including the United States). Countries in grey are not included in the sample due to lack of data. Country classification is based on the IMF definition as outlined in the World Economic Outlook. For details on country coverage and AEs/EMEs classification see Table 5.B.2. **Source.** Standardized World Income Inequality Database (SWIID).

¹⁶While it would be useful for testing mechanisms to have income shares by quantile, the SWIID does not provide these, as the dataset prioritises the standardisation and harmonisation of sources. Only a handful of sources estimate shares, whereas all of them estimate Gini coefficients.

5.4 The global transmission of US monetary policy

What are the effects of the Fed's monetary policy decisions on the economy in foreign countries? Are these effects amplified or mitigated according to the level of income inequality within the recipient countries? This section addresses these questions in an empirical framework. First, I explore the global transmission of US monetary policy in the traditional manner (i.e., without conditioning it to inequality). Second, I introduce household heterogeneity in the model and provide evidence of how it affects spillover effects to real output in foreign economies.

5.4.1 Traditional monetary policy transmission

I begin by estimating Impulse Response Functions (IRFs) of key macroeconomic and financial variables in the United States and foreign economies to a US monetary policy shock (tightening). This exercise replicates and extends the results of Iacoviello and Navarro (2019) and aims to test whether the identified shock produces meaningful outcomes when examining domestic and international responses within the standard framework. The empirical specification employs local projection *à la* Jordà (2005). Local projections are flexible, easy to interpret, and yield meaningful causal responses when the shock series is correctly identified and exogenous. Moreover, recent research shows that local projections are substantially more robust to misspecification compared to Vector Autoregressive (VAR) models and allow to overcome empirical issues such as data that exhibits strong persistence and estimation over extended horizons (Montiel Olea and Plagborg-Møller, 2021; Montiel Olea, Plagborg-Møller, et al., 2024). To assess the effects of the monetary policy shock I estimate the following model:

$$y_{i,t+h} - y_{i,t-1} = \mu_i^h + \beta^h u_t^{US} + \eta^h(x_{i,t-1} - \bar{x}) + \delta t + \phi t^2 + \varepsilon_{i,t+h} \quad h = 0, \dots, 5 \quad (5.2)$$

where y is the response variable of interest (e.g., log GDP), u_t^{US} is the US monetary policy shock, i is the country identifier, and t is the year. β^h is the coefficient of interest, reflecting the response of the outcome variable to the shock. When estimating the effect on the domestic economy (US) I control for one lag of GDP (log), Consumer Price Index (log), the interest rate on Treasury Bills, and linear and quadratic time trends. Confidence bands in this case are computed based on heteroskedasticity and autocorrelation-consistent standard errors (Newey and West, 1987). When looking at spillovers to foreign economies instead, I control for one lag of GDP (log), GDP deflator (log), bilateral exchange rate with the US dollar (log), the Chinn-Ito index of capital account openness,

trade openness, and linear and quadratic time trends.¹⁷ Country fixed effects (μ_i^h) are included to capture time-invariant characteristics that are specific to single countries. Time trends control for long-term changes, such as global conditions or structural trends, and help address potential issues with stationarity by accounting for deterministic trends in the data. Standard errors are clustered at the country level.¹⁸ In all empirical specifications, I estimate local projections at the annual frequency given that the Gini coefficient, as well as some of the control variables, are only available at the yearly level. The monetary policy shock is averaged over the quarters in each year. Alternatively the shock could be summed over the year. This does not make a major difference as I normalise responses to reflect a standard deviation of the monetary policy shock.

Figure 5.5 illustrates the responses of the federal funds rate, output, and other relevant variables to a one standard deviation monetary policy shock. This is equivalent to a shock that increases the federal funds rate by 1 percentage point. Following the shock, GDP in the United States declines, reaching a contraction peak of just below 1% after two years, before recovering. On the one hand, the increase in US interest rate contracts domestic demand, as consumption and investment drops as well as demand for domestic and foreign goods (aggregate demand channel). On the other hand, the dollar appreciates against foreign currencies (REER). This translates into foreign goods being cheaper than domestically produced ones, generating a switch in demand from domestic to foreign goods and reducing net exports (expenditure switching channel). These two channels tend to counteract each other. Looking at the response of imports, the aggregate demand channel seems to dominate the expenditure switching one. As economic activity slows down, unemployment rises, share prices decrease, and financial conditions tighten.

Economic activity contracts in the rest of the world as well, reaching a trough of similar magnitude in advanced foreign economies (AFEs) to that of the United States, but with a lag.¹⁹ The magnitude of the effect is larger for emerging market economies. Moreover, the effect is more persistent in foreign economies compared to the United States, as evidenced by the lack of full recovery after 5 years. These results replicate, qualitatively and quantitatively, the findings in Iacoviello and Navarro (2019) and align broadly with the existing literature on US monetary

¹⁷For the panel local projections I use GDP deflator instead of CPI to ensure larger data coverage. Results are robust to using CPI inflation, although this reduces the country sample. Trade openness is computed as the sum of imports and exports scaled by national GDP.

¹⁸As the shock is a generated regressor, I alternatively bootstrap the standard errors, with 1000 replications. This does not lead to any substantial differences for the results reported in the paper.

¹⁹Advanced foreign economies include advanced economies but exclude the United States.

policy spillovers.

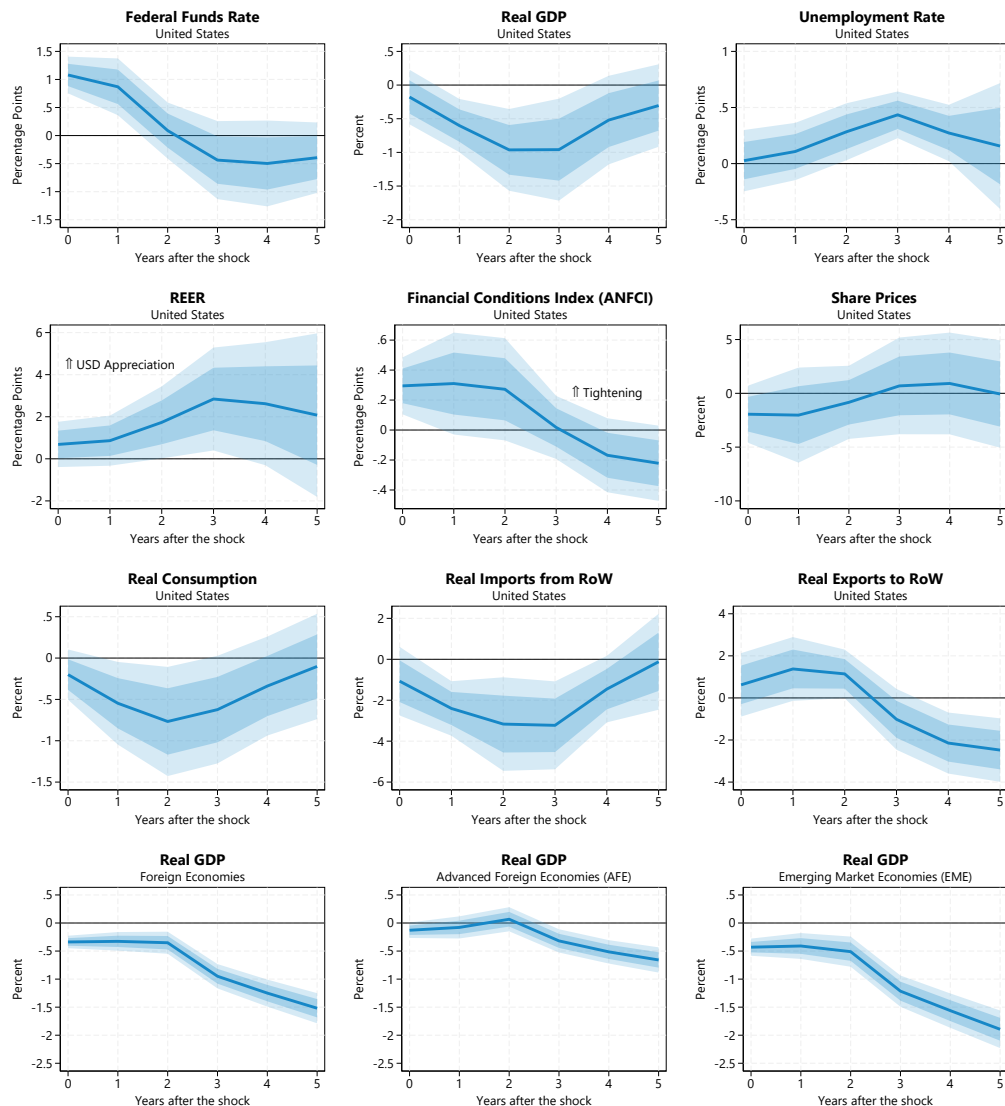


Figure 5.5: Effect of US monetary policy shock on US variables and foreign GDP

Notes. Impulse responses to a monetary policy shock that increases the FFR by 1 percentage point. The solid line represents the point estimate, while the dark and light shaded areas correspond to the 68% and 90% confidence bands, respectively. The empirical model is defined in equation (5.2). For US specific local projection (IRFs 1-9) I control for one lag of GDP (log), CPI (log), the interest rate on Treasury Bills, and linear and quadratic time trends. For panel local projections (IRFs 10-12, bottom panel) I control for one lag of GDP (log), GDP deflator (log), bilateral exchange rate with the US dollar (log), the Chinn-Ito index of capital account openness, trade openness, and linear and quadratic time trends.

5.4.2 Household heterogeneity and monetary policy spillovers

Following the assessment of the unconditional responses to the shock, I turn to the analysis of the role played by inequality. To isolate the specific role of

disposable income inequality, I employ state-dependent local projections. In particular, the preferred empirical specification follows the one formalised in Cloyne, Jordà, and Taylor (2023). This is a parsimonious approach that augments the classic local projections *à la* Jordà (2005) with the Kitagawa-Blinder-Oaxaca decomposition (KBO – Kitagawa, 1955; Blinder, 1973; Oaxaca, 1973) in order to isolate a direct, an indirect, and a total effect of the shock. Building on model (5.2), the augmented version of the model where the US monetary policy shock interacts with the country-specific Gini index is as follows:

$$\begin{aligned} y_{i,t+h} - y_{i,t-1} = & \mu_i^h + \beta^h u_t^{US} + \gamma^h u_t^{US} (gini_{i,t-1} - \overline{gini}) \\ & + \theta^h (gini_{i,t-1} - \overline{gini}) + \eta^h (x_{i,t-1} - \bar{x}) \\ & + \delta t + \phi t^2 + \varepsilon_{i,t+h} \quad h = 0, \dots, 5 \end{aligned} \quad (5.3)$$

where μ_i^h is a country fixed effect, u_t^{US} is the US monetary policy shock, and $gini_{i,t}$ is the Gini coefficient of disposable income. Control variables, time trends, and the clustering of standard errors are the same as for the previous specification. I focus on the spillover to real output, thus the outcome variable of interest y is now GDP (log). As highlighted in Cloyne, Jordà, and Taylor (2023) both the state variable and the controls enter the model in deviation from their sample mean.²⁰ As it is standard in the literature, the Gini and controls are lagged by one period to reduce endogeneity concerns. I estimate the model using OLS, as is conventional for local projections. The following are the coefficients of interest and their relevant combinations. β^h provides the average response of the outcome to the shock (*direct effect*). In other words, this is the standard effect of the monetary policy shock on output when inequality is at average (i.e., zero, given that all variables are demeaned). $\gamma^h (gini_{i,t-1} - \overline{gini})$ reflects the effect of income inequality to the transmission of the shock (*indirect effect*). $\beta^h + \gamma^h (gini_{i,t-1} - \overline{gini})$ is the *total effect*. The latter defines how the transmission of the shock differs when inequality diverges from its sample mean. More specifically, I examine the response of the variable of interest when inequality is at the 75th and 90th percentiles of the cross-country and time distribution. It is important to note that while local projections can establish a causal link when the shock is exogenous, the KBO methodology does not provide an identification strategy that uncovers causality *per se*. Instead, results are to be interpreted as a decomposition

²⁰Demeaning on the sample mean allows interpretation of interactions as deviations around an average monetary policy effects, which should be comparable to those estimated in studies looking at similar shock impact abstracting from state dependence. This definition is commonly employed in papers in the literature using this type of state-dependent local projections (e.g., Kopecky, 2022; Cloyne, Jordà, and Taylor, 2023; Alessandri, Venditti, and Jordà, 2023).

of the empirical relationship between the US monetary policy shock and income inequality across all states within the control set.

Before moving to the analysis of the impulse response functions, there is a matter to be discussed. In a recent paper, Gonçalves et al. (2024) assess the validity of state-dependent local projections. They find that if the state variable is exogenous, the size of the shock is not relevant and the estimator can always recover the population response. Instead, in the case where the state variable is endogenous to the shock, the size of the shock matters. The estimator is able to recover the conditional response to an infinitesimal shock but not the one to a larger shock. Given that our framework concerns international spillovers, we would not expect the US monetary policy shock to be endogenous to a foreign condition that is predominantly driven by domestic drivers, such as inequality. However, to test the exogeneity of the shock to the inequality measure, I run the following regression for each country in the sample:

$$gini_t = \alpha + \sum_{p=0}^2 \beta^p u_{t-p}^{US} + \delta t + \phi t^2 + \varepsilon_{i,t} \quad (5.4)$$

Figure 5.6 shows the 95% confidence interval around the estimates for β^0 (upper panel), β^1 (middle panel), and β^2 (lower panel) for each country. Except for very few cases, the estimate is generally insignificant and the sign of the relationship is not univocal. This exercise provides reassurance for the interpretation of the results.

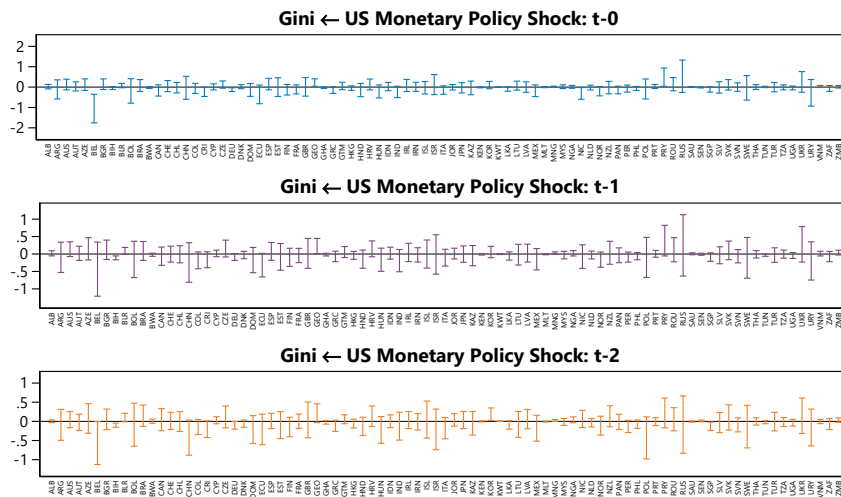


Figure 5.6: Effect of US monetary policy on country level Gini coefficient

Notes. The figure reports the 95% confidence interval around the coefficients associated with lags of the US monetary policy estimated from a regression with the Gini index as dependent variable.

5.4.2.1 Results

Figure 5.7 plots the response of real GDP to a US monetary policy tightening, resulting from the estimation of model (5.3) on the whole sample of foreign economies. The direct effect (β , thinner blue line with confidence bands), defined as the response in a state where inequality is average, depict a contraction in real GDP in the years following the shock. From a qualitative perspective, this is fully in line with evidence shown previously in Figure 5.5 and provides robustness that the framework is solid to the inclusion of the Gini coefficient of disposable income. Quantitatively, the model featuring inequality and the KBO decomposition produce responses that are slightly smaller in magnitude. The thicker lines in the plot illustrate the response of GDP to the shock in two cases in which inequality is higher than average. The two states are associate with the Gini being at the 75th and 90th percentile of the cross-country and time distribution, respectively. The figure shows that the impact of the shock on GDP is an increasing function of the inequality measure. In other words, the main message that emerges is that higher levels of inequality in the recipient country lead to a larger contraction in GDP following the US monetary policy shock.

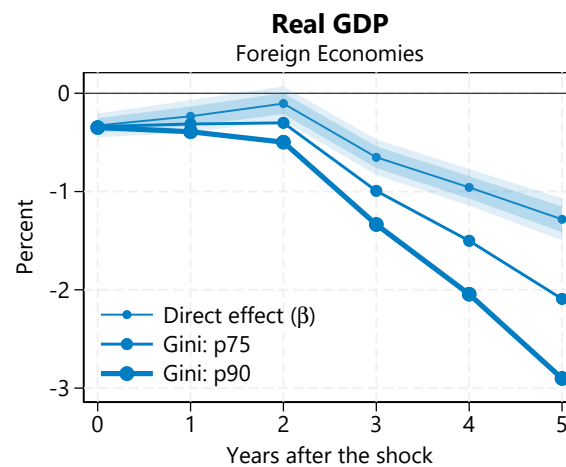


Figure 5.7: Heterogeneous effects of US monetary policy on foreign GDP

Notes. Impulse responses to a monetary policy shock that increases the FFR by 1 percentage point. The solid line represents the point estimate, while the dark and light shaded areas correspond to the 68% and 90% confidence bands, respectively. The direct effect (β) reflects the impact of the shock when inequality is at its average level. The other two lines represent the responses when inequality is at the 75th and 90th percentiles of the cross-country and time distribution. The thicker the line and the larger the marker, the higher the level of inequality. Different countries may fall around these inequality levels in different years. For easier interpretation, when averaging over the full period of analysis, the countries closest to the mean, 75th, and 90th percentiles are Vietnam/Albania, Malaysia, and Guatemala, respectively. The empirical model is defined in equation (5.3) and controls for one lag of GDP (log), GDP deflator (log), bilateral exchange rate with the US dollar (log), the Chinn-Ito index of capital account openness, trade openness, and linear and quadratic time trends.

Although financial linkages and macroeconomic variables tend to be globally interconnected in the current world, advanced economies and emerging market economies usually differ with respect to macroeconomic dynamics. Also, the analysis in this paper looks at a long time perspective. To check whether the main result is univocal, I run the model in equation (5.3) for AFEs and EMEs separately. The results, shown in Figure 5.8, reveal a compelling pattern. For AFEs, the result aligns with what I find for the whole sample. Higher inequality levels deepen the contractionary effect of the shock on real GDP. However, for EMEs the relationship is reversed: with higher levels of inequality, the negative effect of the shock is mitigated.

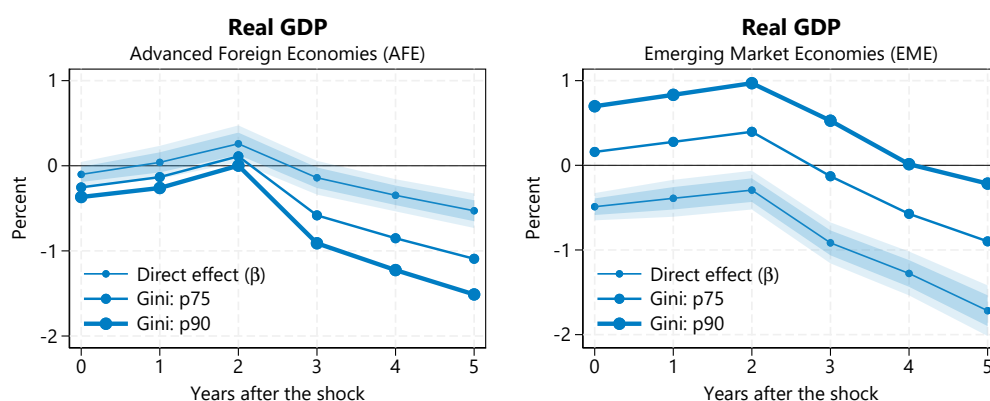


Figure 5.8: Heterogeneous effects of US monetary policy on AFEs and EMEs GDP

Notes. Impulse responses to a monetary policy shock that increases the FFR by 1 percentage point. The solid line represents the point estimate, while the dark and light shaded areas correspond to the 68% and 90% confidence bands, respectively. The direct effect (β) reflects the impact of the shock when inequality is at its average level. The other two lines represent the responses when inequality is at the 75th and 90th percentiles of the cross-country and time distribution. The thicker the line and the larger the marker, the higher the level of inequality. Different countries may fall around these inequality levels in different years. For easier interpretation, when averaging over the full period of analysis, the countries closest to the mean, 75th, and 90th percentiles are Australia/France, Latvia, and Greece, respectively, for AFEs, and Tanzania/Nigeria, Chile, and Honduras, respectively, for EMEs. The empirical model is defined in equation (5.3) and controls for one lag of GDP (log), GDP deflator (log), bilateral exchange rate with the US dollar (log), the Chinn-Ito index of capital account openness, trade openness, and linear and quadratic time trends.

There can be different reasons for this divergence in how heterogeneity in disposable income affects how the monetary policy shock is transmitted to AFEs and EMEs. I introduce a theoretical model in the next section, to better understand – and hence test empirically – the potential mechanisms behind this result.

5.4.2.2 Alternative specifications for the local projections and robustness

Although I showed that the state variable is exogenous to the shock, there could still be reverse causality between income inequality and GDP. To reduce this

concern, inequality and controls are lagged in the specification of the local projection. However, as an additional robustness check, I present two alternative specifications to the preferred model. In the first, the level of income inequality does not directly enter the model but to defines states of low and high inequality. In the second, income inequality is used to categorise groups for separate estimations in a comparative approach.

Binary state-dependence. Before Cloyne, Jordà, and Taylor (2023) introduced the KBO decomposition within the local projections framework, binary dummies for different states of the economy were used to study response heterogeneity. In our case, consider H_t as being a state indicator which takes value 0 when inequality is low (e.g., below the median) and 1 when inequality is high (e.g., above the median). The state changes at the annual level. To complement the main approach in equation (5.3), I estimate the following alternative form of local projection:

$$\begin{aligned} y_{i,t+h} - y_{i,t-1} = & \mu_i^h + (1 - H_t)(\beta_{low}^h u_t^{US} + \gamma_{low}^h (x_{i,t-1} - \bar{x})) \\ & + H_t(\beta_{high}^h u_t^{US} + \gamma_{high}^h (x_{i,t-1} - \bar{x})) \\ & + \delta t + \phi t^2 + \varepsilon_{i,t+h} \quad h = 0, \dots, 5 \end{aligned} \quad (5.5)$$

Figure 5.C.1 in Appendix 5.C compares the impulse responses of real GDP to the US monetary policy shock for the two states. The blue IRF depicts the reaction of real GDP when inequality is low, which at any horizon is given by $\beta_{low}^h + (\gamma_{low}^h * 0)$. Instead, the orange IRF shows the path of real GDP when inequality is high, plotting $\beta_{high}^h + (\gamma_{high}^h * 1)$. The results are consistent with those from the preferred specification.

Local projections by group. As a second alternative, to remove any potential endogeneity remaining from the previous two cases, I run local projections as in equation (5.2) for different groups separately. The idea here is to depart from conditionality within the estimation, but define *ex-ante* heterogeneous groups of countries based on historical inequality. Figure 5.C.2 in Appendix 5.C shows the IRFs estimated for two groups of countries, one selected according to the country's historical average Gini being below the historical median of all countries and the other being above. Once again, results are in line with estimations from the other methodologies and provide further robustness.

After demonstrating the robustness of various specifications of local projections, I will now provide further robustness checks by testing the results against different sets of controls, specifications, lag structures, and alternative samples.

Controls. To show that results are not driven by the selection of controls,

Figure 5.C.3 in Appendix 5.C shows the impulse response function from model (5.3) estimated without including any control variable, except the lag of the independent variable. While coefficients are quantitatively smaller, results are qualitatively in line with the main specification that controls for macro-financial dynamics.

Interaction of controls with inequality. In some empirical specifications in the literature the state variable (inequality in this case) is interacted with the set of control variables too. This is a non-standard element of the local projections that aim at accounting for potential dependence between household heterogeneity and the effect of the shock on the outcome variable. As a robustness, I estimate a version of the model in which controls enter both directly and interacted with the Gini coefficient. Figure 5.C.4 in Appendix 5.C shows that results are robust to this specification.

Lags. Local projections may be sensitive to the number of lags of explanatory variables included in the model. As a robustness check, I provide evidence that the results are not significantly affected by the number of lags included, both for the control variables (Appendix Figure 5.C.5) and the shock (Appendix Figure 5.C.6).

Alternative time samples. A closer look at the monetary policy shock series in Figure 5.3 permits to distinguish two major phases in US monetary policy. The 1970s were characterised by higher uncertainty, pronounced inflation, and lower credibility in the Federal Reserve. The early 1980s are notable for Paul Volcker's aggressive tightening, which led to a recession but significantly reduced inflation. The mid-1980s are commonly identified as the start of the Great Moderation, a period of relative macroeconomic stability marked by falling interest rates, lower volatility and inflation. For this reason, as a robustness, Figure 5.C.7 in Appendix 5.C presents the GDP responses estimated for the period 1986—2020. The results convey a message similar to that of the full sample, both quantitatively and qualitatively. The only difference is that GDP initially increases but then declines substantially after three years. Iacoviello and Navarro (2019) identify a similar pattern when estimating responses over the sample period 1986—2016. The Global Financial Crisis (GFC) is believed to have stopped the Great Moderation. To test the robustness of the results, I truncate the time sample to exclude the GFC and its aftermath period characterised by the zero lower bound.²¹ Results in Appendix Figure 5.C.8 are in line with the baseline ones.

²¹Note that in the construction of the monetary policy shock I substitute the FFR with the shadow-rate (Wu and Xia, 2016) to account for the zero lower bound and unconventional monetary policy. Thus, the estimation on the full sample already takes this into account to a certain extent.

Alternative country samples. Among emerging markets, the informal economy – defined as the set of activities that have market value but are not included in national accounts – is widespread. Where this sector is particularly large, GDP and inequality estimates might not capture the full picture of what they aim to measure. A large informal sector is often associated with underdevelopment and higher income inequality (Deléchat and Medina, 2020). My sample of EMEs is substantial (53 countries), so the estimates are unlikely to be driven by data from individual countries. However, as a robustness check, I estimate a series of state-dependent local projections excluding countries where the informal economy constitutes a significant part of the labour market, based on data from the International Labour Organization (ILO).²² Figure 5.C.9 in Appendix 5.C presents the IRFs for different country samples that cumulatively exclude these countries. The results are robust, suggesting that the main findings are not driven by potential mismeasurement of GDP and income inequality.

5.5 Theoretical model

The empirical results show that the direction in which inequality affects the transmission of a US tightening to the real economy is qualitatively different between AEs and EMEs. While the pattern for AEs is more in line with the prior that more inequality strengthens the negative effects of the shock, the narrative for EMEs that inequality mitigates the contraction in GDP is somewhat more surprising. This is what motivates the need for a theoretical framework. As such, to rationalise the findings and understand how the transmission of the shock to foreign countries is affected by inequality, I provide a general equilibrium model.

5.5.1 Model description

This section describes the main features of the model, while Appendix 5.D reports the complete model with all derivations. For intuition purposes, Figure 5.9 provides a visual and stylised representation of the model.

I build on the open-economy model of Eichenbaum, Johannsen, and Rebelo (2021). There are three economies in the model, indexed by c , each with size n_c . Country 1 is the one in which the shock originates, i.e. the United States, while the other two countries are foreign economies that receive the shock. To model household heterogeneity, the framework is augmented to include two types of households within each economy as in Campbell and Mankiw (1989), Galí, López-Salido, and Vallés (2007), and Bilbiie (2008): constrained and

²²The data and discussion are available here: <https://ilostat.ilo.org/topics/informality/>

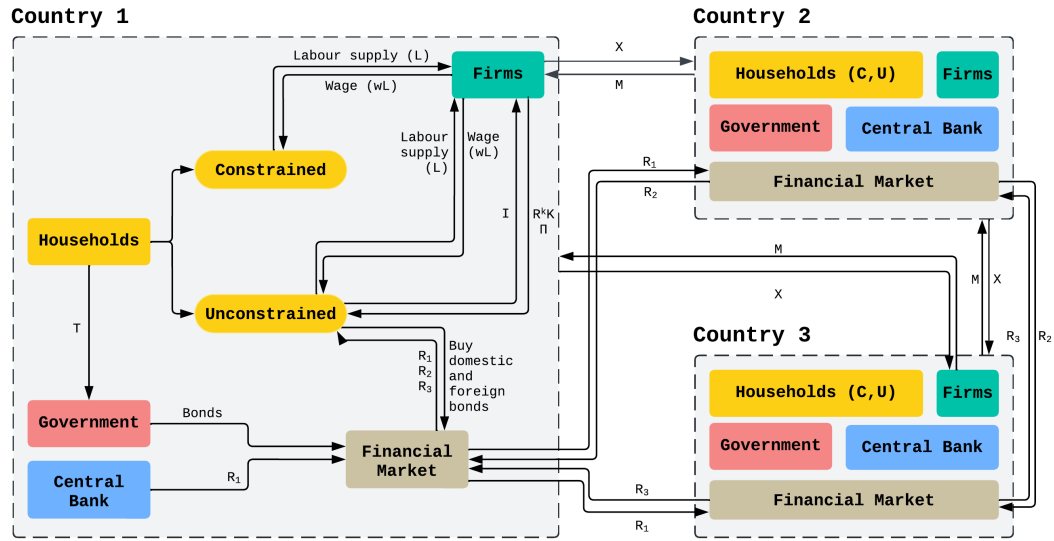


Figure 5.9: Visual representation of the model

Notes. This figures provide a stylised description of the model, while full details and derivations are provided in Appendix 5.D. The environment within each country is identical. R_1, R_2, R_3 are the interest rates on bond holdings of country 1, 2, and 3 bonds respectively. X are imports, while M denote exports. I stands for investment, Π for profits, K for capital, R^K for return on capital, T for taxes. **Source.** Author's own elaboration.

unconstrained. As such, this is a Two-Agent New Keynesian (TANK) model. To reiterate the discussion in the Introduction, as the focus is on the dynamics of the aggregate distribution, a TANK model is better suited to the needs of this paper. Furthermore, recent research reassures that TANK models can indeed effectively capture the aggregate effects of household heterogeneity and produce results consistent with those obtained from HANK models in this context (Debortoli and Galí, 2024). In addition to households, economies are populated with competitive producers, retailers, a government, and a central bank. The model is calibrated as in Eichenbaum, Johannsen, and Rebelo (2021) and Ferrari and Pagliari (2023).²³ The model is symmetric across countries.

5.5.1.1 Households

Within each country, there are two types of households:

- *Constrained households (ch)*. They do not have access to financial markets and consume their labour income (i.e., *hand-to-mouth*);

²³Due to the baseline model being calibrated quarterly in the reference models (Eichenbaum, Johannsen, and Rebelo, 2021; Ferrari and Pagliari, 2023), I retain the quarterly frequency. While the empirical specifications are at the annual frequency, they are still consistent with the theoretical model given that the goal is to look at the medium run dynamics. Details on calibration of parameters in Table 5.D.1 in Appendix 5.D.

- *Unconstrained households (uh)*. They work and own domestic firms, consume part or all of their labour income and can save by investing in domestic and foreign bonds.

The share of each group in the total population is n_j , where $j \in \{ch, uh\}$. Each household maximises their utility choosing the optimal amount of consumption and labour.

The Gini coefficients for each country ($GINI_c$), which are highly relevant for the model applications, are generated through differences in total household income as follows:

$$GINI_{c,t} = \frac{\sum_{i=ch,uh} \sum_{j=ch,uh} |x_i - x_j|}{2 \sum_{i=ch,uh} n_i x_i} \quad (5.6)$$

where x_i is the income of household group $i \in \{ch, uh\}$. While constrained households only earn wages, unconstrained ones have financial income and profits as well.²⁴

5.5.1.2 Firms

In each country there is a *continuum* of perfectly competitive firms. Firms produce undifferentiated final goods which are bundled together by retailers and sold on final markets with monopoly power. Under the Calvo formalism, retailers can update prices only with probability ξ_c and final prices are sticky.

5.5.1.3 Public sector

The central bank manages its own balance sheet and sets the policy rate following a Taylor-type rule. The government sets public consumption exogenously and balances its budget each period through lump-sum taxes. Bond markets are cleared in each period, with zero net supply in each country.

5.5.1.4 Trade and financial markets

Goods and bonds are traded across countries and determine the exchange rate. I assume that bond markets are incomplete, hence the Uncovered Interest Rate Parity (UIP) condition does not hold across countries. Households face a cost of investing in foreign bonds (ϕ_c^B).

²⁴This is how the model relates to the empirical setup. While some household differences are connected to wealth inequality (i.e., investing in bonds and owning firms), inequality in the model arises from income components. Constrained households have only labour income, whereas unconstrained households receive profits from the firms they own, can smooth consumption, save between periods, and benefit from returns on safe assets. Although labour income is not differentiated among groups, the sources of income are, resulting in income disparities.

5.5.2 Estimation and results

I will now turn to the discussion of the model results, highlighting the spillover effects of US monetary policy and how these effects differ in a scenario with higher inequality.

5.5.2.1 Domestic transmission

Figure 5.10 shows the impulse responses of the main variables to a monetary policy shock (tightening) generated by the model for the United States, i.e. the country in which the shock originates. Figure 5.E.1 in Appendix 5.E reports additional responses. At a glance, the results are consistent with findings from the literature and responses obtained from the local projections (Figure 5.5).

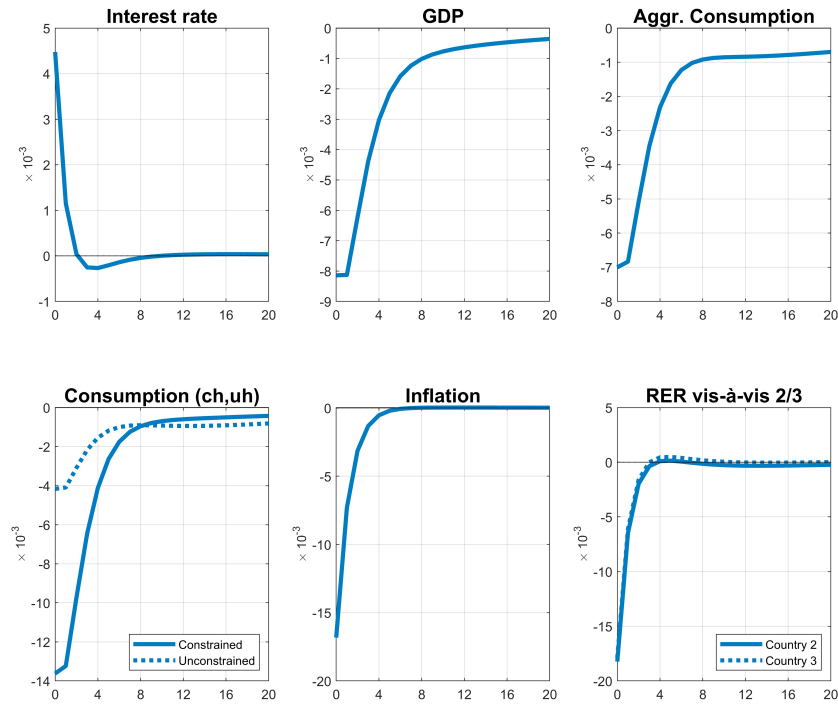


Figure 5.10: Effect of US monetary policy on US variables

Notes. Impulse responses depict deviations from the steady state following a shock to the interest rate (tightening) in country 1 (United States). A decrease in the exchange rate (RER) denotes an appreciation of the currency of country 1 (US dollar). The horizontal axes display quarters after the shock has hit.

Following the shock, GDP contracts sharply. As the interest rate increases, consumption and investment fall due to the higher borrowing cost. As constrained households consume all of their income and cannot invest, they reduce their consumption substantially more because their expenditure decisions are closely

tied to the state of the economy. The local currency appreciates vis-à-vis foreign currencies, which lead to a reduction in imports from the rest of the world. In addition, domestic demand contracts. The lower demand and the fall in consumption curb the inflationary pressures.

5.5.2.2 Spillovers to foreign economies

As in the empirical model, the goal of this section is to understand how the spillovers to countries 2 and 3 are affected by their level of inequality. To achieve this, I define two different scenarios, as highlighted in Table 5.1 below. *Baseline* is the scenario with the Gini resulting from the original calibration. To simulate the alternative scenario, I change the share of constrained and unconstrained households. Once the model is estimated, the *higher inequality* scenario generates a Gini index that is 20% higher than the baseline.

Table 5.1: Model scenarios

	Baseline	Higher inequality
Shares:		
Constrained (<i>ch</i>)	0.3	0.4
Unconstrained (<i>uh</i>)	0.7	0.6
Inequality:		
Gini coefficient	0.10	0.12
Change from baseline	–	+20%

Before looking at the role of inequality, I look at responses in the baseline scenario. This is the thinner line in Figure 5.11.²⁵ The shock has a contractionary effect on GDP in both foreign countries. The dollar appreciates due to higher demand for US assets, driven by increased interest rates. This appreciation makes foreign goods cheaper for the US while making exports more convenient for foreign countries. However, overall demand declines as a result of the economic slowdown, leading to a decrease in exports to the US, which negatively impacts foreign GDP. To contrast this economic downturn, central banks in foreign countries reduce their policy rates. As a consequence, domestic demand, which initially decreased, recovers and partially internalises the negative effects of the recession. Inflation falls reflecting the economic slowdown and the decrease in labour supply.

Constrained households (blue) face a loss in real wages and thus initially decrease their consumption. However, to counteract this negative income effect

²⁵ Responses for additional variables are reported in Figure 5.E.2 in Appendix 5.E.

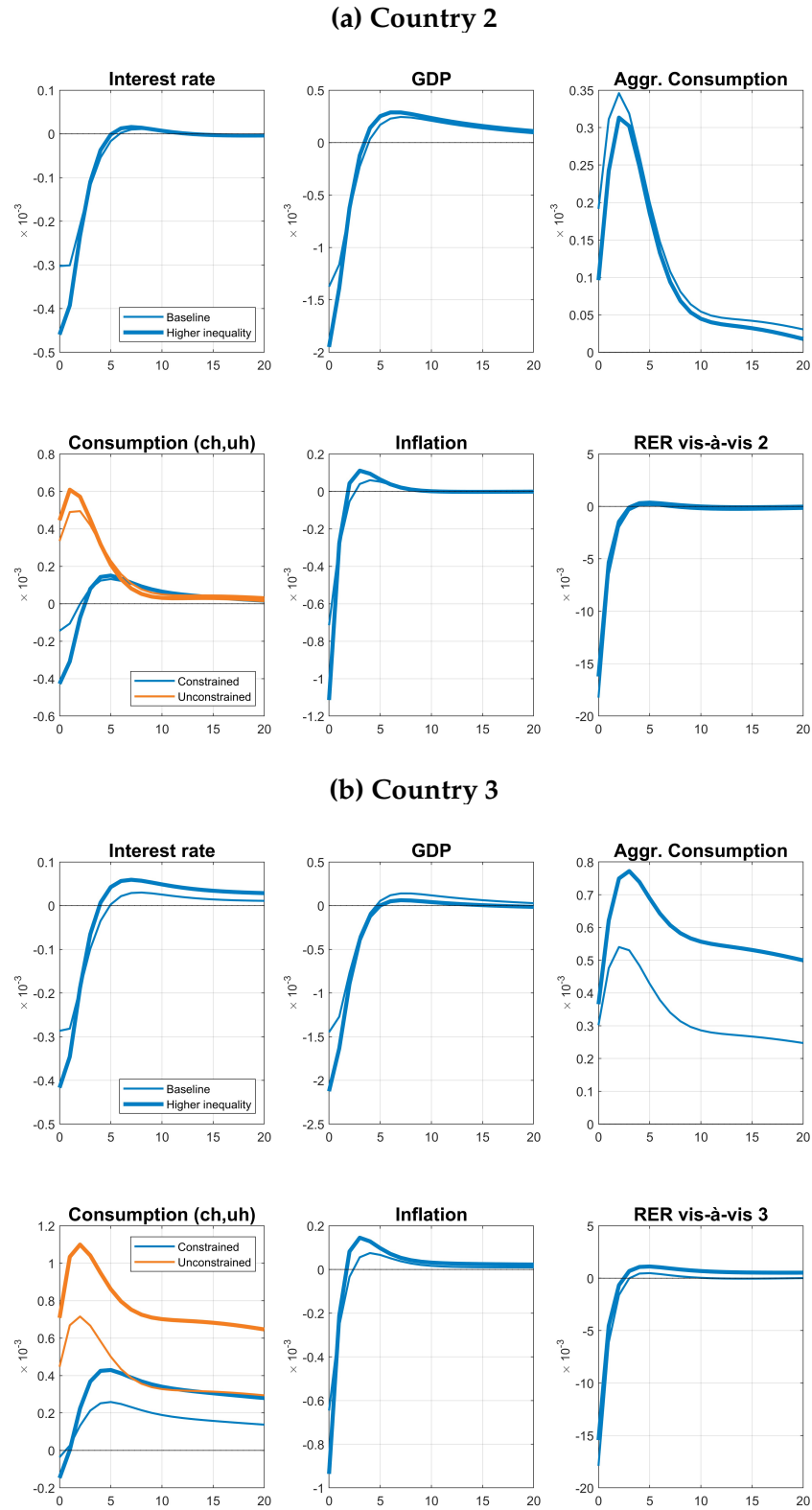


Figure 5.11: Effect of US monetary policy on foreign economies – Different levels of inequality

Notes. Impulse responses depict deviations from the steady state following a shock to the interest rate (tightening) in country 1 (United States). *Baseline* refers to the original calibration, while *Higher inequality* is a scenario where the Gini is 20% higher. A decrease in the exchange rate (RER) denotes an appreciation of the currency of country 1 (US dollar). The horizontal axes display quarters after the shock has hit.

they increase their labour supply, which sustains the recovery of their consumption levels. Instead, unconstrained households (orange) have a positive wealth effect implied by financial markets following the monetary policy tightening in the US. US bond returns are higher and their value increases due to the appreciation of the dollar. As a consequence, households with access to financial markets re-balance their portfolio towards US bonds and away from domestic ones to enjoy a boost in financial income. Moreover, as per the Euler equation, with lower domestic rates, unconstrained households consume more of their income instead of buying domestic bonds. As unconstrained households are the largest share in the economy, aggregate consumption increases.

What happens with higher inequality? In this scenario, represented by the thicker line in Figure 5.11, the share of constrained households increases, while the share of unconstrained households decreases within each economy. In other words, a larger share of *hand-to-mouth* agents translates into higher inequality. In a nutshell, in both countries, higher inequality is associated with stronger spillovers. With a higher share of constrained households, the beneficial transmission effect given by unconstrained households to the economy is reduced and income effects are stronger. In essence, monetary policy is less effective and central banks further reduce the policy rate. This increases the consumption of unconstrained households (Euler equation). However, constrained households are hit harder by the recession and reduce their consumption more heavily.

Remember that inequality in the model is generated by the differences in income between constrained and unconstrained households. Within country, the main difference between the two households is that the former do not have access to financial markets, while the latter do. However, unconstrained households across countries may differ in their ease of access to foreign financial markets. For example, we have empirical and theoretical evidence that home bias in emerging markets tends to be higher than in developed countries (Kim, Yun, et al., 2014; Wallmeier and Iseli, 2022).²⁶ Moreover, costs associated with investment can differ between countries. In particular, investors in EMEs face higher costs of holding foreign bonds that include transaction fees, international brokerage fees, currency conversion fees, and information costs. Access to financial services is also heterogeneous. According to the *World Bank's Global Findex Database*, 96%

²⁶However, the level of home bias and the currency denomination of domestically issued bonds are also influenced by macroeconomic events. For example, Hale and Spiegel (2012) show that the advent of the Economic and Monetary Union (EMU) increased the share of bonds issued by countries outside the euro area that are denominated in euro, at the expense of dollar-denominated ones. Moreover, the global financial crisis led to a significant increase in the issuer currency denomination of bonds placed in global markets (Hale, Jones, and Spiegel, 2020).

of the adult population in high income countries own an account at a financial institution or a mobile-money-service provider.²⁷ This compares to 72% in middle income countries and 39% in low income countries. In addition, opportunities for hedging against currency and interest rate risk are lower and more expensive in EMEs, due to the instability of domestic currencies.

To incorporate this fact into the model, I increase the cost of holding foreign bonds (ϕ_c^B) for country 3 to represent an emerging market economy. Note that this also serves as a proxy for lower financial development and lower efficiency of financial markets. Responses are shown in Figure 5.12.²⁸ I discuss how these differ from the previous case and how the role of inequality changes. The main finding, which replicates the empirical result in Figure 5.8, is that the macroeconomic impact of the shock on country 3 is more contained in a scenario of higher inequality. Why is this the case? It relates to financial openness and access to foreign financial markets.

Notably, when comparing the GDP response, the recession induced by US tightening is much less severe in this case than in the previous one. This is due to the economy being less open. The combination of a reduced contraction in the domestic economy and a more contained appreciation of the dollar exerts upward pressure on prices. The central bank raises the policy rate to counteract this. Unconstrained households would like to invest abroad, but they cannot due to the high cost of holding foreign bonds. As a result, they use their income to invest domestically and consume. Since the recession is less severe and GDP recovers more quickly, constrained households are able to consume more, as they also increase their labour supply.

If inequality is higher but domestic unconstrained households do not hold or hold very little foreign debt (country 3, $\phi_3^B = 0.1$), they cannot re-balance their portfolio from domestic to foreign bonds after the shock. This reduces the pressure on domestic financial conditions, through higher consumption and investment in domestic bonds, and reduces the negative effects of higher inequality.

The bottom line of the model predictions is that the role of household heterogeneity in the transmission of external monetary policy shocks works mainly through the financial channels. Inequality matters in this model setting because it affects asset holdings decisions, which in turn depend on financial

²⁷The full report is available here: <https://www.worldbank.org/en/publication/globalindex/Report>. Percentage of population aged 15 and older.

²⁸Responses for additional variables are reported in Figure 5.E.4 in Appendix 5.E, while responses for country 2 are shown in Figure 5.E.3.

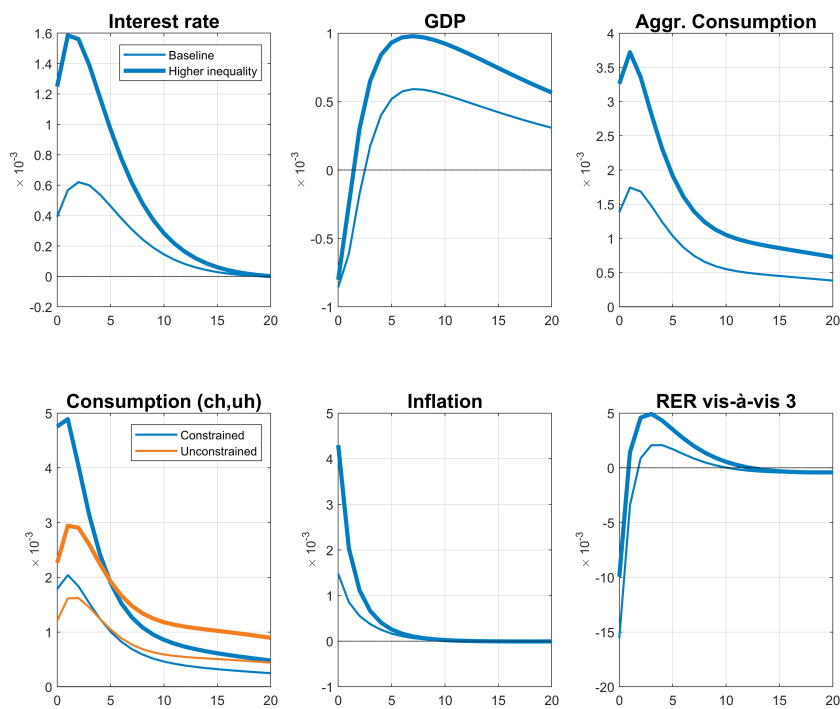


Figure 5.12: Effects of US monetary policy on country 3 – Different levels of inequality and higher cost of foreign bond holding ($\phi_2^B = 0.001$, $\phi_3^B = 0.1$)

Notes. Impulse responses depict deviations from the steady state following a shock to the interest rate (tightening) in country 1 (United States). *Baseline* refers to the original calibration, while *Higher inequality* is a scenario where the Gini is 20% higher. A decrease in the exchange rate (RER) denotes an appreciation of the currency of country 1 (US dollar). The horizontal axes display quarters after the shock has hit.

participation in international markets. Boehnert et al. (2023) uncover a role for inequality in the transmission of monetary policy through differences in consumption of tradable and non-tradable goods between households. However, this distinction is beyond the scope of the model in this paper, which focuses on the differences in consumption–savings decisions rather than within-consumption allocations.

5.6 Effects on consumption and nonlinearity

Before concluding, I test two of the model’s predictions within the empirical framework. First, I look at the heterogeneous response of consumption. Second, I explore nonlinearity in the transmission of US monetary policy to foreign GDP, studying the interaction between income inequality and the degree of financial openness.

5.6.1 Consumption

Once diversities in financial market access are accounted for, the model predicts that the effect of inequality on the transmission to consumption follows a dynamic similar to that of GDP. Specifically, higher inequality has an incremental effect on consumption in emerging market economies and a detrimental effect in advanced economies (Figures 5.12 and 5.E.3). Looking at responses of consumption is relevant because of between-household differences in consumption-savings decisions. To test whether this pattern is confirmed in the data, I use state-dependent local projections as in model (5.3) with household consumption as response variable. Estimated IRFs in Figure 5.13 shows that results align with the dichotomy between AEs and EMEs identified in the theoretical model.

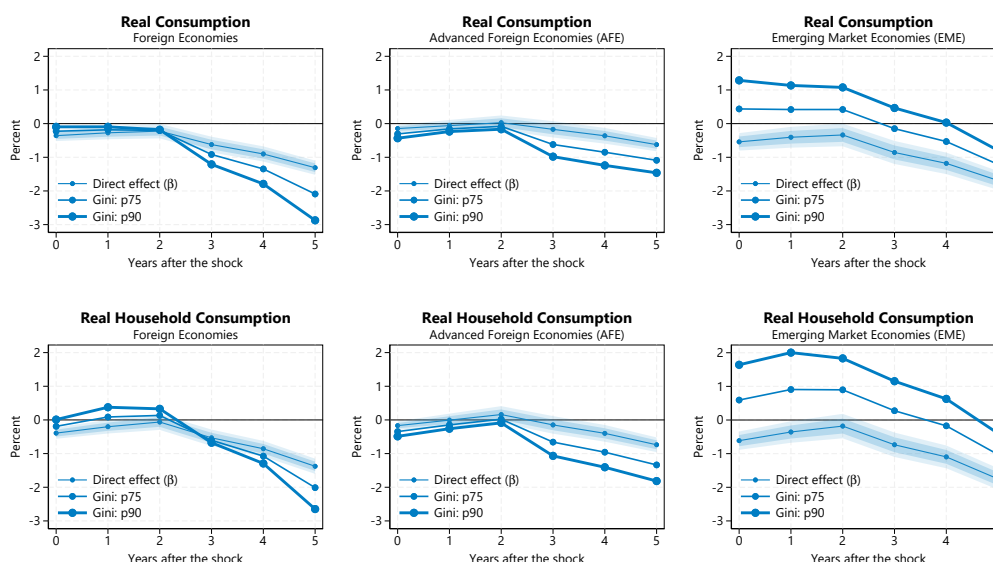


Figure 5.13: Effect of US monetary policy on total and household consumption

Notes. Impulse responses to a monetary policy shock that increases the FFR by 1 percentage point. The solid line represents the point estimate, while the dark and light shaded areas correspond to the 68% and 90% confidence bands, respectively. The direct effect (β) reflects the impact of the shock when inequality is at its average level. The other two lines represent the responses when inequality is at the 75th and 90th percentiles of the cross-country and time distribution. The thicker the line and the larger the marker, the higher the level of inequality. *Real Consumption* refers to total consumption (final consumption expenditure), which is the sum of household and general government final consumption expenditures. *Real household consumption* refers to household final consumption expenditures only. The empirical model is defined in equation (5.3) and controls for one lag of GDP (log), GDP deflator (log), bilateral exchange rate with the US dollar (log), the Chinn-Ito index of capital account openness, trade openness, and linear and quadratic time trends. Due to data availability, the sample for emerging market economies is smaller than the main one, including 47 countries.

5.6.2 Nonlinearity: Inequality and financial openness

The key determinant of the difference in the way inequality influences monetary policy effects between AEs and EMEs in the theoretical model is the differential access to foreign financial markets. For this reason, I will now analyse nonlinearities in the empirical framework. Specifically, I assess the interaction between income inequality and financial openness. The second dimension proxies for different costs in accessing foreign markets, as featured in the theoretical model. Higher financial openness reflects lower foreign asset-holding costs. Ideally, the ideal best measure to use would be financial market participation rates at the household level. However, this measure is hardly available, even for advanced economies. Thus, I use the Chinn-Ito index of capital account openness as the benchmark for financial openness.²⁹ Compared to *de facto* measures, *de jure* measures of financial liberalisation, such as the Chinn-Ito index, are less likely to be endogenous to various economic dimensions (Furceri, Loungani, and Ostry, 2019).³⁰

I estimate the following local projection, identical to the one in model (5.3), but now including a triple interaction term between the shock, inequality, and financial openness (*kaopen*):

$$\begin{aligned}
 y_{i,t+h} - y_{i,t-1} = & \mu_i^h + \beta^h u_t^{US} + \gamma^h u_t^{US} (gini_{i,t-1} - \overline{gini}) \\
 & + \theta^h (gini_{i,t-1} - \overline{gini}) + \tau^h (kaopen_{i,t-1} - \overline{kaopen}) \\
 & + \lambda^h (gini_{i,t-1} - \overline{gini})(kaopen_{i,t-1} - \overline{kaopen}) \\
 & + \rho^h u_t^{US} (gini_{i,t-1} - \overline{gini}) + \chi^h u_t^{US} (kaopen_{i,t-1} - \overline{kaopen}) \\
 & + \zeta^h u_t^{US} (gini_{i,t-1} - \overline{gini})(kaopen_{i,t-1} - \overline{kaopen}) \\
 & + \eta^h (x_{i,t-1} - \bar{x}) + \delta t + \phi t^2 + \varepsilon_{i,t+h} \quad h = 0, \dots, 5
 \end{aligned} \tag{5.7}$$

As I am interested in studying how the impact of the shock on GDP differs according to the level on inequality and the degree of financial openness, I compute marginal effects following the estimation of local projections for each horizon of interest.

From the results reported in Figure 5.14, three messages emerge. First, in general, openness to international markets amplifies the negative effect of the shock. This is in line with findings from the literature. For example, Faia and Iliopoulos (2011) show that financial liberalisation intensifies fluctuations in

²⁹Note that the Chinn-Ito index is already included as a control variable in all empirical specifications in this paper, as financial openness is an important dimension for monetary policy spillovers.

³⁰This is important for the context of this exercise, in which financial openness and inequality are assessed before the shock occurs and their interaction determines the heterogeneity in the spillover effect.

consumption and economic activity. Moreover, in economies that are highly financially integrated, monetary policy spillovers are more pronounced (Georgiadis, 2016; Wu, Xie, and Zhang, 2024) and vulnerability to external shocks is higher (Edwards, 2007). Second, with exception of the year the shock hits and the following year, higher degrees of financial openness are associated with a less negative effect of the shock on GDP, at any level of inequality. Third, and most important for the interpretation of results of this paper, the effect of financial openness differs according to the level of inequality. When financial openness is low, higher inequality reduces the negative effect of the shock on GDP. When financial openness is high, higher inequality is associated with larger spillovers to GDP. If a country is more financially closed, unconstrained households invest less in foreign assets and use their extra income to either buy domestic bonds or consume, reducing the negative effect of the shock. On the other hand, if a country is more open, unconstrained households would invest a substantial part of their income in foreign bonds, generating capital outflows that amplify the negative effects of the shock. Moreover, the wealth effect from the appreciation of the dollar is greater (smaller) for countries that are more (less) financially and commercially exposed to the United States (Rose and Spiegel, 2012). This is reflected in the impulse responses of the exchange rate, with the dollar appreciating less in the case of high foreign bond-holding costs than in the original case.

To summarise, inequality is linked to heterogeneous spillover effects. However, the way this link operates depends on financial openness. In other words, while inequality determines the *magnitude* of the effect of a US monetary policy shock on foreign GDP, financial openness provides the *direction* of the relationship between inequality and the impact of the shock on GDP.

While it is beyond the scope of this paper to assess the direct relationship between financial openness and inequality, the findings discussed above resonate with existing literature on the subject. For instance, Avdjiev and Spasova (2022) show that the relationships between financial openness and inequality is stronger in EMEs compared to AEs. This might explain the broader heterogeneity of spillover effects observed in EMEs. Liu, Spiegel, and Zhang (2023) find that capital inflows contribute to increasing income inequality, while capital outflows make the distribution of income more equal. This dynamic could further explain the interaction between inequality and financial openness identified in this paper. In countries characterised by high levels of financial openness, capital inflows can amplify the spillover mechanism by increasing inequality. Inequality increases vulnerabilities, as wealthier individuals are more exposed to fluctuations in global financial markets. Conversely, in economies that are less open, capital flows

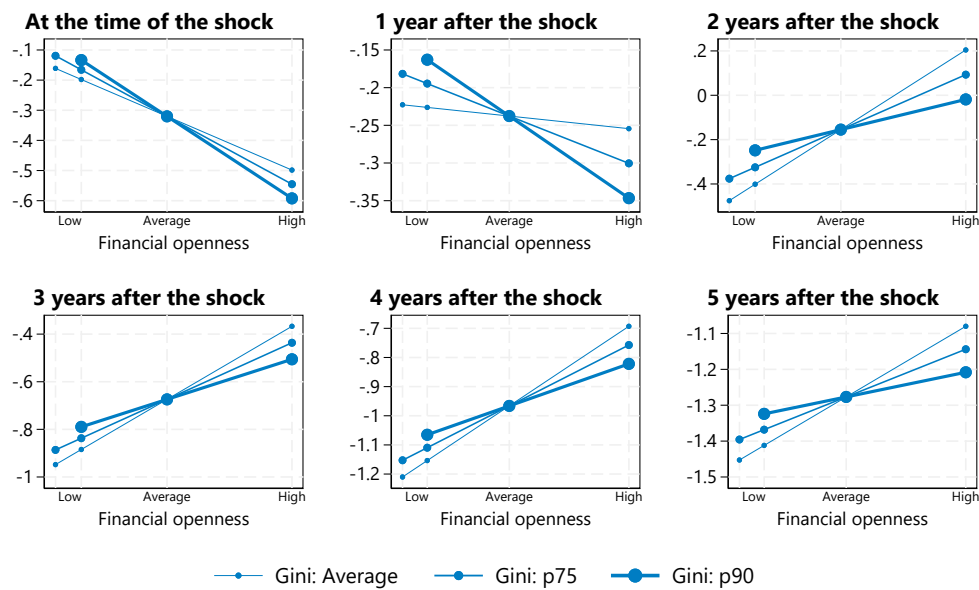


Figure 5.14: Marginal effects of US monetary policy on foreign economies' GDP – Nonlinearity: inequality and financial openness

Notes. The figure reports the predicted marginal effects, i.e. changes in real GDP following a monetary policy shock that increases the FFR by 1 percentage point, at different levels of financial openness and disposable income inequality. The x axis defines low, average, and high levels of financial openness, measured with the Chinn-Ito index. *Low* and *High* are defined as the 25th and 75th percentile of its cross-country distribution, respectively. The lines and markers identify how the effect on real GDP differs according to the level of income inequality (average, 75th, and 90th percentiles) for each level of financial openness. The thicker the line and larger the marker, the higher the inequality level. Note that for the 90th percentiles of Gini only, the effect for low openness is estimated at the 32nd percentile instead of 25th, due to empirical constraints. The estimation includes the whole sample of 87 countries. To preserve readability of the chart, confidence bands around the estimates are not reported. While the difference between estimates is not always statistically significant, the goal of this exercise is primarily to show the direction of the interaction between financial openness and inequality.

generally have a more limited impact, especially when outflows are constrained by elevated costs of foreign bond holdings. When resources are concentrated in the hands of those that are in a better position to absorb shocks, the aggregate effect on the real economy is more contained.

5.7 Conclusion

This paper investigates how income inequality in foreign economies affects the transmission of US monetary policy to their real economic activity. Specifically, I employ state-dependent local projections and exploit variation in within-country disposable income inequality across a large panel of 87 countries to estimate the heterogeneous response of GDP to a monetary policy tightening in the United States. I then rationalise these responses and the related mechanisms within a

theoretical framework.

While reaffirming traditional results from the spillover literature, this paper presents novel findings with two main takeaways. First, inequality affects how real activity in foreign economies responds to US monetary policy shocks. Specifically, in advanced economies, greater household heterogeneity amplifies the contractionary effect of the shock on GDP. In contrast, in emerging market economies, higher inequality is associated with a reduction in spillovers to the real economy. Second, this divergence is determined by the level of participation in international financial markets. Using a Two-Agent New Keynesian (TANK) model, I show that when inequality is high but domestic households hold little to no foreign bonds, they are unable to re-balance their portfolios towards foreign assets after the shock impacts their economy. This mechanism mitigates the negative effects on domestic financial conditions, thereby reducing the macroeconomic consequences of high inequality. This dynamic is validated by the data when tested using the empirical framework.

These results carry relevant policy implications. As central banks increasingly focus on the distributional effects of their policies, they might also consider, within the scope of their mandates, how household heterogeneity influences the spillover effects on foreign economies. For example, Mishra and Rajan (2016) suggested that *“the next step would be an agreement to discuss policies and their international spillover effects at meetings such as those of the IMF Board, the IMFC, the BIS, and the G-20”*. This, however, is not the core issue, as only spillovers from the Fed are significant enough to justify considering their effects, and the discussion around domestic inequality is already challenging. Instead, understanding these dynamics is particularly important for countries affected by such foreign shocks. Specifically, the findings of this paper can inform discussions on how foreign economies might optimally design public policies to mitigate negative spillover effects from foreign monetary policy. For example, given the significance of the relationship between financial openness and inequality, countries could directly influence their exposure to such shocks through income-equalising policies and/or by adjusting the cost of foreign investments. Within advanced economies, as the impact of the shock increases with the level of inequality, policymakers could implement policies aimed at reducing income inequality, for instance through redistribution, social welfare, and promoting financial market participation. In emerging markets, by contrast, given that the effect of the shock is mitigated by higher inequality and that it is harder for these countries to reduce inequality, raising the cost of foreign investments is an option to better absorb the macroeconomic impact of the shock. Of course, all these policies must be weighed against their direct domestic

impacts, which extend beyond the effects of the shock.

The paper identifies several potential avenues for future research. First, the focus on the US in this paper is motivated by research showing that US monetary policy has a greater impact on economic and financial conditions in the rest of the world compared to that of the European Central Bank (Ca' Zorzi et al., [2023](#)). However, examining the role of inequality for spillovers from other central banks remains an unexplored area that warrants further investigation. Second, future research could explore the differences in the transmission channels identified in this paper between conventional and unconventional monetary policies (e.g., quantitative easing).

Appendix 5.A Literature overview

Table 5.A.1: Literature on the role of inequality for the domestic transmission of monetary policy

Paper	Methodology	Country	Main finding
Areosa and Areosa (2016) <i>Journal of Macroeconomics</i>	New Keynesian DSGE with inequality curve. Skilled and unskilled agents.	–	Higher inequality weakens the transmission of monetary policy and reduce welfare when there is a scarcity of skilled agents.
Voinea, Lovin, and Cojocaru (2018) <i>Journal of International Money and Finance</i>	Cross sectional estimation using household data (HBS). Monetary policy: debt service-to-income.	Romania.	Lower inequality improves the effectiveness of monetary policy transmission.
Ampudia et al. (2018) <i>ECB Working Paper</i>	Decomposition of change in consumption between direct and indirect effect of monetary policy, exploiting MPC heterogeneity. Household data (HFCS).	Euro area.	Direct effects of changes in monetary policy rates differ between <i>hand-to-mouth</i> and other households.
Auclert (2019) <i>American Economic Review</i>	Theoretical model. Decomposition of consumption effect of monetary policy into three channels: earnings heterogeneity, unexpected inflation, interest rate exposure. Empirical validation using household data for US (PSID) and Italy (SHIW).	US, Italy.	Redistribution channels amplify the effects of monetary policy.
Silva et al. (2022) <i>BIS Working Paper</i>	State-dependent local projections (consumption). Country-specific MP shocks estimated using a PVAR 1999-2019.	20 AEs + US states.	Higher inequality reduced the power of monetary policy effects.
Ma (2023) <i>International Economic Review</i>	HANK model. Empirical validation using state-dependent local projection (GDP). MP shock from Romer and Romer (2004). 1969-2006.	US states.	The more equal the country, the more effective the monetary policy.
Domonkos, Fisera, and Siranova (2023) <i>Economic Modelling</i>	Panel data model using household level data (EU SILC). Monetary policy: EONIA, credit easing, QE, shadow rate. 2008–2016.	Euro area.	Higher inequality limits the monetary transmission to consumer and housing loans, but it improves the transmission to small firm loan rates.
Matusche and Wacks (2023) <i>Journal of Macroeconomics</i>	State-dependent local projections. Monetary policy: change in policy rate.	US, UK, euro area + US states.	Higher wealth inequality translates in stronger real effects of monetary policy.
Acharya and Pesenti (2024) <i>NBER Working Paper</i>	Tractable two-country TANK model, with precautionary savings and real income channels.	–	Both channels amplify the size of spillovers and spillbacks. Larger spillovers in countries with higher shares of households with high MPC and more income risk.
Acharya and Challe (2024) <i>CEPR Discussion Paper</i>	Small Open Economy (SOE) HANK model, household heterogeneity due to uninsured idiosyncratic risk and unequal bond market access.	–	Central bank optimally stabilises output/exchange rate more in SOE-HANK than in SOE-RANK.

Appendix 5.B Data

Table 5.B.1: Data sources and description

<i>Variable</i>	<i>Description</i>	<i>Source</i>
Estimation of the monetary policy shock and other United States specific variables		
FFR	Effective federal funds rate, percent (average, not seasonally adjusted)	Federal Reserve Board via FRED
Shadow rate	United States shadow federal funds rate	Wu and Xia (2016)
Inflation	US Gross Domestic Product Implicit Price Deflator (SA, 2012=100)	BEA via Haver
Corporate bond yield	Moody's seasoned Baa corporate bond yield, ICE BofA BBB US Corporate Index from 2016:Q4 (correlation 98.6%)	Moody's and Bank of America via Bloomberg
Long term yield	10-year government bond yield	OECD via FRED
Real GDP	GDP at constant 2010 US\$	Haver (G10+ and EMERGE)
Treasury Bill rate	Interest rate on government securities (Treasury bills), percent	IMF IFS
REER	Real Effective Exchange Rate	BIS
ANFCI	Adjusted National Financial Conditions Index	Chicago Fed
Share Price	Share Prices for United States, index	OECD MEI
Estimation of local projections (all countries)		
Real GDP	GDP at constant 2010 US\$	World Bank WDI
Gini, disposable income	Gini coefficient of post-tax national income	SWIID
Consumption	Household (private consumption) and total final consumption expenditure, constant 2015 US\$	World Bank WDI
Unemployment rate	Unemployment rate, percent	IMF IFS
Exchange rate	Bilateral exchange rate vis-à-vis the US Dollar	EWN
CPI	Consumer Price Index	World Bank WDI
GDP Deflator	Ratio of GDP in current local currency to GDP in constant local currency	World Bank WDI
Capital account openness	Country's degree of capital account openness based on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)	Chinn and Ito (2008)
Imports, Exports, Trade openness	Imports and exports of goods and services. Trade openness is computed as the sum of imports and exports, as a percentage of national GDP	World Bank

Table 5.B.2: Data availability and country coverage

Advanced Foreign Economies (AFE) - 34												Emerging Markets Economies (EMEs) - 53											
	Real GDP		Gini	Inflation		FX		KAopen		Trade Op			Real GDP		Gini	Inflation		FX		KAopen		Trade Op	
Australia	1968	2020	1968	2020	1968	2020	1970	2020	1970	2020	1968	2020	Albania	1997	2020	1997	2020	1997	2020	1997	2020	1997	2020
Austria	1988	2020	1988	2020	1988	2020	1988	2020	1988	2020	1988	2020	Argentina	1968	2020	1968	2020	1968	2020	1970	2020	1970	2020
Belgium	1975	2020	1975	2020	1975	2020	1975	2020	1975	2020	1975	2020	Azerbaijan	1992	2009	1992	2008	1992	2009	1992	2009	1996	2009
Canada	1999	2020	1999	2020	1999	2020	1999	2020	1999	2020	1999	2020	Belarus	1992	2020	1992	2020	1992	2020	1992	2020	1996	2020
Croatia	1997	2020	1997	2020	1997	2020	1997	2020	1997	2020	1997	2020	Bolivia	1993	2020	1993	2020	1993	2020	1993	2020	1993	2020
Cyprus	1986	2020	1986	2020	1986	2020	1986	2020	1986	2020	1986	2020	Bosnia and Herzegovina	2002	2016	2002	2015	2002	2016	2002	2016	2002	2016
Czech Republic	1992	2020	1992	2020	1992	2020	1993	2020	1996	2020	1992	2020	Botswana	1987	2017	1987	2016	1987	2017	1987	2017	1987	2017
Denmark	1977	2020	1977	2020	1977	2020	1977	2020	1977	2020	1977	2020	Brazil	1968	2020	1968	2020	1968	2020	1970	2020	1970	2020
Estonia	1997	2020	1997	2020	1997	2020	1997	2020	1997	2020	1997	2020	Bulgaria	1990	2020	1990	2020	1990	2020	1990	2020	1994	2020
Finland	1968	2020	1968	2020	1968	2020	1970	2020	1970	2020	1970	2020	Chile	1969	2020	1969	2020	1969	2020	1970	2020	1970	2020
France	1968	2020	1968	2020	1968	2020	1970	2020	1970	2020	1968	2020	China	1979	2020	1979	2020	1979	2020	1979	2020	1984	2020
Germany	1972	2020	1972	2020	1972	2020	1972	2020	1972	2020	1972	2020	Colombia	1971	2020	1971	2020	1971	2020	1971	2020	1971	2020
Greece	1975	2020	1975	2020	1975	2020	1975	2020	1975	2020	1975	2020	Costa Rica	1968	2020	1968	2020	1968	2020	1970	2020	1970	2020
Hong Kong	1968	2020	1968	2020	1968	2020	1970	2020	1970	2020	1968	2020	Dominican Republic	1987	2020	1987	2020	1987	2020	1987	2020	1987	2020
Iceland	1997	2018	1997	2017	1997	2018	1997	2018	1997	2018	1997	2018	Ecuador	1995	2020	1995	2020	1995	2020	1995	2020	1995	2020
Ireland	1972	2020	1972	2020	1972	2020	1972	2020	1972	2020	1972	2020	El Salvador	1992	2020	1992	2020	1992	2020	1992	2020	1992	2020
Israel	1997	2020	1997	2020	1997	2020	1997	2020	1997	2020	1997	2020	Georgia	1989	2020	1989	2020	1989	2020	1995	2020	1996	2020
Italy	1968	2020	1968	2020	1968	2020	1970	2020	1970	2020	1970	2020	Ghana	1989	2018	1989	2017	1989	2018	1989	2018	1989	2018
Japan	1968	2019	1968	2018	1968	2019	1970	2019	1970	2019	1970	2019	Guatemala	1982	2015	1982	2014	1982	2015	1982	2015	1982	2015
Korea	1968	2020	1968	2020	1968	2020	1970	2020	1970	2020	1968	2020	Honduras	1989	2020	1989	2020	1989	2020	1989	2020	1989	2020
Latvia	1997	2020	1997	2020	1997	2020	1997	2020	1997	2020	1997	2020	Hungary	1993	2020	1993	2020	1993	2020	1993	2020	1993	2020
Lithuania	1997	2020	1997	2020	1997	2020	1997	2020	1997	2020	1997	2020	India	1972	2020	1972	2020	1972	2020	1972	2020	1972	2020
Malta	2000	2020	2000	2020	2000	2020	2000	2020	2000	2020	2000	2020	Indonesia	1968	2020	1968	2020	1968	2020	1970	2020	1970	2020
Netherlands	1978	2020	1978	2020	1978	2020	1978	2020	1981	2020	1978	2020	Iran	1970	2020	1970	2019	1970	2020	1970	2020	1970	2020
New Zealand	1983	2020	1983	2020	1983	2020	1983	2020	1983	2020	1983	2020	Jordan	1987	2018	1987	2017	1987	2018	1987	2018	1987	2018
Norway	1971	2020	1971	2020	1971	2020	1971	2020	1971	2020	1971	2020	Kazakhstan	1992	2020	1992	2020	1992	2020	1993	2020	1996	2020
Portugal	1969	2020	1969	2020	1969	2020	1970	2020	1970	2020	1970	2020	Kenya	1977	2020	1977	2020	1977	2020	1977	2020	1977	2020
Singapore	1974	2020	1974	2020	1974	2020	1974	2020	1974	2020	1974	2020	Kuwait	1994	2000	1994	1999	1994	2000	1994	2000	1994	2000
Slovakia	1994	2020	1994	2020	1994	2020	1994	2020	1996	2020	1994	2020	Malaysia	1971	2020	1971	2019	1971	2020	1971	2020	1971	2020
Slovenia	1997	2020	1997	2020	1997	2020	1997	2020	1997	2020	1997	2020	Mexico	1968	2020	1968	2020	1968	2020	1970	2020	1970	2020
Spain	1975	2020	1975	2020	1975	2020	1975	2020	1975	2020	1975	2020	Mongolia	1996	2019	1996	2018	1996	2019	1996	2019	1996	2019
Sweden	1968	2020	1968	2020	1968	2020	1970	2020	1970	2020	1968	2020	Nicaragua	1994	2015	1994	2014	1994	2015	1994	2015	1994	2015
Switzerland	1982	2020	1982	2020	1982	2020	1982	2020	1996	2020	1982	2020	Nigeria	1986	2020	1986	2019	1986	2020	1986	2020	1986	2020
United Kingdom	1968	2020	1968	2020	1968	2020	1970	2020	1970	2020	1970	2020	Panama	1971	2020	1971	2020	1971	2020	1971	2020	1971	2020
													Paraguay	1991	2020	1991	2020	1991	2020	1991	2020	1991	2020
													Peru	1973	2020	1973	2020	1973	2020	1973	2020	1973	2020
													Philippines	1968	2020	1968	2020	1968	2020	1970	2020	1970	2020
													Poland	1992	2020	1992	2020	1992	2020	1992	2020	1992	2020
													Romania	1992	2020	1992	2020	1992	2020	1992	2020	1992	2020
													Russia	1991	2020	1991	2020	1991	2020	1992	2020	1996	2020
													Saudi Arabia	2008	2019	2008	2018	2008	2019	2008	2019	2008	2019
													Senegal	1992	2019	1992	2018	1992	2019	1992	2019	1992	2019
													South Africa	1976	2018	1976	2017	1976	2018	1976	2018	1976	2018
													Sri Lanka	1971	2020	1971	2019	1971	2020	1971	2020	1971	2020
													Tanzania	1990	2019	1990	2018	1990	2019	1990	2019	1990	2019
													Thailand	1968	2020	1968	2020	1968	2020	1970	2020	1970	2020
													Tunisia	1986	2016	1986	2015	1986	2016	1986	2016	1986	2016
													Turkey	1988	2020	1988	2020	1988	2020	1988	2020	1988	2020
													Uganda	1990	2020	1990	2020	1990	2020	1990	2020	1990	2020
													Ukraine	1989	2020	1989	2020	1989	2020	1992	2020	1996	2020
													Uruguay	1982	2020	1982	2020	1982	2020	1982	2020	1982	2020
													Vietnam	1994	2020	1994	2020	1994	2020	1994	2020	1994	2020
													Zambia	1977	2016	1977	2015	1977	2016	1977	2016	1977	2016

Notes. Country classification is based on the IMF definition as outlined in the World Economic Outlook. *Inflation* is measured with the GDP deflator, which is available for a wider panel of countries. *FX* is the bilateral exchange rate of the country vis-à-vis the US Dollar. *KAopen* is the Chinn-Ito index of capital account openness. *Trade Op* is trade openness, computed as the sum of imports and exports of goods and services over national GDP. For details on the measures and data sources see Table 5.B.1.

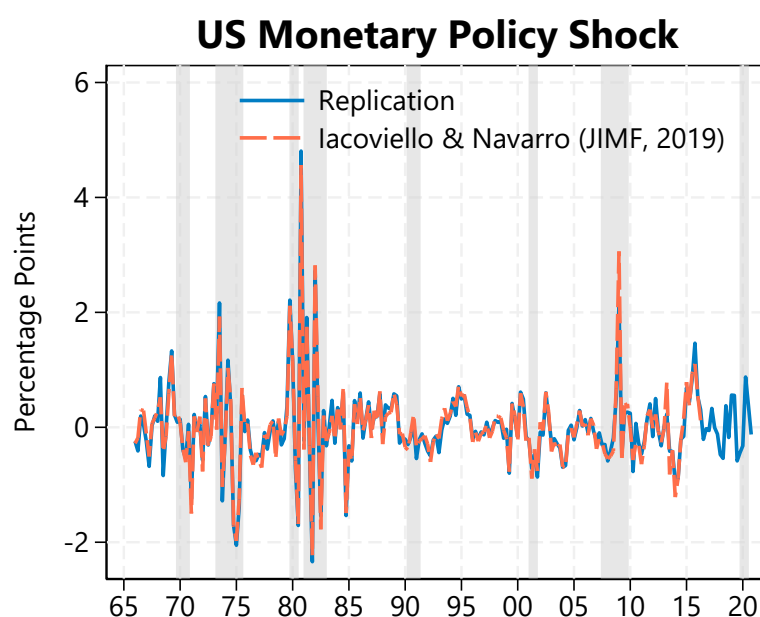


Figure 5.B.1: Replicated and original MP shocks by Iacoviello and Navarro (2019)

Notes. Shaded areas represent NBER recessions. For the period 2009–2015, I substitute the federal funds rate with the Wu-Xia shadow rate to account for unconventional monetary policy and the zero lower bound. The shocks are calculated as the residuals of a regression of the federal funds rate on contemporaneous and lagged values of inflation, log US GDP, corporate spreads, log foreign GDP, as well as lagged values of the federal funds rate, and linear and quadratic time trends. The sample covers 1966:Q1–2020:Q4. **Source.** Iacoviello and Navarro (2019) and author's calculations.

Appendix 5.C Robustness

5.C.1 Alternative specifications for the local projections

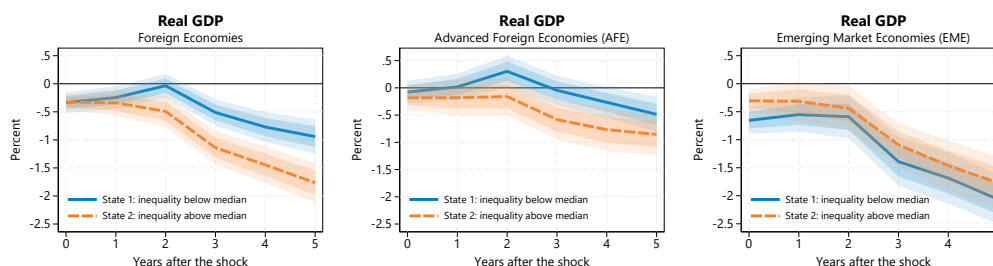


Figure 5.C.1: Heterogeneous effects of US monetary policy on foreign economies' GDP, Alternative specification: binary state-dependence

Notes. Impulse responses to a monetary policy shock that increases the FFR by 1 percentage point in State 1 (low inequality, Gini below annual median, solid blue line) and State 2 (high inequality, Gini above annual median, dashed orange line). The line is the point estimate and the dark and light shaded areas are 68% and 90% confidence bands, respectively. I control for one lag of GDP (log), GDP deflator (log), bilateral exchange rate with the US dollar (log), the Chinn-Ito index of capital account openness, trade openness, and linear and quadratic time trends.

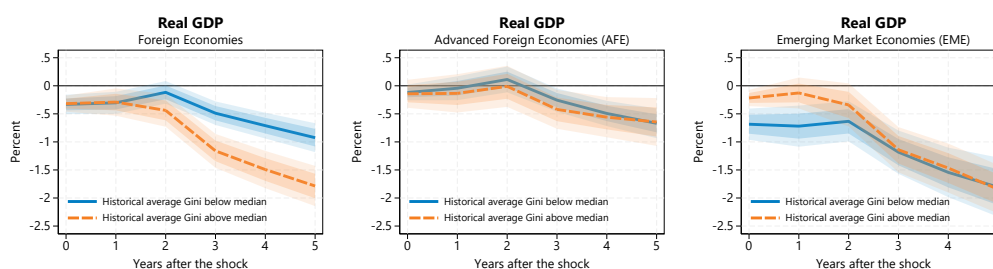


Figure 5.C.2: Heterogeneous effects of US monetary policy on foreign economies' GDP, Alternative specification: comparative approach

Notes. Impulse responses to a monetary policy shock that increases the FFR by 1 percentage point for the group of countries whose average Gini is below (solid blue line) and above (dashed orange line) median. The line is the point estimate and the dark and light shaded areas are 68% and 90% confidence bands, respectively. I control for one lag of GDP (log), GDP deflator (log), bilateral exchange rate with the US dollar (log), the Chinn-Ito index of capital account openness, trade openness, and linear and quadratic time trends.

5.C.2 Robustness of state-dependent local projections

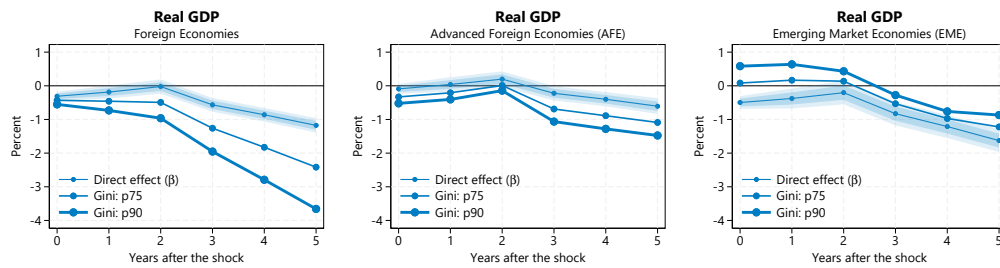


Figure 5.C.3: Heterogeneous effects of US monetary policy on foreign economies' GDP, Without controls

Notes. Impulse responses to a monetary policy shock that increases the FFR by 1 percentage point. The solid line represents the point estimate, while the dark and light shaded areas correspond to the 68% and 90% confidence bands, respectively. The direct effect (β) reflects the impact of the shock when inequality is at its average level. The other two lines represent the responses when inequality is at the 75th and 90th percentiles of the cross-country and time distribution. The thicker the line and the larger the marker, the higher the level of inequality. The empirical model is defined in equation (5.3) and controls only for one lag of GDP (log), and linear and quadratic time trends.

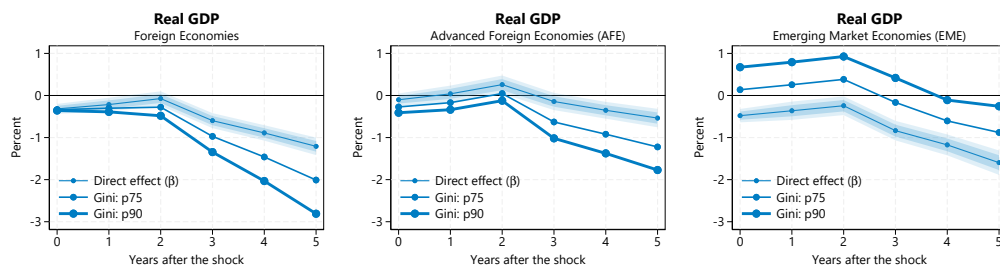


Figure 5.C.4: Heterogeneous effects of US monetary policy on foreign economies' GDP, Controls interacted with the Gini

Notes. Impulse responses to a monetary policy shock that increases the FFR by 1 percentage point. The solid line represents the point estimate, while the dark and light shaded areas correspond to the 68% and 90% confidence bands, respectively. The direct effect (β) reflects the impact of the shock when inequality is at its average level. The other two lines represent the responses when inequality is at the 75th and 90th percentiles of the cross-country and time distribution. The thicker the line and the larger the marker, the higher the level of inequality. The empirical model is defined in equation (5.3) and controls for one lag of GDP (log), GDP deflator (log), bilateral exchange rate with the US dollar (log), the Chinn-Ito index of capital account openness, trade openness, linear and quadratic time trends, as well as interactions between each control variable and the Gini index.

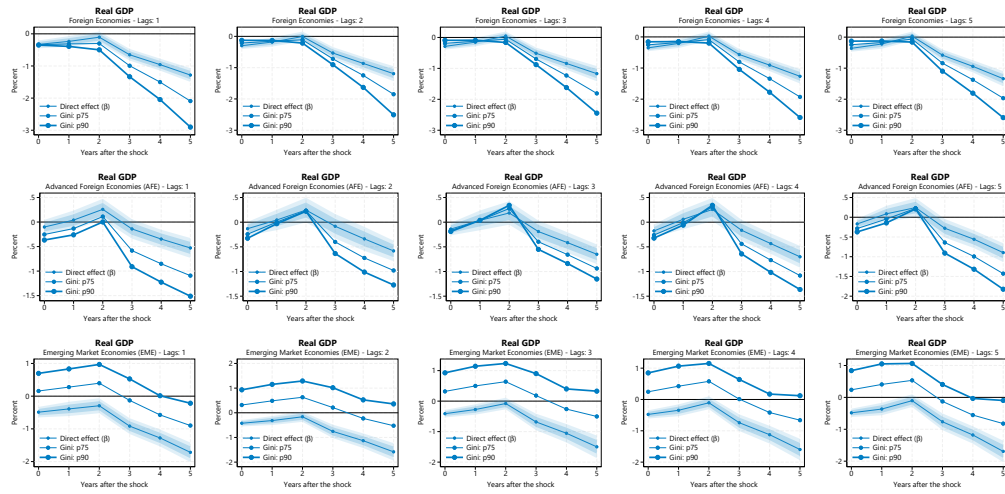


Figure 5.C.5: Heterogeneous effects of US monetary policy on foreign economies' GDP, Different number of lags for control variables

Notes. Impulse responses to a monetary policy shock that increases the FFR by 1 percentage point. The solid line represents the point estimate, while the dark and light shaded areas correspond to the 68% and 90% confidence bands, respectively. The direct effect (β) reflects the impact of the shock when inequality is at its average level. The other two lines represent the responses when inequality is at the 75th and 90th percentiles of the cross-country and time distribution. The thicker the line and the larger the marker, the higher the level of inequality. The empirical model is defined in equation (5.3) and controls for one to five lags of GDP (log), GDP deflator (log), bilateral exchange rate with the US dollar (log), the Chinn-Ito index of capital account openness, trade openness, and linear and quadratic time trends.

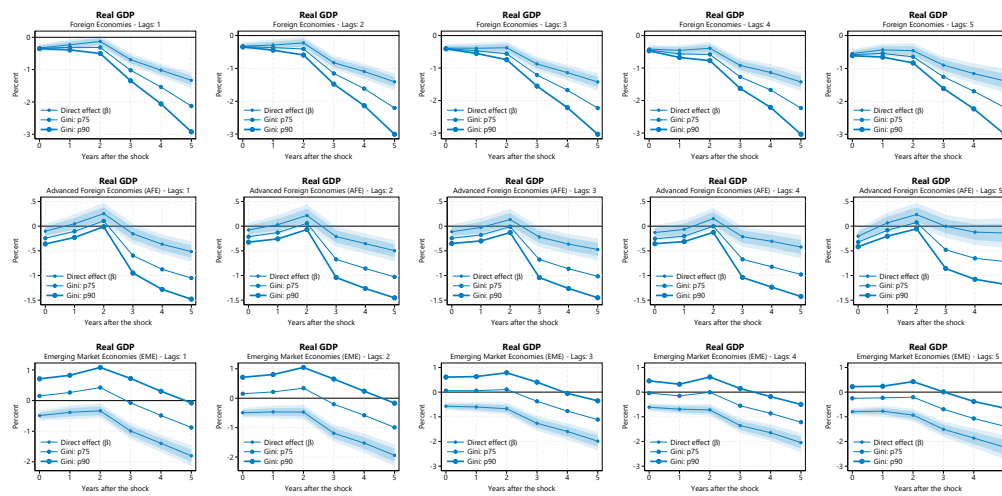


Figure 5.C.6: Heterogeneous effects of US monetary policy on foreign economies' GDP, Different number of lags for the shock

Notes. Impulse responses to a monetary policy shock that increases the FFR by 1 percentage point. The solid line represents the point estimate, while the dark and light shaded areas correspond to the 68% and 90% confidence bands, respectively. The direct effect (β) reflects the impact of the shock when inequality is at its average level. The other two lines represent the responses when inequality is at the 75th and 90th percentiles of the cross-country and time distribution. The thicker the line and the larger the marker, the higher the level of inequality. The empirical model is defined in equation (5.3) and controls for one to five lags of the shock, one lag of GDP (log), GDP deflator (log), bilateral exchange rate with the US dollar (log), the Chinn-Ito index of capital account openness, trade openness, and linear and quadratic time trends.

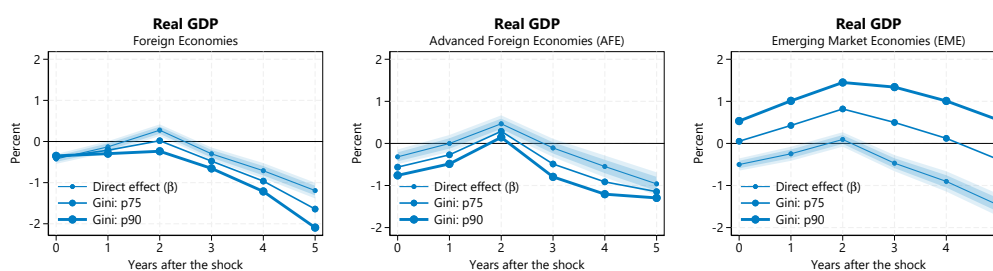


Figure 5.C.7: Heterogeneous effects of US monetary policy on foreign economies' GDP, 1986–2020

Notes. Impulse responses to a monetary policy shock that increases the FFR by 1 percentage point. The solid line represents the point estimate, while the dark and light shaded areas correspond to the 68% and 90% confidence bands, respectively. The direct effect (β) reflects the impact of the shock when inequality is at its average level. The other two lines represent the responses when inequality is at the 75th and 90th percentiles of the cross-country and time distribution. The thicker the line and the larger the marker, the higher the level of inequality. The empirical model is defined in equation (5.3) and controls for one lag of GDP (log), GDP deflator (log), bilateral exchange rate with the US dollar (log), the Chinn-Ito index of capital account openness, trade openness, and linear and quadratic time trends. Responses are estimated over the period 1986–2020.

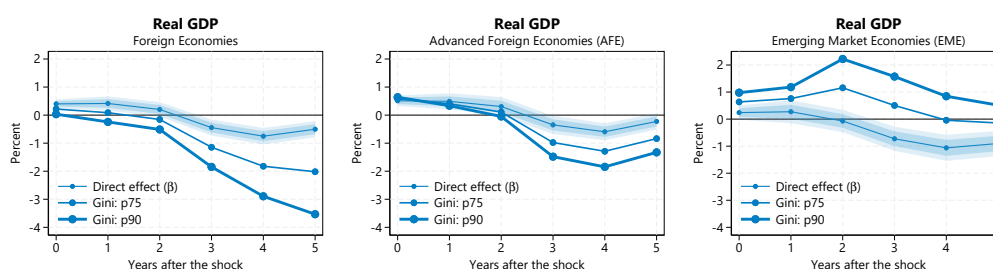
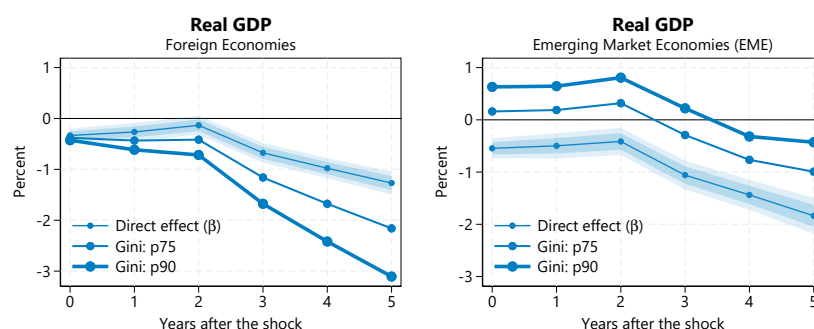


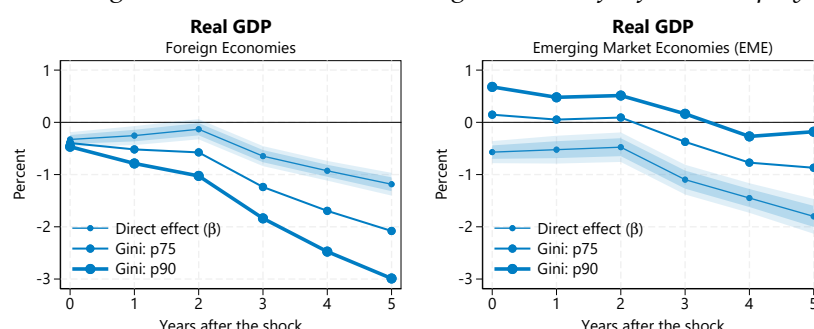
Figure 5.C.8: Heterogeneous effects of US monetary policy on foreign economies' GDP, 1966–2006

Notes. Impulse responses to a monetary policy shock that increases the FFR by 1 percentage point. The solid line represents the point estimate, while the dark and light shaded areas correspond to the 68% and 90% confidence bands, respectively. The direct effect (β) reflects the impact of the shock when inequality is at its average level. The other two lines represent the responses when inequality is at the 75th and 90th percentiles of the cross-country and time distribution. The thicker the line and the larger the marker, the higher the level of inequality. The empirical model is defined in equation (5.3) and controls for one lag of GDP (log), GDP deflator (log), bilateral exchange rate with the US dollar (log), the Chinn-Ito index of capital account openness, trade openness, and linear and quadratic time trends. Responses are estimated over the period 1966–2006.

(a) Excluding the 10 countries with the highest share of informal employment



(b) Excluding the 15 countries with the highest share of informal employment



(c) Excluding countries where the share of informal employment is higher than 50%

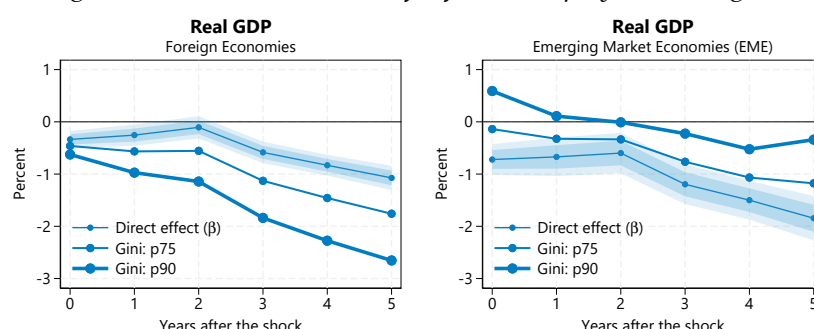


Figure 5.C.9: Heterogeneous effects of US monetary policy on foreign economies' GDP, Excluding countries with large informal economy

Notes. Impulse responses to a monetary policy shock that increases the FFR by 1 percentage point. The solid line represents the point estimate, while the dark and light shaded areas correspond to the 68% and 90% confidence bands, respectively. The direct effect (β) reflects the impact of the shock when inequality is at its average level. The other two lines represent the responses when inequality is at the 75th and 90th percentiles of the cross-country and time distribution. The thicker the line and the larger the marker, the higher the level of inequality. The empirical model is defined in equation (5.3) and controls for one lag of GDP (log), GDP deflator (log), bilateral exchange rate with the US dollar (log), the Chinn-Ito index of capital account openness, trade openness, and linear and quadratic time trends. Countries are excluded based on their share of informal employment in total employment (source: [ILO National Labour Force Survey](#)). The 10 countries with the highest share of informal employment are Uganda, Nigeria, Tanzania, Senegal, India, Kenya, Zambia, Bolivia, Honduras, and Indonesia. The next five countries are Guatemala, Ghana, Botswana, Peru, and Ecuador. Countries with an informal employment share exceeding 50% include these 15, as well as Vietnam, Sri Lanka, Paraguay, El Salvador, Thailand, Mexico, Panama, Colombia, Dominican Republic, Georgia, and Jordan. IRFs for AFEs are not reported, as all the excluded countries are EMEs.

Appendix 5.D Model

This Appendix reports the complete model and all derivations for exposition reasons. There are three economies in the model, indexed by c , each with size n_c . Within each country, there are two types of households: i) constrained households (ch), who do not have access to financial markets and consume their labour income; ii) unconstrained households (uh), who work, save through domestic and foreign bonds, and own domestic firms. The share of each group in the total population is n_j where $j \in \{ch, uh\}$. Income inequality is generated through differences in total households' income: while constrained (ch) households only earn wages, unconstrained ones (uh) have access to financial income. Firms produce undifferentiated final goods which are bundled together by retailers and sold on final markets with monopoly power. Under the Calvo formalism, retailers can update prices only with probability ξ_c and final prices are sticky. Goods and bonds are traded across countries and determine the exchange rate. I assume that bond markets are incomplete, hence the Uncovered Interest Rate Parity (UIP) condition does not hold across countries. The model is calibrated following Eichenbaum, Johannsen, and Rebelo (2021) and Ferrari and Pagliari (2023), with time being discrete, and it is solved using local methods (first-order linearisation). As in Eichenbaum, Johannsen, and Rebelo (2021) a standard sequence-of-markets equilibrium concept is adopted. Households and firms are assumed to be optimising, so their first-order conditions are satisfied, markets clear, and the resource constraints are satisfied.

5.D.1 Households

5.D.1.1 Constrained households

Constrained households only consume through labour income. Their period utility, which depends on consumption and leisure, is:

$$U_{c,ch,t} = e_{c,t}^C \ln(C_{c,ch,t} - h_c C_{c,ch,t-1}) - \frac{\chi_{c,l}}{1 + \phi_c} L_{c,ch,t}^{1+\phi_c} \quad (5.8)$$

where c is the country index. The budget constraint is:

$$P_{c,t} C_{c,ch,t} = w_{c,t} L_{c,ch,t} - T_{ch} \quad (5.9)$$

$C_{c,ch}$ is consumption, $L_{c,ch}$ aggregate labour, P_c the CPI price index, w_c the nominal wage (constant across groups) and T_{ch} steady-state taxes. $e_{c,t}^C$ is a common

consumption preference shock. There are habits in consumption captured by the parameter h . First order conditions imply:

$$\frac{e_{c,t}^C}{C_{c,uh,t} - hC_{c,uh,t-1}} - E_t \frac{\beta_c e_{c,t+1}^C h_c}{C_{c,uh,t+1} - h_c C_{c,uh,t}} = \lambda_{c,uh,t} \quad (5.10a)$$

$$\chi_c^b L_{c,uh,t}^{\phi_c} = \lambda_{c,uh,t} \frac{w_{c,uh,t}}{P_{c,t}} \quad (5.10b)$$

where $\lambda_{c,uh,t}$ is the Lagrangian multipliers associated to the budget constraint.

5.D.1.2 Unconstrained households

Relative to constrained households, unconstrained households have access to global financial markets for bonds. Therefore they can save through purchases of domestic and foreign bonds, subject to financial frictions. Their period utility function is:

$$U_{c,uh,t} = e_{c,t}^C \ln(C_{c,uh,t} - h_c C_{c,uh,t-1}) - \frac{\chi_{c,l}}{1 + \phi_c} L_{c,uh,t}^{1+\phi_c} \quad (5.11)$$

The budget constraint is:

$$\begin{aligned} P_{c,t} C_{c,uh,t} + \frac{B_{c,c,uh,t}}{R_{c,t}} + \sum_{l \neq c} \frac{B_{l,c,uh,t}}{R_{l,t} NER_{l,c,t}} + P_{c,t} I_{c,uh,t} = w_{c,t} L_{c,uh,t} + R_{c,t} B_{c,c,uh,t-1} + \\ + \sum_{l \neq c} \frac{R_{l,t} B_{l,c,uh,t-1}}{NER_{l,c,t}} - \sum_{l \neq c} \frac{\phi_c^B}{2} \left(\frac{B_{l,c,uh,t}}{R_{l,t} P_{c,t} NER_{l,c,t}} \right)^2 P_{c,t} + P_{c,t} R_{c,t}^k K_{c,uh,t-1} - T_{uh} + \Pi_{c,t} \end{aligned} \quad (5.12)$$

$B_{l,c,uh}$ are holdings of bonds issued by country l by unconstrained households uh in country c (with $l = c$ the special case of domestic bond holdings). $NER_{l,c,t}$ is the nominal exchange rate and $R_{l,t}$ the returns on safe assets from country l . Financial markets are subject to cross-border frictions, captured by the parameter ϕ_c^B . There are habits in consumption captured by the parameter h . T_{uh} are steady-state taxes.

$K_{c,uh}$ are holdings of capital, $I_{c,uh}$ new investments, R_c^k returns on capital, and Π_c firms' profits. The law of motion of capital is:

$$K_{c,uh,t+1} = \left\{ (1 - \delta_c) K_{c,uh,t} + I_{c,uh,t} \left[1 - \frac{\phi_c^K}{2} \left(\frac{I_{c,uh,t}}{I_{c,uh,t-1}} - 1 \right)^2 \right] \right\} \quad (5.13)$$

There are frictions in capital installation, captured by the parameter ϕ_c^K , while δ_c denotes the depreciation rate of capital. First order conditions are:

$$\frac{e_{c,t}^C}{C_{c,uh,t} - h C_{c,uh,t-1}} - E_t \frac{\beta_c e_{c,t+1}^C h_c}{C_{c,uh,t+1} - h_c C_{c,uh,t}} = \lambda_{c,uh,t} \quad (5.14a)$$

$$\chi_c L_{c,uh,t}^{\phi_c} = \lambda_{c,uh,t} \frac{w_{c,uh,t}}{P_{c,t}} \quad (5.14b)$$

$$\beta_c E_t \left(\frac{\lambda_{c,uh,t+1}}{\pi_{c,t+1}} \right) = \frac{\lambda_{c,uh,t}}{R_{c,t}} \quad (5.14c)$$

$$\lambda_{c,uh,t} \left[\frac{1}{R_{l,t}} + \phi_c^B \left(\frac{B_{l,c,uh,t}}{P_{l,t} RER_{l,c,t}} \right) \right] = \beta_c E_t \left(\frac{\lambda_{c,uh,t+1}}{\pi_{c,t+1}} \frac{NER_{l,c,t}}{NER_{l,c,t+1}} \right) \quad (5.14d)$$

$$Q_{c,t} \left\{ \left[1 - \frac{\phi_c^K}{2} \left(\frac{I_{c,uh,t}}{I_{c,uh,t-1}} - 1 \right)^2 \right] - \frac{I_{c,uh,t}}{I_{c,uh,t-1}} \phi_c^K \left(\frac{I_{c,uh,t}}{I_{c,uh,t-1}} - 1 \right) \right\} +$$

$$+ \beta_c E_t \left[Q_{c,t+1} \phi_c^K \left(\frac{I_{c,uh,t}}{I_{c,uh,t-1}} - 1 \right) \left(\frac{I_{c,uh,t+1}}{I_{c,uh,t}} \right)^2 \right] = \lambda_{c,t} \quad (5.14e)$$

$$\beta_c E_t \left[Q_{c,t+1} (1 - \delta_c) + \Lambda_{c,t+1} R_{c,t+1}^k \right] = Q_{c,t} \quad (5.14f)$$

where $\lambda_{c,uh,t}$ is the Lagrangian multiplier associated with the budget constraint and Q_c is the price of capital. Aggregate consumption is:

$$C_{c,t} = \sum_{j=ch,uh} n_j C_{c,j,t} \quad (5.15)$$

The Gini coefficients for each country ($GINI_c$) are constructed as follows:

$$GINI_{c,t} = \frac{\sum_{i=ch,uh} \sum_{j=ch,uh} |x_i - x_j|}{2 \sum_{i=ch,uh} n_i x_i} \quad (5.16)$$

where x_i is the income of household group $i \in \{ch, uh\}$.

5.D.2 Production

In each country there is a *continuum* of perfectly competitive firms, indexed by k . Firms' production function is:

$$X_{c,t}(k) = A_{c,t} (K_{c,t}(k))^{\alpha_c} (L_{c,t}(k))^{1-\alpha_c} \quad (5.17)$$

where A_c is a total factor productivity shock. Total output is the sum of output consumed domestically and exported, formally $X_t(k) = \sum_{l=1,2,3} X_{c,l,t}^b(k)$ with domestic demand being for $X_{c,c,t}^b(k)$. Cost minimisation implies:

$$R_{c,t}^k(k) = A_{c,t} MC_{c,t}(k) \alpha_c (K_{c,t}(k))^{\alpha_c-1} (L_{c,t}(k))^{1-\alpha_c} \quad (5.18a)$$

$$W_{c,t}(k) = A_{c,t} MC_{c,t}(k) (1 - \alpha_c) (K_{c,t}(k))^{\alpha_c} (L_{c,t}(k))^{-\alpha_c} \quad (5.18b)$$

where MC_c is the Lagrangian multiplier associated with the optimisation problem of firms, and W_c is the real wage.

5.D.3 Retailers and aggregation

Retailers aggregate intermediate goods and transform them into final goods. Define $Y_{c,c}$ and $Y_{l,c}$ as the domestic demand and export of final goods to country l . The following aggregators for domestic demand is adopted:

$$C_{c,c,t} + I_{c,c,t} + G_{c,c,t} = Y_{c,c,t} \quad (5.19)$$

where $C_{c,c}$, $I_{c,c}$, $G_{c,c}$ denote final consumption, investment, and government spending in country c of goods produced in country c (i.e., domestic). Exports aggregators are defined as:

$$\sum_{l \neq c} C_{l,c,t} + I_{l,c,t} + G_{l,c,t} = Y_{l,c,t} \quad (5.20)$$

where $C_{l,c}$, $I_{l,c}$, $G_{l,c}$ denote final consumption, investment, and government demand in country l of goods produced in country c . In other terms, these are total exports from country c to country l . $Y_{c,c}$ and $Y_{l,c}$ are produced aggregating across undifferentiated intermediate goods produced by domestic and foreign firms respectively. The demand function for these goods is:

$$Y_{c,c,t} = \left[\int_0^1 X_{c,c,t}(k)^{\frac{\nu_c-1}{\nu_c}} dk \right]^{\frac{\nu_c}{\nu_c-1}} \quad \text{and} \quad Y_{l,c,t} = \left[\int_0^1 X_{l,c,t}(k)^{\frac{\nu_c-1}{\nu_c}} dk \right]^{\frac{\nu_c}{\nu_c-1}} \quad (5.21)$$

where ν_c is the elasticity of substitution across different goods produced by country c .

Price aggregators are:

$$P_{c,c,t} = \left[\int_0^1 P_{c,c,t}(k)^{1-\nu_c} dk \right]^{\frac{1}{1-\nu_c}} \quad \text{and} \quad P_{l,c,t} = \left[\int_0^1 P_{l,c,t}(k)^{1-\nu_c} dk \right]^{\frac{1}{1-\nu_c}} \quad (5.22)$$

with $P_{c,c,t}$ and $P_{l,c,t}$ being the prices of domestically consumed and exported goods. Demand functions for individual varieties are:

$$X_{c,c,t}(k) = \left[\frac{P_{c,c,t}(k)}{P_{c,c,t}} \right]^{-\nu_c} Y_{c,c,t} \quad \text{and} \quad X_{l,c,t}(k) = \left[\frac{P_{l,c,t}(k)}{P_{l,c,t}} \right]^{-\nu_c} Y_{l,c,t} \quad (5.23)$$

Final consumption goods are created by combining goods from each country. Aggregate consumption C_c is therefore:

$$C_{c,t} = \left\{ \sum_l \omega_{c,l} (C_{c,l,t})^{\rho_c} \right\}^{\frac{1}{\rho_c}} \quad (5.24)$$

$C_{c,l}$ is intermediate consumption in country c and produced in l . For example, $C_{c,c}$ is domestic consumption of domestically produced goods. $\omega_{c,l} \in [0, 1]$

captures the share of goods produced in country l in total consumption, with $\omega_{c,c}$ the home bias. Similarly, aggregate government spending and investment are:

$$G_{c,t} = \left\{ \sum_l \omega_{c,l} (G_{c,l,t})^{\rho_c} \right\}^{\frac{1}{\rho_c}} \quad (5.25)$$

$$I_{c,t} = \left\{ \sum_l \omega_{c,l} (I_{c,l,t})^{\rho_c} \right\}^{\frac{1}{\rho_c}} \quad (5.26)$$

where $G_{c,c}$ ($I_{c,c}$) is government consumption (investment) of domestically produced goods, while $G_{c,l}$ ($I_{c,l}$) is government consumption (investment) of goods produced in country l . Cost minimisation defines the demand function for consumption of domestic and imported goods:

$$\begin{aligned} C_{c,c,t} &= \left(\frac{P_{c,c,t}}{P_{c,t}} \right)^{\frac{1}{\theta_c-1}} \omega_{c,c} C_{c,t}, & C_{c,l,t} &= \left(\frac{P_{c,l,t}}{P_{c,t}} \right)^{\frac{1}{\theta_c-1}} \omega_{c,l} C_{c,t} \\ G_{c,c,t} &= \left(\frac{P_{c,c,t}}{P_{c,t}} \right)^{\frac{1}{\theta_c-1}} \omega_{c,c} G_{c,t}, & G_{c,l,t} &= \left(\frac{P_{c,l,t}}{P_{c,t}} \right)^{\frac{1}{\theta_c-1}} \omega_{c,l} G_{c,t} \\ I_{c,c,t} &= \left(\frac{P_{c,c,t}}{P_{c,t}} \right)^{\frac{1}{\theta_c-1}} \omega_{c,c} I_{c,t}, & I_{c,l,t} &= \left(\frac{P_{c,l,t}}{P_{c,t}} \right)^{\frac{1}{\theta_c-1}} \omega_{c,l} I_{c,t} \end{aligned} \quad (5.27)$$

whereby, demand in country c for goods produced in country l depends on their price relative to the aggregate price level and total consumption in country c . The aggregate price is:

$$P_{c,t} = \left\{ \sum_l \omega_{c,l} \left(P_{c,l,t}^b \right)^{\frac{\rho_c}{1-\rho_c}} \right\}^{\frac{1-\rho_c}{\rho_c}} \quad (5.28)$$

5.D.4 Monopolists

Goods are sold on the final market by monopolists who set prices with some degree of market power. I assume there are frictions in price setting à-la Rotemberg. Formally, monopolists optimise:

$$E_t \sum_{d=0}^{\infty} (\beta_c)^d \Lambda_{c,t+d} \left\{ \frac{NER_{l,c,t} P_{l,c,t}}{P_{c,t}} X_{l,c,t}(k) - TC_{c,t} - \frac{\phi_{c,r}}{2} \left(\frac{P_{l,c,t}}{P_{l,c,t-1}} - 1 \right)^2 \right\} \quad (5.29)$$

where TC are total costs and $\phi_{c,r}$ the Rotemberg parameter. $l = c$ is the case of domestic goods sold in the domestic economy and the exchange rate $NER_{c,c,t}$

is 1. First order condition is:

$$(1 - v_c) + \frac{MC_{c,t} v_c}{P_{l,c,t} NER_{l,c,t}} - \phi_{c,r} (\pi_{l,c,t} - 1) \frac{\pi_{l,t}}{P_{l,c,t-1} NER_{l,c,t}} + \beta_c E_t \left[\frac{\lambda_{t+1}}{\lambda_t} \frac{Y_{l,c,t+1}}{Y_{l,c,t}} \phi_{c,r} (\pi_{l,c,t+1} - 1) \frac{\pi_{l,c,t+1}}{P_{l,c,t} NER_{l,c,t}} \right] = 0 \quad (5.30)$$

Inflation rates are $\pi_{c,l,t} = \frac{P_{c,l,t}}{P_{c,l,t-1}}$ and $\pi_{c,t} = \frac{P_{c,t}}{P_{c,t-1}}$. Notice that the Rotemberg parameter $\phi_{c,r}$ can be written as a function of the probability of updating prices ξ_c as $\phi_{c,r} = \frac{(v_c-1)\xi_c}{(1-\xi_c)(1-\beta_c\xi_c)}$

5.D.5 Public sector

The central bank sets the policy rate and manages its own balance sheet. The policy rate follows a Taylor-type rule of the form:

$$R_{c,t} = R_{c,t}^{\gamma_{c,r}} \left[R_{c,ss} \left(\frac{Y_{c,t}}{Y_{c,t-1}} \right)^{\theta_Y} \pi_{c,t}^{\theta_\pi} \right]^{1-\gamma_{c,r}} \quad (5.31)$$

where Y_c is total output. The government sets public consumption exogenously and all shocks follow an AR(1) process.

5.D.6 Calibration

Table 5.D.1: Calibrated parameters

Parameter	Description	Value	Parameter	Description	Value
$n_{c,1}$	Country size	0.33	ϕ_1^K	Capital adjustment cost	1.728
$n_{c,2}$	Country size	0.33	ϕ_2^K	Capital adjustment cost	1.728
$n_{c,3}$	Country size	0.33	ϕ_3^K	Capital adjustment cost	1.728
$n_{ch,1}$	Share of constrained households	0.3 (0.4)†	δ_1	Depreciation rate of capital	0.025
$n_{ch,2}$	Share of constrained households	0.3 (0.4)†	δ_2	Depreciation rate of capital	0.025
$n_{ch,3}$	Share of constrained households	0.3 (0.4)†	δ_3	Depreciation rate of capital	0.025
$n_{uh,1}$	Share of unconstrained households	0.7 (0.6)†	ρ_1	Elasticity of substitution across goods	0.33
$n_{uh,2}$	Share of unconstrained households	0.7 (0.6)†	ρ_2	Elasticity of substitution across goods	0.33
$n_{uh,3}$	Share of unconstrained households	0.7 (0.6)†	ρ_3	Elasticity of substitution across goods	0.33
β_1	Discount factor	0.9926	ξ_1	Calvo parameter	0.6
β_2	Discount factor	0.9926	ξ_2	Calvo parameter	0.6
β_3	Discount factor	0.9926	ξ_3	Calvo parameter	0.6
h_1	Habit formation	0.65	v_1	Demand elasticity	6
h_2	Habit formation	0.65	v_2	Demand elasticity	6
h_3	Habit formation	0.65	v_3	Demand elasticity	6
ϕ_1	Inverse Frish elasticity of labour	1	$\omega_{1,1}$	Home bias	0.9
ϕ_2	Inverse Frish elasticity of labour	1	$\omega_{2,2}$	Home bias	0.9
ϕ_3	Inverse Frish elasticity of labour	1	$\omega_{3,3}$	Home bias	0.9
$\gamma_{1,r}$	Interest rate smoothing	0.75	α_1	Production technology	0.3
$\gamma_{2,r}$	Interest rate smoothing	0.75	α_2	Production technology	0.3
$\gamma_{3,r}$	Interest rate smoothing	0.75	α_3	Production technology	0.3
$\theta_{1,\pi}$	Sensitivity to inflation	1.2	L_1	Steady state labour supply	1
$\theta_{2,\pi}$	Sensitivity to inflation	1.2	L_2	Steady state labour supply	1
$\theta_{3,\pi}$	Sensitivity to inflation	1.2	L_3	Steady state labour supply	1
$\theta_{1,Y}$	Sensitivity to output	0.6	G/Y_1	Steady state gov. spending over output	0.2
$\theta_{2,Y}$	Sensitivity to output	0.6	G/Y_2	Steady state gov. spending over output	0.2
$\theta_{3,Y}$	Sensitivity to output	0.6	G/Y_3	Steady state gov. spending over output	0.2
ϕ_1^B	Foreign bond holding cost	0.001			
ϕ_2^B	Foreign bond holding cost	0.001			
ϕ_3^B	Foreign bond holding cost	0.001 (0.1)★			

Notes. Different countries are denoted with subscripts 1, 2, and 3. †The first parameter is the one of the original calibration, while the second one (in brackets) refers to the scenario of simulated higher inequality. ★The first parameter is the one of the original calibration, while the second one (in brackets) refers to the scenario in which the cost of holding foreign bonds is substantially higher in country 3 compared to the other two countries. **Source.** Eichenbaum, Johannsen, and Rebelo (2021), Ferrari and Pagliari (2023), and author's elaboration.

Appendix 5.E Additional responses from the model

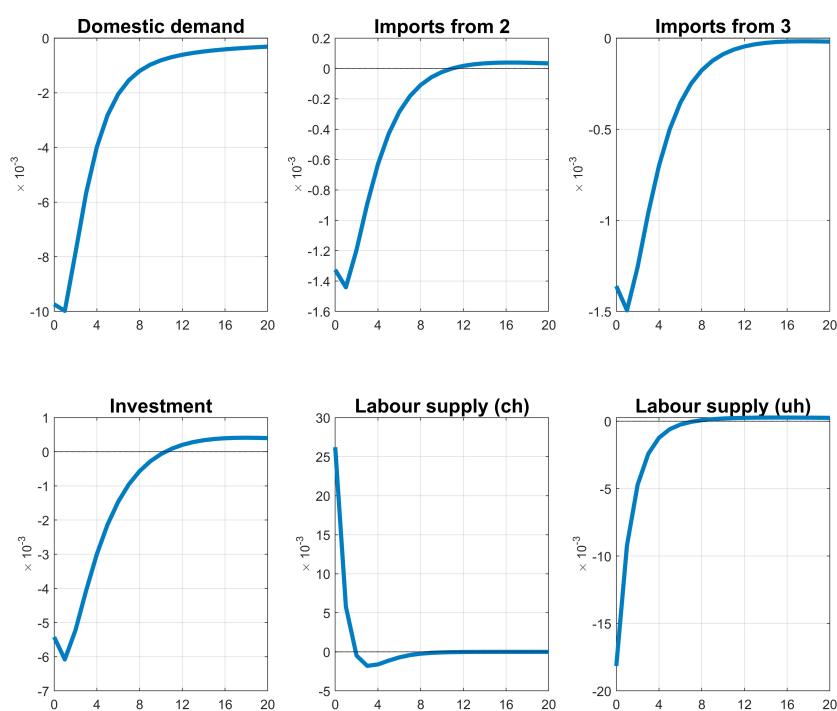
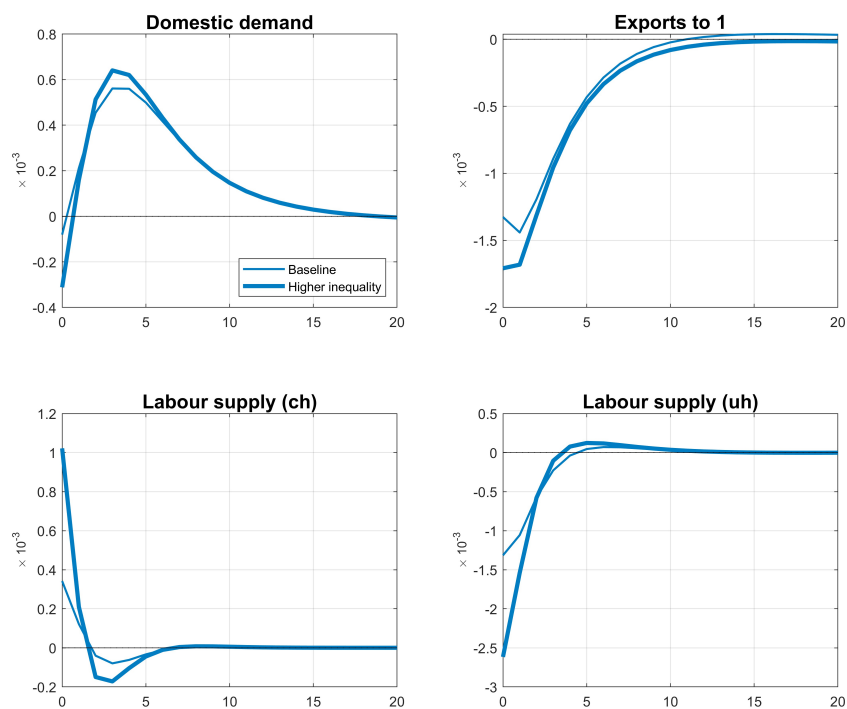


Figure 5.E.1: Effect of US monetary policy on US variables – Additional variables

Notes. Impulse responses depict deviations from the steady state following a shock to the interest rate (tightening) in country 1 (United States). The horizontal axes display quarters after the shock has hit.

(a) Country 2



(b) Country 3

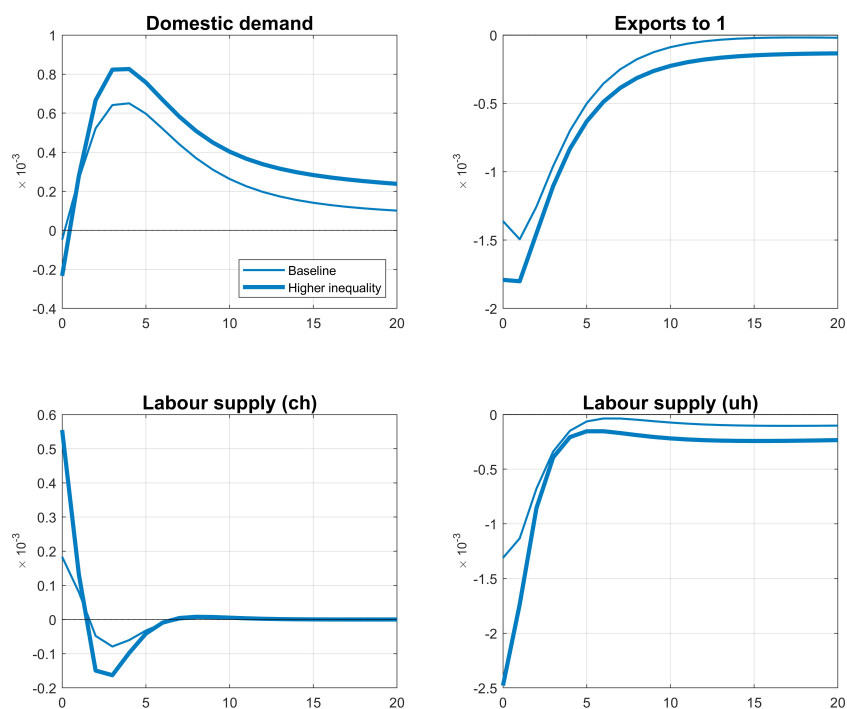


Figure 5.E.2: Effect of US monetary policy on foreign economies – Different levels of inequality, additional variables

Notes. Impulse responses depict deviations from the steady state following a shock to the interest rate (tightening) in country 1 (United States). *Baseline* refers to the original calibration, while *Higher inequality* is a scenario where the Gini is 20% higher. The horizontal axes display quarters after the shock has hit.

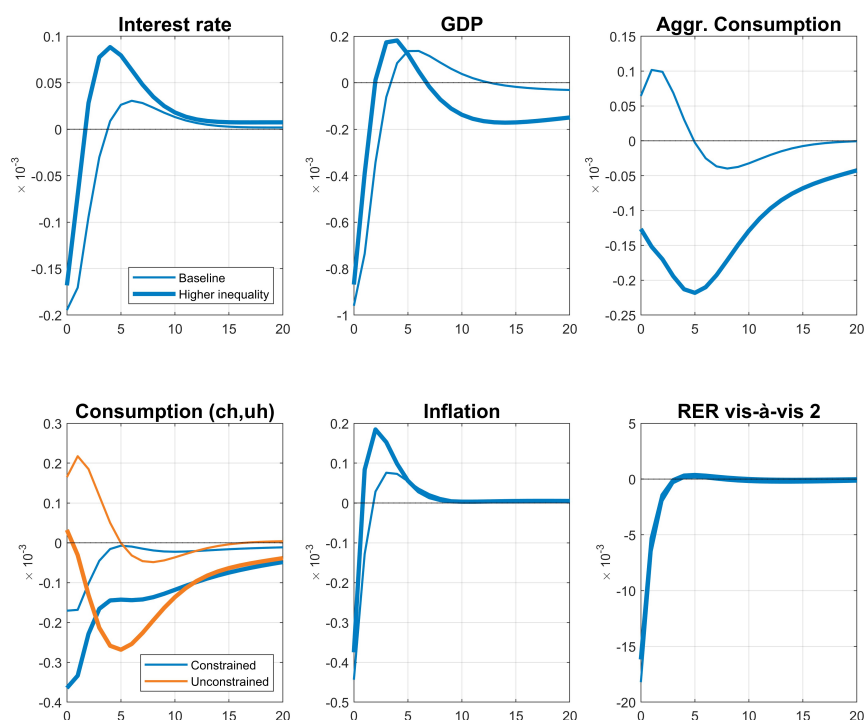
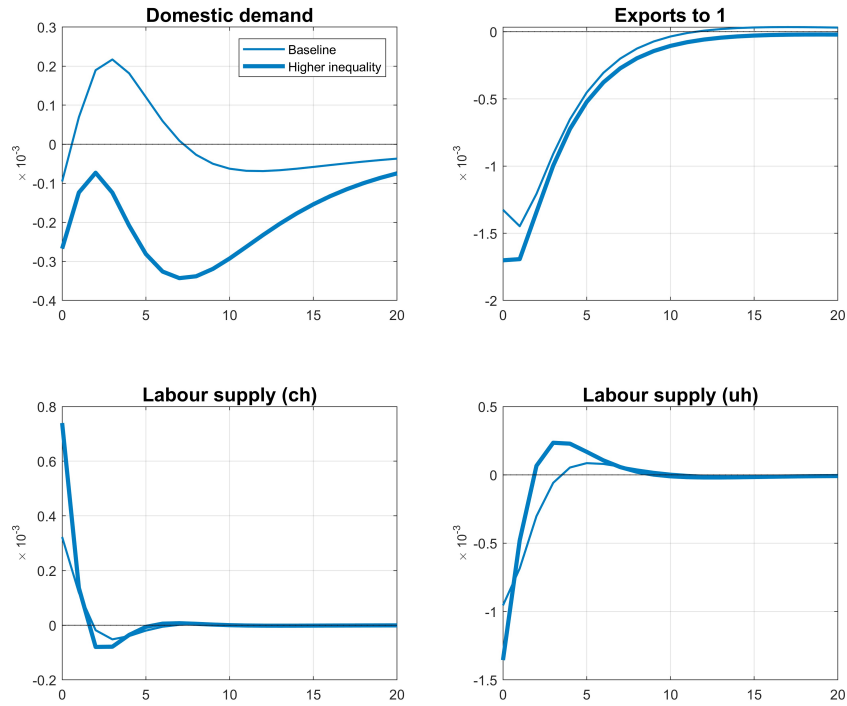


Figure 5.E.3: Effect of US monetary policy on country 2 – Different levels of inequality and higher cost of foreign bond holding for country 3
 $(\phi_2^B = 0.001, \phi_3^B = 0.1)$

Notes. Impulse responses depict deviations from the steady state following a shock to the interest rate (tightening) in country 1 (United States). *Baseline* refers to the original calibration, while *Higher inequality* is a scenario where the Gini is 20% higher. A decrease in the exchange rate (RER) denotes an appreciation of the currency of country 1 (US dollar). The horizontal axes display quarters after the shock has hit.

(a) Country 2



(b) Country 3

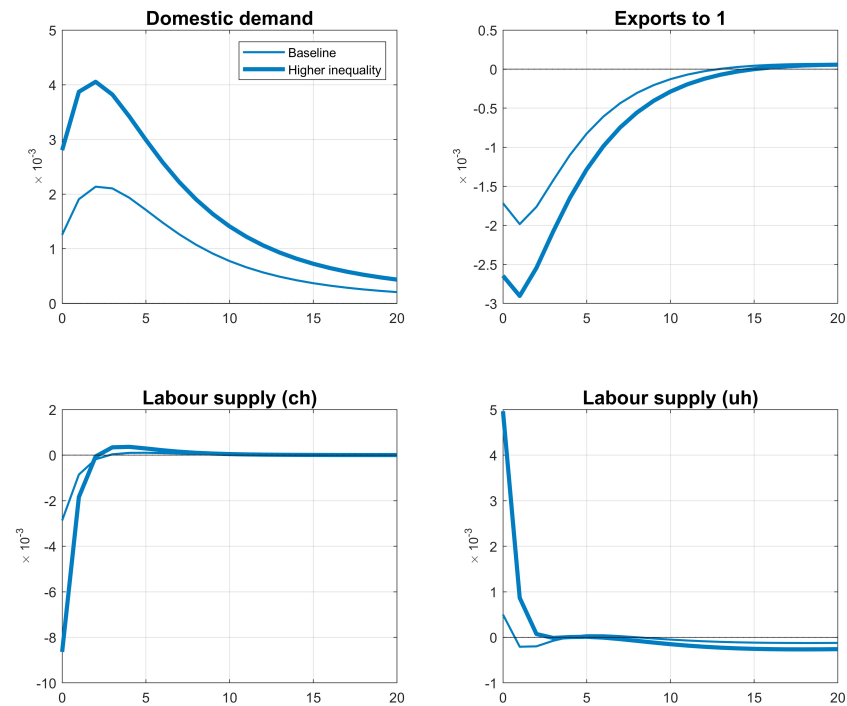


Figure 5.E.4: Effect of US monetary policy on foreign economies – Different levels of inequality and higher cost of foreign bond holding for country 3 ($\phi_2^B = 0.001, \phi_3^B = 0.1$), additional variables

Notes. Impulse responses depict deviations from the steady state following a shock to the interest rate (tightening) in country 1 (United States). *Baseline* refers to the original calibration, while *Higher inequality* is a scenario where the Gini is 20% higher. The horizontal axes display quarters after the shock has hit.

Chapter 6

General Conclusion

This thesis presented four chapters exploring the topics of international macroeconomics and economic inequality, as well as their interaction. In this concluding chapter, I summarise their findings and highlight the relevant policy implications related to their results.

The first chapter discussed the properties of financial conditions indices (FCIs) and tested the ability of different indices, constructed with different approaches on a common set of macro-financial variables, to assess tail risk to economic activity and predict financial crises. An econometric evaluation, conducted through quantile regressions and probit models, showed that FCIs constructed via equal weights combinations of macro-financial variables have good statistical properties and often outperform more sophisticated methods such as factor models with time-varying parameters and principal component analysis. Averaging using equal weights has a long tradition in the forecasting literature, preserves the heterogeneity and relevance of each component, allows for the diversification of signs of components based on economic judgement (e.g., exchange rate) and eliminates parameter estimation uncertainty. Moreover, it enables an easy decomposition of the index into its drivers and provides a convenient way to address issues like short data and series irregularities, a pressing concern when working with emerging markets data.

These results speak directly to policymakers, using FCIs on a regular basis to assess the current state of financial conditions, and researchers, who uses them for a broad range of economic analyses. Econometric models and complex machinery cannot replace the judgement of economists when it comes to understanding the relationship between financial conditions and economic outcomes. Indicators should be revised whenever deemed appropriate in the face of structural changes, such as for example digital currencies. In this regard, simplicity in the aggregation method will continue to provide valuable robustness to a synthetic index of

financial conditions.

The second chapter examined how intergenerational transfers (inheritance and gifts) shape the distribution of wealth in Ireland. By means of Gini decomposition using granular household-level data, we showed that inherited wealth in Ireland does not contribute significantly to wealth inequality, and may even reduce it over time. Exploring tentative mechanisms, we provided evidence that while the share of households receiving inheritance increases with net wealth, its contribution is decreasing in net wealth. In other words, inheritances are more important for the middle-lower part of the distribution than for the top part. Moreover, the flow of inherited wealth co-moves with asset prices, especially house prices, and inheritors tend to substitute employee income for rental income.

This chapter offers direct policy implications regarding the discussion on inheritance tax in Ireland. Currently, the cumulative value of inheritances and gifts received over a lifetime by an individual is taxed at a 33% rate for the portion exceeding €335,000. Budget 2025, which was announced on 1 October 2024, increased the tax free threshold to €400,000 to reflect the rise in house prices.¹ In line with what we find in the chapter, this cut in the capital acquisition tax may support property acquisition for the lower and middle classes. However, the median inheritance value is around €80,000. This means that 50% of households receive less than a fourth of the current exemption threshold and a fifth than the suggested one. Also, the median net wealth of inheritors is €330,000. The tax-free threshold has changed often in modern Ireland, usually reflecting asset price shifts. However, our results suggest that thoughtful policy design is key to balancing the easing of financial burdens while addressing wealth inequality and the impact on tax revenue. The 2022 Commission on Taxation and Welfare *Foundations for the Future* report highlights that tax reforms should jointly take into account ways to increase the amount of tax collected, minimise distortions and improve equity.

In the third chapter, I investigated how the increase in cross-border financial flows has impacted the distribution of net wealth. I employed a panel data econometric specification to estimate this effect using data for the United States, France, and the United Kingdom. I reported that financial globalisation is associated with wealth gains at the top of the wealth distribution, specifically within the top 1%.

This chapter gives rise to several policy considerations. Understanding how financial globalisation influences wealth distribution is crucial for crafting

¹See [here](#) for a detailed overview of the tax policy changes of Budget 2025.

targeted and effective policies that foster a more equitable society. Reforms such as capital account regulations, capital flow management, and macro-prudential policies could mitigate the effects on inequality by expanding access to foreign financial instruments. Progressive taxation on capital and/or wealth may help redistribute wealth gains from the wealthy to lower-income groups. However, these policies must be carefully evaluated for their potential impacts on economic growth and overall welfare, to prevent adverse outcomes like sudden stops in capital flows or profit shifting. Additionally, from a broader perspective, policies that promote financial literacy would enable greater participation in global markets. Strengthening financial stability could also lessen the impact that financial globalisation has on inequality during financial crises.

The last chapter studied the heterogeneity of US monetary policy spillovers to the rest of the world based on the level of income inequality in the recipient country. I showed that, generally, the negative effect on GDP following a monetary policy tightening in the United States is amplified when inequality is higher than average. However, this result is reversed for emerging market economies. By employing a theoretical model with heterogeneous agents, I found that this divergence in the result is driven by the level of participation in international financial markets and the fact that households in emerging markets face higher foreign bond holding costs than those in advanced economies.

The policy implications of this chapter are far-reaching. While central banks are increasingly focusing on how their policies affect household heterogeneity, they should also consider how inequality influences the transmission of monetary policy to the economy. Given that monetary policies from major economies, such as the United States, have global repercussions, it is essential for policymakers to discuss these spillover effects within an international framework. Recipient countries, in particular, should address domestic inequality to mitigate the impact of foreign monetary policy shocks. Additionally, the chapter highlights the significant role of the interaction between inequality and international financial participation. Policies aimed at reducing market frictions and enhancing efficiency in global markets can help manage the effects of US monetary policy on recipient economies.

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