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UNBALANCED FINANCIAL GLOBALIZATION

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ABSTRACT

We use a dynamic spatial general equilibrium model of international investment and production to investigate the real implications of the last five decades of financial globalization. We introduce a wedge accounting framework to estimate country- and time-varying measures of outward and inward Revealed Financial Openness (RFO). These wedges are meant to capture all impediments to cross-border investment, rather than explicit policy measures alone. We show how to identify these wedges for a large panel of countries using limited publicly available data on national accounts and external asset and liability positions since the 1970s. Our analysis reveals striking cross-country differences in the pace and direction of financial opening: wealthier countries have become relatively more open to foreign capital inflows, while poorer countries have become relatively more open to capital outflows, a phenomenon we call “Unbalanced Financial Globalization.” Counterfactual simulations show that this unbalanced financial globalization has worsened capital allocation, resulting in a 5.9% decrease inworld GDP, a 3.4% rise in cross-country income inequality, lower wages in poorer countries, and a decline in rates of return on capital in richer countries. In contrast, if financial integration had been uniform, the improved allocation of capital would have reduced income inequality, and increased global GDP. These findings underscore the crucial role of spatial heterogeneity in shaping the real impact of international capital markets integration.

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1 Introduction

Over the last five decades, cross-border investments have undergone a tremendous expansion. As most countries have eased restrictions on the international movement of capital, the world's total external assets and liabilities have dramatically increased from 50% of the world GDP in 1970 to over 300% by 2019. How has this overall increase in cross-border investment affected the allocation of capital and economic activity across countries? What implications has it had for income inequality across countries and within countries, through changes in wages and rates of return on capital?

Traditional neoclassical models predict that the integration of international capital markets should lead to an efficient reallocation of capital from capital-rich to capital-scarce countries, resulting in higher world GDP and lower cross-country income inequality. Yet, empirical evidence indicates that such reallocation has not fully materialized (Lucas, 1990; Obstfeld and Taylor, 2005; Monge-Naranjo, Sánchez and Santaeulalia-Llopis, 2019). As highlighted by recent papers, various factors, including capital controls, political risk, financial development, and taxation—often more pronounced in developing countries—likely impede the reallocation of capital, despite *de jure* liberalization efforts (Levchenko, Rancière and Thoenig, 2009; Mendoza, Quadrini and Rios-Rull, 2009; Broner and Ventura, 2016; Buera and Shin, 2017). To assess the impacts of financial globalization, it is thus essential to consider the joint implications of these various factors on a country's *de facto* financial openness and to account for their significant heterogeneity across countries.

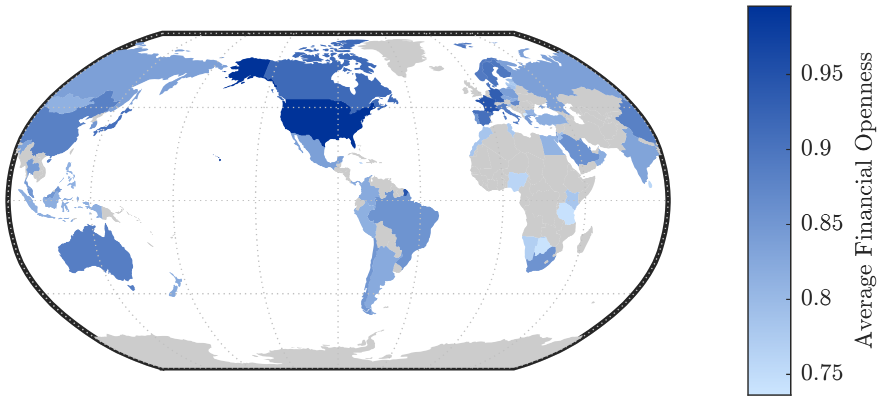
In this paper, we measure the *de facto* financial openness of a large number of developed and developing countries over time using a tractable dynamic spatial general equilibrium model of international investment and production in the style of Pellegrino et al. (2025). To do so, we develop a wedge accounting framework that enables us to estimate time-varying measures of inward and outward *Revealed Financial Openness* (RFO). Conditional on the model, these measures capture all impediments to asset trade at the country level. These may include explicit policy-related barriers such as capital controls, as well as non-policy factors affecting a country's ability to attract foreign investors or to retain domestic capital (e.g. geo-political risk or information frictions). We then use the estimated model and RFO wedges to analyze the impact of the last five decades of financial globalization on the global allocation of capital, countries' output and income, and factor prices within countries.

A key feature of the model is to embed a logit asset demand system in a multi-country neoclassical framework, building on Koijen and Yogo (2019). Importantly, it allows for a flexible yet simple representation of frictions to international asset trade, which proves instrumental in our wedge accounting methodology. The model is otherwise conventional. Overlapping generations of households decide how much to consume and to save each period and firms use capital, labor and energy to produce a tradable good with a local technology. While the model allows for rich heterogeneity across countries, it remains tractable and can be easily inverted to estimate each country's set of fundamentals for every year.

Using the structure of the model, we develop a wedge accounting framework in the style of Chari et al. (2007) to identify new time-varying and country-level measures of inward and outward *de facto* financial openness. We estimate these RFO wedges for a large panel of countries since 1970 by leveraging two publicly available datasets: the Penn World Tables for national accounts and the External Wealth of Nations dataset by Lane and Milesi-Ferretti (2018) on external assets and liabilities. Figure 1 plots the map of our RFO wedges in 2019.

Our wedge accounting framework offers a solution to two challenges. First, the lack of cross-border bilateral investment data before the 2000s makes it impossible to apply the standard techniques used in the

Figure 1: Map of Revealed Financial Openness Wedges in 2019



Note: This figure plots the product of the outward and inward financial openness wedges estimated in 2019 ($\tau_j^{in} \cdot \tau_j^{out}$). Wedges can be interpreted as one minus the implicit tax rate on foreign investment.

trade literature that estimates bilateral trade costs by inverting a gravity model of bilateral trade flows (Balassa, 1965). Instead, our measurement framework only requires aggregate data that is publicly available for a large panel of countries since 1970. Second, within each country, a myriad of policies affects the degree of *de facto* financial openness and it would be impossible to simultaneously model all of them. Our RFO wedges summarize all these impediments into an easily interpretable shadow tax on incoming and outgoing investment.

The identification of inward and outward RFO wedges is intuitive and as follows. We infer that a country has high barriers to incoming foreign investments if its external liability is lower than what the model predicts based on its return on capital and the observed external assets of other countries. Similarly, an observed domestic portfolio share that exceeds the frictionless model's prediction would signal high barriers to outgoing foreign investment. Our approach does not involve taking a stand on which specific factors drive the wedges in each country; instead, we estimate the total effect of all frictions collectively.

We validate our estimated RFO wedges in three complementary ways. First, we show that they correlate strongly and with the expected sign with several known barriers to international investment, including measures of *de jure* capital controls, weak financial development, political risk and the lack of tax and investment treaties. Second, we show that they also strongly correlate with asset trade costs estimated by inverting the gravity equation on bilateral positions, which are available after 2007 for a subset of countries in the *Global Allocation of Capital Project* (Coppola, Maggiori, Neiman and Schreger, 2021). Third, in an event-study analysis, we find that an episode of financial liberalization, as identified by Bekaert and Harvey (2000), is followed by an economically and statistically meaningful decrease in the estimated implicit tax, reflecting increasing *de facto* openness.

Two important stylized facts emerge from investigating the patterns of financial globalization since 1970 through the lens of the RFO wedges. First, countries have become significantly more open over time on average. The average implicit tax on gross returns on cross-border investments faced by investors—the average RFO wedges—has been steadily decreasing, from 27% in 1971 to just 17% in 2019. Second, and more importantly, our findings reveal important asymmetries in the pace and direction in which impediments to international asset trade have declined across countries. More specifically, higher-income countries have experienced an increase in their openness – especially their inward openness – earlier and faster than poorer countries. Low-income countries have instead opened later and mostly to capital outflows. We call this phenomenon *Unbalanced Financial Globalization.*

We then use the model to draw the implications of this unbalanced financial globalization for the allocation of capital, for countries' output and for income inequality across countries and factor prices within countries. To do so, we compare the actual path of the world economy to a counterfactual one without financial globalization. The latter corresponds to the equilibrium path of the model in which we hold the RFO wedges fixed at their 1970 levels. This comparison delivers three important findings.

First, through the lens of the model, the uneven decline in barriers has resulted in a worsening of capital allocation across countries and a lower world output. Had the RFO wedges remained at their 1970 levels, global output in 2019 would be 5.9% higher. This is driven by the fact that countries with initially high levels of Revealed Financial Openness—typically high-income countries—have outpaced the others in becoming more attractive to foreign investors – that is, their perceived rate of return on capital increased relative to low-income countries. As a result, capital has migrated from capital-scarce to capital-rich countries, worsening the allocation of capital and further lowering the domestic rate of returns on capital in high-income countries.

These results contrast sharply with what would be predicted by a typical neoclassical 2-country model of financial integration, and constitute a dynamic version of the Lucas puzzle (Lucas, 1990): despite an overall decline in international investment frictions, capital misallocation has increased due to the uneven pace and pattern of this decline across countries.

Second, unbalanced financial globalization has contributed to a widening of income gaps between rich and poor countries. The variance of log output per worker in 2019 is 3.4% higher than it would have been in a world with no financial globalization. Third, financial globalization has reduced wages and increased the return on capital in low-income countries, while having the opposite effects in high-income countries. Relative to our counterfactual no-financial globalization scenario, wages in low-income countries are lower by 9.8% in 2019, while the rate of return on capital is higher by 10.6%. The opposite is true in high-income countries. Interestingly, while the rate of return on capital in high-income countries has declined due to the influx of capital, the rate of return on the portfolios of investors located in these countries have not decreased as much, due to their improved access to higher-return destinations.

In contrast, we find that a balanced financial globalization would have raised world output and decreased inequality across countries, consistent with the predictions of traditional neoclassical models. We define "balanced" globalization in two different ways. In a first version, we assume that RFO wedges of all countries improve at the same pace as the world average in the actual economy. In the second version, we assume that wedges converge over time to the same average value by 2019 as in the actual economy. These findings confirm that the unevenness of financial globalization has been a key driver of the worsening allocation of capital, the decline of world output and the increase in inequality across countries over time. Overall, our paper underscores the importance of accounting for spatial heterogeneity and the relative pace at which countries become inwardly and outwardly open, when assessing the effects of financial globalization.

Finally, we check the robustness of our findings to several concerns. More specifically, we show that they are robust (i) to the country coverage of our sample, (ii) the inclusion of government debt, (iii) restricting our investment data to equity and FDI positions, and (iv) the inclusion of risk in the portfolio shares. The fact that our results are robust to including only equity and FDI, or to excluding government debt is important. It implies that the findings that financial globalization has been unbalanced and that this has led to a worsening of capital allocation are in part but not only driven by government flows (Alfaro, Kalemli-Ozcan & Volosovich, 2014).

Related literature. This paper contributes to the extensive empirical literature on the patterns, drivers and effects of financial globalization. Lane and Milesi-Ferretti (2008) empirically investigate the patterns of financial globalization, and we extensively use their data on external assets and liabilities. Rancière, Tornell and Westermann (2006) empirically decompose the direct growth effects of financial liberalization from its indirect effects via crisis incidence. Henry (2007) and Chari et al. (2012) show that stock market liberalization in emerging economies leads to an increase in capital inflows, growth and wages. At the firm-level, Forbes (2007) finds that financial integration in emerging countries is associated with a decline in the cost of capital, consistent with the core mechanism in our model. Dell'Arriccia, Di Giovanni et al. (2008) study the role of institutions and financial development in mediating the effects of financial liberalization. Heathcote and Perri (2004) study the relationship between financial globalization and international comovement. Our contribution is to estimate model-based measures of *de facto* inward and outward financial openness to document that financial globalization has been unbalanced with significant differences in the pace and patterns of financial integration across countries and to show that this has led to a worsening of the global allocation of capital.

Our findings also shed light on the distributional consequences of globalization. A rich literature has investigated the impact of trade opening on welfare and inequality, see for instance Antràs, De Gortari and Itskhoki (2017) and Dix-Carneiro et al. (2023). Closer to our analysis of financial globalization, Furceri and Loungani (2018) and Furceri, Loungani and Ostry (2019) find that liberalization episodes are associated with an increase in the income inequality within countries. David, Rancière and Zeke (2024) find that international diversification is associated with changes in the labor share of value added at the firm-level. The analysis by Azzimonti, De Francisco and Quadrini (2014) and Broner, Martin, Pandolfi and Williams (2021) emphasize the role of public debt. We contribute by showing that, through the lens of the model, financial globalization has increased cross-country inequality, in poorer countries it has decreased wages and raised the returns on capital while the opposite is true in richer countries.

We also contribute to a long-standing literature on the global allocation of capital (Lucas, 1990; Maggiori et al., 2020; Coppola et al., 2021). We see our findings as a dynamic version of the Lucas puzzle: despite an overall decline in barriers to international investment, capital misallocation has increased due to the uneven pace and pattern of this decline across countries. This finding also aligns with important studies showing higher returns on capital in emerging markets (David, Henriksen and Simonovska, 2014; Monge-Naranjo, Sánchez and Santaeulalia-Llopis, 2019), which suggests the existence of capital misallocation. We also relate to papers that analyze empirically and theoretically specific mechanisms and drivers of this misallocation. Rancière and Tornell (2016) use a two-sector model to show that financial liberalization improves allocative efficiency by relaxing borrowing constraints, while endogenously generating systemic risk. Financial development and contracting institutions are emphasized by Mendoza, Quadrini and Rios-Rull (2009), Mendoza and Quadrini (2010), and Broner and Ventura (2016). Relatedly, Boyd and Smith (1997) highlight the role of informational frictions and Heathcote and Perri (2016) and Costinot, Lorenzoni and Werning (2014) the role of capital controls (see also the reviews of Ghosh et al., 2010, Magud et al., 2018 and Erten et al., 2021). Our contribution is to develop a measure of *de facto* financial openness that incorporates all the impediments to inward and outward foreign investment at the country level and to document their patterns since 1970.

Methodologically, our work builds on a stream of papers that develop wedge accounting frameworks in an international macro-finance context, such as Gourinchas and Jeanne (2013) on the capital allocation puzzle, Gârleanu, Panageas and Yu (2020) on informational frictions and under-diversification, Reyes-Heroles (2016), Dix-Carneiro, Pessoa, Reyes-Heroles and Traiberman (2023) and Eaton, Kortum, Neiman and Romalis (2016) on the impact of trade shocks and Ohanian, Restrepo-Echavarria and Wright (2018) and Ohanian, Restrepo-Echavarria, Van Patten and Wright (2021) on capital account controls in the Bretton Woods era. Relative to the latter paper, our focus is on the implications of financial globalization in the post Bretton Woods era. Our model differs from all these papers in that we incorporate an asset demand framework and we adopt a spatial-structural approach, inspired by the recent trade literature (Balassa, 1965; Koopman, Wang and Wei, 2014), including recent quantitative multi-country models (Caliendo, Parro and Tsyvinski, 2022; Boehm, Levchenko, Pandalai-Nayar and Toma, 2024; Bonadio, Huo, Levchenko and Pandalai-Nayar, 2025). This approach allows us to estimate the Revealed Financial Openness wedges in a transparent way, and to perform detailed quantification with rich country heterogeneity.

We build on a growing body of work that introduces segmentation and asset demand systems in international finance, including Gabaix and Maggiori (2015), Koijen and Yogo (2020), Jiang, Richmond and Zhang (2024), Shen and Zhang (2022), Kleinman, Liu, Redding and Yogo (2023) and Itskhoki and Mukhin (2025). In particular, we draw on the model of Pellegrino, Spolaore and Wacziarg (2025). Relative to these papers, we introduce a new wedge accounting framework and we develop a dynamic multi-country model that is sufficiently tractable to allow us to invert it and recover the path of each country's set of fundamentals back to the 1970s. Like PSW, we find that impediments to international investment misallocate capital from low-income towards high-income countries. The novel insight of this paper is to show how financial globalization has worsened this misallocation over time, as de facto financial integration, especially to capital inflows, has proceeded faster in high-income countries than it has in low-income ones.

The remainder of the paper is organized as follows. Section 2 introduces our model; Section 3 introduces the data used for the estimation of the model and our calibration strategy; Section 4 outlines the identification of the RFO wedges; Section 5 validates our estimated RFO wedges; Section 6 uses our RFO wedges to document patterns of financial globalization, including its unbalancedness; Section 7 investigates its macroeconomic implications based on counterfactual analyses; Section 8 assesses the robustness of our results; Section 9 concludes.

2 A Dynamic Spatial Model of International Capital Allocation

We start by introducing a tractable multi-country dynamic general equilibrium model that incorporates a logit demand system for international assets, in the style of Pellegrino et al. (2025, henceforth PSW), and which endogenously generates a network of bilateral investment flows between countries. We will use it in the following section to develop our wedge accounting framework and in Section 7 to simulate counterfactuals.

2.1 Production

Time is discrete and indexed by t. The world economy is made of I countries. We use the subscript $i \in \{1, 2, ..., I\}$ to denote the country that receives the investment, and the subscript $j \in \{1, 2, ..., I\}$ to denote the country where investors are located. For example, A_{ijt} denotes the aggregate investment from j to i at time t.

In each country, there is a representative firm that produces a homogeneous tradable good which is the numeraire of this economy with price equal to 1. The production technology is country-specific and uses three inputs:

$$Y_{it} \ = \ \zeta_{it} \, \Omega_{it} \, K_{it}^{\kappa_{it}} \, L_{it}^{\lambda_{it}} \, X_{it}^{\xi_{it}} \tag{1}$$

where K_{it} is the reproducible capital, L_{it} is human capital and X_{it} is natural resources.[1] Total factor productivity is the product of two components: a deterministic component Ω_{it}, whose path is known to all agents, and a stochastic i.i.d. shock ζ_{it} that is unanticipated at time $t-1$ and log-normally distributed with expectation 1. The country-specific and time-varying variance of $\log \zeta_{it}$ is denoted v_{it}. We also assume constant returns to scale ($\kappa_{it} + \lambda_{it} + \xi_{it} = 1$).

Following the existing literature on international capital allocation, we assume that the amount of labor and of natural resources available at time t are exogenous and immobile, while reproducible capital is endogenously accumulated and imperfectly mobile across countries. We follow PSW in assuming that the rate of depreciation of capital δ_{it} is stochastic and such that the undepreciated fraction of the capital stock is equal to $\zeta_{it} \, (1 - \delta)$.

Investors own the capital stock and are the residual claimants on the profits of the representative firm. Taking the wage rate P_{it}^L and the rental rate of natural resources P_{it}^X as given, the representative firm in i maximizes profits (Π_{it}), which are defined as follows:

$$\Pi_{it} \ \stackrel{\text{def}}{=} \ Y_{it} - P_{it}^L L_{it} - P_{it}^X X_{it} \tag{2}$$

At the optimum, firms equate the marginal product of each input to its cost:

$$P_{it}^L \ = \ \lambda_{it} \frac{Y_{it}}{L_{it}}; \qquad P_{it}^X \ = \ \xi_{it} \frac{Y_{it}}{X_{it}} \tag{3}$$

Denoting the marginal product of capital as MPK_{it}, it is also the profit per unit of capital invested:

$$\text{MPK}_{it} \ \stackrel{\text{def}}{=} \ \kappa_{it} \frac{Y_{it}}{K_{it}} \ \equiv \ \frac{\Pi_{it}}{K_{it}} \tag{4}$$

[1] We include natural resources as a separate variable from reproducible capital because accounting for rents from natural resources can significantly affect the measurement of the rate of return on reproducible capital and the elasticity of output to capital (Monge-Naranjo, Sánchez and Santaeulalia-Llopis, 2019).

Finally, the aggregate resource constraint is given by

$$\sum_{i=1}^{I} Y_{it} + (1-\delta_{it})K_{it} + \mathcal{E}_{it} \;\;=\;\; \sum_{i=1}^{I} C_{it} + K_{it+1} \tag{5}$$

where C_{it} is the aggregate consumption of country i at time t, and $\mathcal{E}_{it}$ is an exogenous endowment of output in country i at time t, a residual source of income that we introduce so that equation (5) exactly holds in the data.

2.2 Households

We now turn to the behavior of the households who populate our economy. In each year t, and in each country j, a representative agent is born; we index this agent with the time of birth b. Each period, all individuals face a probability of death $\mathfrak{D}_{jt} \in (0,1)$. This probability of death and the expected longevity is independent of age as in the perpetual youth model of Blanchard (1985) and Yaari (1965).

In the first year of life $(t = b)$, the newly born representative agent is endowed with L_{jt} units of labor and X_{jt} units of natural resources. They supply both inelastically to firms, from whom they collect labor earnings $P^L_{jt} L_{jt}$, and natural resources rents $P^X_{jt} X_{jt}$. In this period of their life, they also receive government transfers (T_{jt}) and the exogenous endowment $(\mathcal{E}_{jt})$. In all the following periods of their life $(t > b)$, agents live off capital income. The youngest cohort thus works while older cohorts are capitalists. This structure enables us to integrate a logit asset demand system à la Koijen and Yogo (2019) in a dynamic spatial general equilibrium model that can be solved in closed form globally outside of the steady state. This in turn allows us to easily invert the model and perform wedge accounting back to the 1970s.

Every period agents choose how much of the final good to consume (C_{jbt}) and how much to save to grow their financial wealth (A_{jbt}). We denote by A_{jbt} the wealth saved at time t by the representative agent born at time b in country j and by R_{jt} the rate of return earned at time t on wealth saved at time $(t-1)$. Households take prices as given, including the rate of return on wealth. Their investment portfolio is managed by a financial intermediary, whose behavior is discussed in the next subsection.

The representative agent of each cohort and country seeks to maximize the expected discounted sum of utility from consumption, C_{jbt}. In recursive form, at time t the utility of the representative agent born at time b located in country j is given by:

$$V_{jbt} \;\stackrel{\text{def}}{=}\; (1-\sigma_{jt}) \log C_{jbt} + \sigma_{jt}\; \mathbb{E}_t\left(V_{jbt+1}\right) \tag{6}$$

where the parameter σ_{jt} is the country- and time-specific discount parameter, adjusted for the risk of death. Note that we have normalized the value of death to 0. The operator $\mathbb{E}_t$ denotes the expectation conditional on the information set at time t.

The representative agent born at time b in country j maximizes their utility given by equation (6) subject to the following constraints:

$$C_{jbt} + A_{jbt} \;=\; \begin{cases} P^L_{jt} L_{jt} + P^X_{jt} X_{jt} + T_{jt} + \mathcal{E}_{jt} & \text{if} \quad t = b \\ R_{jt} A_{jbt-1} & \text{if} \quad t > b \end{cases} \tag{7}$$

where R_{jt} is the rate of return earned on wealth between time $t-1$ and time t.

Finally, we build aggregate variables by summing across cohorts within each country. Aggregate consumption and wealth are given by

$$C_{jt} \stackrel{\text{def}}{=} \sum_{b \leq t} C_{jbt}; \qquad A_{jt} \stackrel{\text{def}}{=} \sum_{b \leq t} A_{jbt}; \tag{8}$$

Since only the youngest cohort supplies labor and resources and receive an endowment and government transfers, we have that aggregate natural resources, labor, transfers and endowments are respectively equal to X_{jt}, L_{jt}, T_{jt} and $\mathcal{E}_{jt}$.

2.3 Optimal Saving and Consumption

An appealing feature of our setting with a simple life cycle and unitary elasticity of intertemporal substitution and risk-aversion is that it yields a simple analytical expression for the optimal saving rate. All cohorts of agents save the same fraction of their income and consume the rest. This fraction is given by σ_{jt}. Aggregate saving and consumption are therefore equal to:

$$A_{jt} \stackrel{\text{def}}{=} \sum_{b \leq t} A_{jbt} = \sigma_{jt} \left(R_{jt} A_{jt-1} + P_{jt}^{L} L_{jt} + P_{jt}^{X} X_{jt} + \mathcal{E}_{jt} \right) \tag{9}$$

$$C_{jt} \stackrel{\text{def}}{=} \sum_{b \leq t} C_{jbt} = (1 - \sigma_{jt}) \left(R_{jt} A_{jt-1} + P_{jt}^{L} L_{jt} + P_{jt}^{X} X_{jt} + \mathcal{E}_{jt} \right) \tag{10}$$

It is worth pointing out that prior works have also made functional form and parametric assumptions that deliver similar closed-form expressions for the aggregate saving rate as a function of the discount factor. For example, Krebs (2003) shows that with tradable human capital claims and logarithmic preferences, the consumption-wealth ratio is constant and the saving rate is an explicit function of the discount rate. Similarly, Angeletos (2007) shows in a setting with identical labor incomes, no aggregate risk, i.i.d. investment return shocks and a unitary intertemporal elasticity of substitution that the optimal saving rule is a closed-form function of the patience parameter.

2.4 Portfolio Shares and RFO Wedges

We assume that international investment is intermediated (Gabaix and Maggiori, 2015) by asset managers who make a portfolio decision. We denote by w_{ijt} the share of country j wealth that is invested in destination country i at time t. It is given by the following logit asset demand:

$$w_{ijt} = \frac{\left(\tau_{ijt} \cdot \mathcal{R}_{it-1}\right)^{\beta} \cdot K_{it}}{\sum_{\iota=1}^{I} \left(\tau_{\iota jt} \cdot \mathcal{R}_{\iota t-1}\right)^{\beta} \cdot K_{\iota t}} \tag{11}$$

The optimal portfolio share depends on three objects. First, it depends on the capital stock in the destination country K_{it}. This captures the gravity term which has been shown to be important in the empirical literature Portes and Rey (2005). Second, it depends on the risk-adjusted expected return on capital, $\mathcal{R}_{it-1}$, which is defined in accordance with the microfoundations of the asset demand system (see PSW as well as appendix A). The time subscript $t-1$ indicates that the expectation is conditional on the information available at the time the investment is made. Assuming that the productivity shock ζ_{it} is log-normally distributed with variance v_{it}, the risk-adjusted expected return is given by:

$$\mathcal{R}_{it-1} \;=\; \exp\left(-\frac{1}{2}v_{it}\right)\left(1 + \mathbb{E}_{t-1}\text{MPK}_{it} - \delta\right) \tag{12}$$

Finally, and more importantly, it depends on τ_{ijt}, the wedge distorting investment from country j to country i at time t. These wedges, which we label *Revealed Financial Openness* (RFO), are our original approach to measuring the openness of a country to international investment flows. The RFO wedges for destination country i and origin country j can be interpreted as the summary statistics of all impediments to investments going out of j and coming into i. These impediments may include policy-related barriers such as capital controls and taxes, but also broader factors such as informational frictions, political risk, weak financial development. Consistent with this idea, the term $(1 - \tau_{ijt})$ is the implicit tax rate that an investor located in j pays on the (gross) return on an investment located in country i. Importantly, we assume that the proceeds of these taxes are rebated as a lump sum to the same agents on which it is levied. As a result, it distorts international portfolios, but it does not impact the aggregate resource constraint.

Consistent with this interpretation, these RFO wedges are identified using observable cross-border investment data as shown in Section 4 and they provide a *de facto* measure of a country's financial openness. They are thus analogous to Revealed Comparative Advantage (RCA) in international trade (Balassa, 1965; Koopman, Wang and Wei, 2014). This contrasts with approaches in the international finance literature based on *de jure* openness, such as capital controls. Our *de facto* measure complements these other approaches and is appealing for several reasons: many factors shape the true degree of openness and it would be difficult to model and estimate everyone of them in a single framework; some of these factors are very difficult to measure (*e.g.* political risk); and *de jure* measures don't fully capture the degree of enforcement, which is especially problematic for capital controls.

The logit formulation in equation (11) is a feature of several recent models of demand for international assets (Pellegrino, Spolaore and Wacziarg, 2025; Koijen and Yogo, 2020; Jiang, Richmond and Zhang, 2024). There are several ways to microfound it, as shown in PSW in the context of a model similar to ours and in recent works by Koijen and Yogo (2019) and Kleinman et al. (2023). Critically, we do not interpret the wedges as measuring policy interventions alone; rather, they reflect the combined effect of all factors, policy and non-policy, that create frictions in international capital flows. While different microfoundations entail different structural interpretation of the wedges, we remain agnostic on the particular microfoundation and interpret these wedges as capturing all impediments to international investment.[2] We provide an overview of these different microfoundations in Appendix A.

There are two factors that make this asset demand framework especially attractive in our setting. First, it allows us to define and estimate the RFO wedges τ_{ijt} using the limited country-level information available since the 1970 as shown in Section 4. Second, it makes our dynamic model highly tractable, allowing us to invert it and recover the path of exogenous variables, and then perform counterfactual analysis over the full path of the world economy since 1970.

[2]For example, in the characteristics approach by Koijen and Yogo (2019) the wedges would be interpreted as unobserved characteristics. In the approach by Kleinman et al. (2023) they would be interpreted as investment costs while in Pellegrino (2023) they would correspond to informational costs.

2.5 Market Clearing

All markets clear. There are I markets for labor and I markets for natural resources, one in each country. There is one global market for final goods and the market clearing condition is given by equation (5). The capital markets are also global but partially segmented due to frictions to the free movement of capital. For each country's capital market, the market clearing condition is given by

$$K_{it} = \sum_{j=1}^{I} A_{ijt}; \qquad A_{jt} = \sum_{i=1}^{I} A_{ijt} \tag{13}$$

which can be rewritten in matrix form as follows:

$$\mathbf{K}_t = \mathbf{W}_t \mathbf{A}_t \quad : \quad \begin{bmatrix} K_{1t} \\ K_{2t} \\ \vdots \\ K_{It} \end{bmatrix} = \begin{bmatrix} w_{11t} & w_{12t} & \cdots & w_{1It} \\ w_{21t} & w_{22t} & \cdots & w_{2It} \\ \vdots & \vdots & \ddots & \vdots \\ w_{I1t} & w_{I2t} & \cdots & w_{IIt} \end{bmatrix} \begin{bmatrix} A_{1t} \\ A_{2t} \\ \vdots \\ A_{It} \end{bmatrix} \tag{14}$$

Because the matrix of portfolio shares $\mathbf{W}_t$ depends on the vector of expected rates of return $\mathbf{MPK}_t$, and the rate of return on capital in country i is monotonically decreasing in the capital stock K_{it}, finding an equilibrium consists in finding a vector of rates of return or of capital stocks such that equation (14) holds.

2.6 Government Budget Constraint

The government collects revenues from accidental bequests of cohorts that died between $t-1$ and t (equal to $\mathfrak{D}_{jt-1} R_{jt} A_{jbt-1}$) and transfers them in a lump-sum payment to the newly born cohort. Hence, the government budget constraint at time t is given by

$$T_{jt} = \mathfrak{D}_{jt-1} R_{jt} A_{jt-1} \tag{15}$$

2.7 RFO Wedges and Capital Misallocation

Finally, we show that the RFO wedges distort the equilibrium allocation of capital across countries, consistent with the notion that RFO wedges capture all impediments to international investment. The following proposition establishes that, without these barriers, the equilibrium allocation is efficient in the sense that world GDP is maximized.

Proposition 1. *When risk is homogeneous across countries ($v_i = v$), full financial openness ($\tau_{ijt} = 1 \; \forall \, i$) yields an allocation of capital across countries that maximizes world GDP at time t.*

Proof. Substituting $\tau_{ijt} = 1$ inside equation (11), we obtain $w_{ijt} = \mathcal{R}^{\beta}_{it-1} K_{it} / (\sum_{\iota=1}^{n} \mathcal{R}^{\beta}_{\iota t-1} K_{\iota t})$. Because w_{ijt} does not depend on j, we have $w_{ijt} \propto K_{it}$. This in turn implies that the equation above simplifies to $\mathcal{R}^{\beta}_{it-1} = \sum_{\iota=1}^{n} \mathcal{R}^{\beta}_{\iota t-1} w_{\iota jt}$, which doesn't depend on i. Hence, rates of return on capital and therefore MPK are equalized across countries, which is a necessary and sufficient condition for the maximization of world output. □

Proposition 1 provides a useful benchmark that further clarifies the interpretation of the RFO wedges. The RFO wedges can be interpreted as capturing *all* distortions that cause the world economy to deviate from the efficient allocation of the available capital across countries, whether arising from government policies, institutional weaknesses, informational asymmetries, or other factors. One shouldn't however conclude that the removal of all distortions, $\tau_{ijt} = 1$, is necessarily optimal in a welfare sense. This is because distortions-inducing policies may be second best, such as the use of capital controls to provide macroeconomic stabilization. Relatedly, the removal of all frictions $\tau_{ijt} = 1$ is in general not implementable in practice as some sources of distortions are not under the direct control of governments, at least in the short to medium run (*e.g.* political risk).

3 Data and Calibration

3.1 Data Sources

The Penn World Tables (version 10) are our data source for the number of employees (L_{it}), the real capital stock measured in constant prices (K_{it}), the labor compensation share $\left(\lambda_{it} \equiv P_{it}^{L} L_{it}/Y_{it}\right)$, real output measured in PPP at constant prices (Y_{it}), consumption (C_{it}) and the rate of depreciation of capital (δ).[3]

The panel of total external assets and liabilities is provided by the External Wealth of Nations dataset constructed by Lane and Milesi-Ferretti (2018). Because in our model capital is homogeneous, we deflate all countries' capital stocks and external assets and liabilities using a common deflator to ensure that capital stocks and external positions are measured in the same units.[4]

The natural resources rent share $\left(\xi_{it} \equiv P_{it}^{X} X_{it}/Y_{it}\right)$ data comes from the World Bank database "The Changing Wealth of Nations 2018." Following the methodology of Monge-Naranjo, Sánchez and Santaeulalia-Llopis (2019), we avoid on purpose measuring the natural resources share using data on stocks of natural capital, opting instead to use natural resources rent payments as a percentage of GDP. The World Bank estimates these using the annual production of several natural commodities, evaluated at current prices.

3.2 Coverage

In our estimation, we use a balanced panel of countries for which the implied domestic investment is always positive *i.e.* we require that $A_{jt} \geq \tilde{A}_{jt}$ and $K_{jt} \geq \widetilde{K}_{jt}$ where $\tilde{A}_{jt}$ and $\widetilde{K}_{jt}$ denote the external assets and liabilities, respectively. Our baseline sample contains a total of 58 countries, covering nearly 70% of the world GDP in 2019. The full list of countries is available in Appendix C. This list excludes Russia and China, for which no data is available before the 1990s. We make sure that our results are not driven by our selected sample in Section 8, by repeating our analyses with a broader but shorter balanced panel of countries, which covers 94 countries, accounts for about 90% of the world GDP, and starts in 1993.

3.3 Calibration of Key Parameters

The main parameter that we need to calibrate is β: the elasticity of the portfolio shares with respect to the risk-adjusted rate of return on capital. We follow PSW and set it equal to 18.3. This value is based on the estimates of Koijen and Yogo (2020) of a demand system for international assets. They report demand-price

[3]Using human capital-adjusted employment instead of simply employed persons wouldn't change our findings. This choice only shifts that measured total factor productivity (z) but it does not affect our estimated wedges or the results of the counter-factual analyses.

[4]If we deflated capital with the PWT country-specific deflator, we wouldn't be able to compare capital stocks to external positions, since constructing deflators for external assets and liabilities positions requires knowing the entire matrix of bilateral positions between countries.

elasticities for equity, long-term debt and short-term debt. In order to obtain a value for β, PSW convert these into demand-gross return elasticities and take an average across asset classes.

The other parameter which we need to calibrate is the expected rate of capital depreciation: we set this to 3.8%, based on its empirical mean in the Penn World Table.

4 Identification and Wedge Accounting

In this section we explain how we invert the model to recover the path of all exogenous variables based on the observable data, assuming the model is the true data-generating process. We also develop our wedge accounting framework and show how to identify the RFO wedges from the panel data on external assets and liabilities. The mapping of the model to the data, along with the calibration of parameters and the identification of exogenous variables is summarized in Table 1.

4.1 Identification: Preliminary Steps

The first step in the identification process consists of recovering the output-capital elasticity κ_{it}. Using the assumption of constant return to scale, this is simply given by $(1 - \lambda_{it} - \xi_{it})$. The second step is to compute the marginal product of capital using data on output (Y_{it}), capital stocks (K_{it}) and the capital-output elasticities (κ_{it}) previously identified using equation (4).

The next step consists of recovering the productivity shocks (ζ_{it}). Because the productivity shock (ζ_{it}) is given by the ratio between the gross return and the expectation of the gross return at $t-1$, we have that

$$\zeta_{it} \;=\; \frac{1 + \mathrm{MPK}_{it} - \delta_{it}}{\mathbb{E}_{t-1}\left(1 + \mathrm{MPK}_{it} - \delta_{it}\right)} \tag{16}$$

we use the previously estimated gross returns $(1 + \mathrm{MPK}_{it} - \delta)$ and a model-consistent measure of its expectation at time $t-1$. Our approach to estimate the expectation of gross returns $\mathbb{E}\left(1 + \mathrm{MPK}_{it} - \delta\right)$ is to use the trend component of a Hodrick-Prescott filter applied to our country-level annual time series of gross returns with smoothing parameter 6.25 (Ravn and Uhlig, 2002). By taking the ratio of the realized and expected gross returns, we recover the country-specific paths of shocks (ζ_{it}).

We then estimate the time-varying volatility of the shock (v_{it}), in a way that is consistent with the model. Given that v_{it} is the time-varying variance of the log of the productivity shock $(\log \zeta_{it})$ we estimate it with the 10-year moving average of the squared log difference between the gross returns and its trend component.

4.2 Identification of the RFO wedges

We now show how to identify the RFO wedges (τ_{ijt}) from cross-border investment data, assuming our model is the true data-generating process. If we observed bilateral investment positions, we could directly back out the wedges by inverting equation (11).[5] However, bilateral data exists for a large subset of countries only for the most recent years. For example, the bilateral positions data from the IMF starts in the middle of the 2000s with only a few countries. Instead, our wedge accounting framework relies on the country-level panel of aggregate external asset and liability positions as well as of domestic portfolio shares, which we can construct for a large set of countries since 1970. Our approach is as follows.

[5] We do so in subsection 5.2 for the most recent years for which we have data on bilateral investment positions in order to validate our multilateral wedges.

Table 1: Data, Calibration and Identification Summary

Notation	Observed Variable	Measurement	Source
Y_{it}	Output	PPP$ GDP (deflated)	Penn World Tables
K_{it}	Capital Stock	Capital Stock (deflated)	Penn World Tables
L_{it}	Labor Input	Total Employees	Penn World Tables
λ_{it}	Output-Labor Elasticity	Labor Income Share	Penn World Tables
ξ_{it}	Output-Natural Resources Elasticity	Natural Resources Income Share	WB Wealth of Nations Dataset
$\tilde{K}_{it}$	External Liabilities	External Liabilities (deflated)	Lane and Milesi-Ferretti (2018)
$\tilde{A}_{it}$	External Assets	External Assets (deflated)	Lane and Milesi-Ferretti (2018)

Notation	Free Parameter	Calibrated Value
β	Elasticity of Portfolio Shares with respect to MPK	= 18.3 (Pellegrino et al., 2025)
δ	Expected Rate of Depreciation	= 3.8% (Penn World Table)

Notation	Identified Variable	Identification
κ_{it}	Output-Capital Elasticity	$\kappa_{it} \ = \ \max(0, 1 - \lambda_{it} - \xi_{it})$
A_{jt}	Invested Wealth	$A_{jt} \ = K_{jt} + \tilde{A}_{jt} - \widetilde{K}_{jt}$
$\mathcal{E}_{jt}$	Residual Exogenous Income	$\mathcal{E}_{jt} \ = \ C_{jt} + A_{jt} - P^L_{jt} L_{jt} - P^X_{jt} X_{jt} - R_{jt} A_{jt-1}$
w_{jjt}	Domestic Portfolio Share	$w_{jjt} \ = \ \left(K_{jt} - \widetilde{K}_{jt}\right) / A_{jt}$
τ^{in}_{it}	RFO In-Wedge	(normalized) solution to equation system (21)
τ^{out}_{jt}	RFO Out-Wedge	$\tau^{\text{out}}_{jt} \ = \ \left(\frac{1 - w_{jjt}}{w_{jjt}} \cdot \frac{\mathcal{R}^{\beta}_{it-1} \cdot K_{jt}}{\sum_{\iota \neq j} \left(\tau^{\text{in}}_{\iota t} \cdot \mathcal{R}_{\iota jt-1}\right)^{\beta} K_{\iota t}} \right)^{\frac{1}{\beta}}$
$\tilde{w}_{ijt}$	External Portfolio Shares	$\tilde{w}_{ijt} \ = \ \frac{\left(\tau^{\text{in}}_{it} \cdot \mathcal{R}_{it-1}\right)^{\beta} \cdot K_{it}}{\sum_{\iota \neq j} \left(\tau^{\text{in}}_{\iota t} \cdot \mathcal{R}_{\iota t-1}\right)^{\beta} \cdot K_{\iota t}}$
σ_{jt}	Saving Rate	$\sigma_{jt} \ = \ A_{jt} / \left(R_{jt} A_{jt} + P^L_{jt} L_{jt} + P^X_{jt} X_{jt} + \mathcal{E}_{jt} \right)$

First, we impose some structure on the RFO wedges. We assume that they can be decomposed as the product of an in-wedge τ_{it}^{in} – applied by the destination country – which captures the barriers to incoming capital investments in country i, and an out-wedge τ_{jt}^{out} – applied by the origin country – which captures the barriers to outgoing capital investments from country j. Formally:

$$\tau_{ijt} \;=\; \begin{cases} 1 & \text{if} \quad i = j \\ \tau_{it}^{\text{in}} \cdot \tau_{jt}^{\text{out}} & \text{if} \quad i \neq j \end{cases} \tag{17}$$

This structure is consistent with the notion that most impediments to international investment reflects factors that operate at the country level—such as capital controls on inward or outward investment and capital taxation—or non-policy characteristics of the destination or origin countries—such as political risk, financial development or central bank independence. Like the overall RFO wedge (τ_{ijt}), the inward (τ_{it}^{in}) and outward (τ_{jt}^{out}) RFO wedges can be interpreted as the summary statistics of all impediments to incoming and outgoing investments, respectively.

We start by identifying the inward wedges τ_{it}^{in}. We define $\widetilde{K}_{it}$ the external liability position of country i, $\tilde{A}_{jt}$ the external asset position of country j and w_{jjt} the domestic portfolio share of country j:

$$\widetilde{K}_{it} \overset{\text{def}}{=} \sum_{j \neq i} A_{ijt} \;, \qquad \tilde{A}_{jt} \overset{\text{def}}{=} \sum_{i \neq j} A_{ijt} \qquad \text{and} \qquad w_{jjt} \overset{\text{def}}{=} \frac{A_{jjt}}{A_{jt}} \tag{18}$$

We can then identify total wealth (A_{jt}^{-}) and the share that is invested in domestic assets (w_{jjt}) as:

$$A_{jt} \;= K_{jt} + \tilde{A}_{jt} - \widetilde{K}_{jt} \qquad \text{and} \qquad w_{jjt} \;=\; \frac{K_{jt} - \widetilde{K}_{jt}}{A_{jt}}. \tag{19}$$

Next, we define the portfolio share conditional on investing abroad, which we call the external portfolio share:

$$\tilde{w}_{ijt} \;\overset{\text{def}}{=}\; \frac{A_{ijt}}{\tilde{A}_{jt}} \;=\; \frac{\left(\tau_{it}^{\text{in}} \cdot \mathcal{R}_{it-1}\right)^{\beta} \cdot K_{it}}{\sum_{\iota \neq j} \left(\tau_{\iota t}^{\text{in}} \cdot \mathcal{R}_{\iota t-1}\right)^{\beta} \cdot K_{\iota t}} \qquad \text{for } i \neq j \tag{20}$$

Notice that the term τ_{jt}^{out} has dropped out. After stacking the external portfolio shares $\tilde{w}_{ijt}$ in a square matrix $\widetilde{\mathbf{W}}_t$, we can write a variant of the capital markets clearing conditions (14), in terms of observable variables and the vector of in-wedges $\boldsymbol{\tau}_t^{\text{in}}$:

$$\widetilde{\mathbf{K}}_t \;=\; \widetilde{\mathbf{W}}_t(\boldsymbol{\tau}_t^{\text{in}}) \cdot \tilde{\mathbf{A}}_t \tag{21}$$

We thus obtain a system of I identifying equations that we can invert to identify the I-dimensional vector $\boldsymbol{\tau}_t^{\text{in}}$.

Intuitively, we infer that a country is characterized by high barriers to capital investment if its external liability is lower than what the model predicts given the observed external assets of all other countries and the model-implied portfolio share invested into this country.

It is important to note that because the system is homogeneous of degree 0 in $\boldsymbol{\tau}_t^{\text{in}}$, this vector is only identified up to a multiplicative constant. This is however not a problem because the product of wedges $\tau_{it}^{\text{in}} \cdot \tau_{jt}^{\text{out}}$ is, on the other hand, exactly identified. A normalization of $\boldsymbol{\tau}_{it}^{\text{in}}$ by a constant leads to a corresponding rescaling of $\boldsymbol{\tau}_{jt}^{\text{out}}$, leaving the overall τ_{ijt} unaffected. After discussing the identification of $\boldsymbol{\tau}_t^{\text{out}}$, we propose an intuitive normalization.

The second step is to identify the out-wedges $\boldsymbol{\tau}_t^{\text{out}}$. By rewriting the domestic portfolio shares w_{jjt} as follows

$$w_{jjt} \;=\; \frac{\mathcal{R}_{jt-1}^{\beta} \cdot K_{jt}}{\mathcal{R}_{jt-1}^{\beta} \cdot K_{jt} + \sum_{\iota \neq j} (\tau_{\iota t}^{\text{in}} \, \tau_{jt}^{\text{out}} \cdot \mathcal{R}_{\iota t-1})^{\beta} K_{\iota t}} \tag{22}$$

we can then rearrange and solve for the out-wedges in closed form:

$$\tau_{jt}^{\text{out}} \;=\; \left(\frac{1 - w_{jjt}}{w_{jjt}} \cdot \frac{\mathcal{R}_{jt-1}^{\beta} \cdot K_{jt}}{\sum_{\iota \neq j} \left(\tau_{\iota t}^{\text{in}} \cdot \mathcal{R}_{\iota t-1}\right)^{\beta} K_{\iota t}} \right)^{\frac{1}{\beta}} \tag{23}$$

The reason why the domestic portfolio shares identify the barriers impeding the outgoing flow of capital is also intuitive: a domestic portfolio share higher than what the model would predict given the observed returns implies high barriers to outgoing capital investment. Conversely, a higher propensity to invest abroad than the model predicts implies low barriers to outgoing investment.

4.3 World financial openness & Normalization

Next, we propose a statistic of overall financial openness, which we call the "World financial openness" (WFO), and we use to normalize our wedges. The WFO is defined as the GDP-weighted average of bilateral RFO wedges:

$$\tau_t^{w} \quad \stackrel{\text{def}}{=} \quad \sum_{i=1}^{I} \sum_{j=1}^{I} \frac{\bar{Y}_i \, \bar{Y}_j \cdot \tau_{it}^{\text{in}} \, \tau_{jt}^{\text{out}}}{\sum_{i'=1}^{n} \sum_{j'=1}^{n} \bar{Y}_{i'} \, \bar{Y}_{j'}} \tag{24}$$

where $\bar{Y}_i$ is the GDP of country i taken in a base year.[6] We can similarly define the following indices of inward and outward openness:

$$\bar{\tau}_t^{\text{in}} \quad \stackrel{\text{def}}{=} \quad \sum_{i=1}^{I} \frac{\bar{Y}_i \cdot \tau_{it}^{\text{in}}}{\sum_{i'=1}^{n} \bar{Y}_{i'}}; \qquad \bar{\tau}_t^{\text{out}} \;\stackrel{\text{def}}{=}\; \sum_{j=1}^{n} \frac{\bar{Y}_j \cdot \tau_{jt}^{\text{out}}}{\sum_{j'=1}^{n} \bar{Y}_{j'}} \tag{25}$$

An appealing property of these three indices is that, by construction, $\bar{\tau}_t^{\text{in}} \times \bar{\tau}_t^{\text{out}} \equiv \bar{\tau}_t^{w}$.

We can now go back to the problem of the normalization of $\boldsymbol{\tau}_t^{\text{in}}$, which we previously mentioned after equation (21). Intuitively, the reason why $\boldsymbol{\tau}_t^{\text{in}}$ is only identified up to a constant is that, in our model, a high degree of world outward openness is observationally equivalent to a high degree of world inward openness. For this reason, it is natural to normalize $\boldsymbol{\tau}_t^{\text{in}}$ and $\boldsymbol{\tau}_t^{\text{out}}$ so that:

$$\bar{\tau}_t^{\text{in}} \;\equiv\; \bar{\tau}_t^{\text{out}} \;\equiv\; \sqrt{\tau_t^{w}} \tag{26}$$

4.4 Recovering Other Exogenous Variables

Finally, we show how to recover the other time-varying exogenous variables in our model. The residual income ($\mathcal{E}_{it}$) is obtained by inverting the household's budget constraint:

$$\mathcal{E}_{jt} \;=\; C_{jt} + A_{jt} - P_{jt}^{L} L_{jt} - P_{jt}^{X} X_{jt} - R_{jt} A_{jt-1} \tag{27}$$

[6] Our weights are based on national GDP in 1995 but the method is robust to alternative weighting variables.

where all the terms on the right-hand side are observable or have been constructed above.

To recover the output elasticity to capital (κ_{it}), we use the constant return to scale assumption and the fact that we observe the income share of labor (λ_{it}) and natural resources (ξ_{it}) in the data, hence

$$\kappa_{it} = 1 - \lambda_{it} - \xi_{it} \tag{28}$$

Regarding the stock of natural resources (X_{it}), we cannot identify them separately from TFP (Ω_{it}) because we do not have measures of the natural capital stock. However, this does not pose a challenge since we only need to identify the product $\left(\Omega_{it} X_{it}^{\xi_{it}}\right)$. This product can be easily recovered by inverting the production function given by equation (1)

$$\Omega_{it} X_{it}^{\xi_{it}} \;=\; \frac{Y_{it}}{\zeta_{it}\, K_{it}^{\kappa_{it}}\, L_{it}^{\lambda_{it}}}. \tag{29}$$

since all the terms on the right-hand side are observable and the elasticities have been estimated in previous steps.

The path of adjusted discount factor (σ_{jt}) is pinned down by the path of saving rates consistent with the optimality condition of households given by equation (9):

$$\sigma_{jt} \;=\; \frac{A_{jt}}{R_{jt} A_{jt-1} + P_{jt}^{L} L_{jt} + P_{jt}^{X} X_{jt} + \mathcal{E}_{jt}}. \tag{30}$$

5 Validation

After calibrating the model and applying our wedge accounting framework, we now validate our estimated RFO wedges (τ_{ij}) in three ways. We show that (i) they are tightly related to several barriers to cross-border investment, (ii) they correlate with bilateral asset trade costs estimated from a gravity equation on bilateral positions, (iii) they respond significantly and persistently to known episodes of financial liberalization. Overall, these validation exercises provide empirical support to the interpretation of our wedges as measures of *de facto* financial openness.

5.1 Cross-Sectional Correlations with *De Jure* Measures of Openness

We first validate our RFO wedges by examining their correlations with several well-established measures of frictions to international investment. We emphasize that we expect our comprehensive wedges to correlate with various measures, including both policy measures (like capital controls) and non-policy factors (like financial development and political risk), since our wedges are designed to capture all of these factors collectively. We thus combine multiple datasets that capture different frictions and measures of financial openness and investment climate. We focus on cross-sectional correlations using data from 2019, though our results are robust to using data from different years (although the coverage varies across variables).

First, we employ two widely used measures of *de jure* financial openness derived from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAR) database, which documents country-level policy measures affecting international capital flows. The first is from Chinn and Ito (2008, CI) and the second is from Fernández, Klein, Rebucci, Schindler and Uribe (2015, FKRSU).[7] While CI provides only a single index at the country level capturing both restrictions on inflows and outflows, the

[7] Our results are robust to using measures of capital controls from Jahan and Wang (2016, JW).

Table 2: Cross-Sectional Correlation of the RFO Wedges with Other Measures

Wedge	Predictor	Source	Correlation (ρ)
$\log \sqrt{\tau_{it}^{\text{in}}\,\tau_{it}^{\text{out}}}$	financial openness	Chinn and Ito (2008)	$+0.59^{**}$
$\log \sqrt{\tau_{it}^{\text{in}}\,\tau_{it}^{\text{out}}}$	Number of Tax Treaties	Tax Treaties Explorer	$+0.41^{**}$
$\log \sqrt{\tau_{it}^{\text{in}}\,\tau_{it}^{\text{out}}}$	Num. of Investment Treaties	Alschner et al. (2020)	$+0.53^{**}$
$\log\left(\tau_{it}^{\text{out}}\right)$	Outward Capital Controls	Fernández et al. (2015)	0.03
$\log\left(\tau_{it}^{\text{in}}\right)$	Inward Capital Controls	Fernández et al. (2015)	-0.44^{**}
$\log\left(\tau_{it}^{\text{in}}\right)$	Credit/GDP	IMF GFD Dataset	$+0.53^{**}$
$\log\left(\tau_{it}^{\text{in}}\right)$	ICRG Investment Safety	Political Risk Services	$+0.63^{**}$

Table Notes: This table presents pairwise correlations between our estimated RFO wedges and various de-jure measures of financial openness and international investment climate. All correlations are cross-sectional using 2019 data. $^{**}p$-value < 0.01;$^{*}p$-value < 0.05.

second dataset has a separate measure for inward and outward restrictions. When we use this second dataset, we therefore correlate our measure of outward wedges with their index of outward capital control in the origin country and our measure of inward wedges with the index on inward restrictions in the destination country.

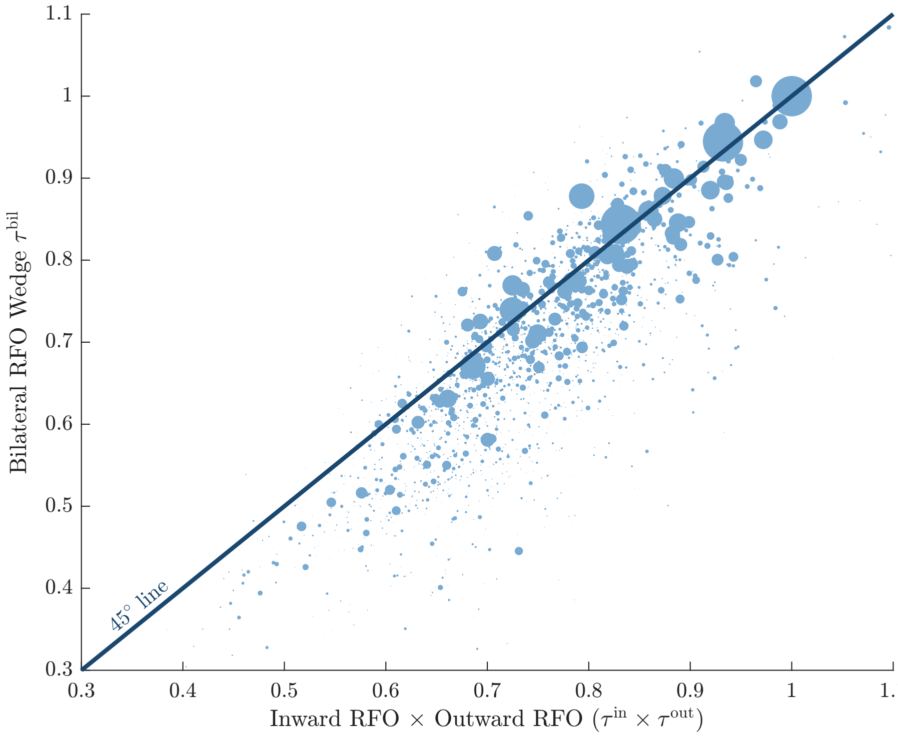
Second, we examine correlations with measures of the institutional and policy environment for international investment. We use data on the number of tax treaties from the Tax Treaties Explorer database, which reflects countries' efforts to reduce barriers to cross-border investment through bilateral agreements. We also use the number of bilateral investment treaties from the EDIT database of Alschner, Elsig and Polanco (2020), which provides another measure of countries' commitment to facilitating international investment flows.

Third, we incorporate measures of financial development and political risk. We use the credit-to-GDP ratio from the World Bank Global Financial Development dataset as a proxy for financial market development, which should facilitate both inward and outward investment flows. We also use the Investment Safety Score published by the International Country Risk Guide (ICRG), which combines information on risk of expropriation, payment delays, and profit repatriation restrictions. The ICRG dataset covers 137 countries since 1984.

As shown in Table 2, we find strong and statistically significant correlations between our RFO wedges and these various measures of barriers to international investment. The correlations are consistently in the expected direction and economically meaningful. Our combined inward and outward openness measure ($\sqrt{\tau_{it}^{\text{in}}\,\tau_{it}^{\text{out}}}$) correlates positively with the Chinn-Ito financial openness index ($\rho = +0.59$), the number of tax treaties ($\rho = +0.41$), and the number of investment treaties ($\rho = +0.53$).

For the directional measures, our inward openness wedges correlate negatively with inward capital controls ($\rho = -0.44$), as expected, and positively with both financial development measured by credit-to-GDP

FIGURE 2: RFO WEDGES DERIVED FROM BILATERAL AND MULTILATERAL POSITIONS



($\rho = +0.53$) and political stability measured by the ICRG investment safety score ($\rho = +0.63$). The correlation with outward capital controls is smaller and not statistically significant, which may reflect the fact that outward controls are often implemented in response to financial crises and thus exhibit high-frequency variation that our annual measures may not capture well.[8]

All statistically significant correlations have p-values below 1%. Although we do not interpret this analysis as providing causal identification of the drivers of our wedges, it provides strong support for our interpretation of the RFO wedges as a valid and comprehensive measure of *de facto* financial openness.

5.2 Estimating Bilateral Wedges from Bilateral Positions

In recent years, data on bilateral investment positions has become available, allowing for the estimation of bilateral RFO wedges (τ_{ijt}) without assuming that they are the product of origin and destination wedges. In this section, we compare the previously estimated wedges with those obtained using this alternative method for the most recent years.

From equation (11), one can always decompose τ_{ijt} as the product of two terms. The first term, which we denote $\tau_{ijt}^{(1)}$ is a function of the position of country j in country i A_{ijt}, the aggregate asset of the origin country A_{jt}, the capital stock K_{it} and the risk-adjusted expected return on capital of the destination

[8] A possible hypothesis for the relatively lower correlation with outward capital controls is the fact that most of the time such measures have responded to financial crises (see the recent work by Chang et al., 2024), a phenomenon that, due to its high frequency nature, would presumably not be captured in the analysis.

country $\mathcal{R}_{ijt}$. The second term $\tau_{jt}^{(2)}$ is origin- and year-specific. Specifically:

$$\tau_{ijt} \;=\; \tau_{ijt}^{(1)} \cdot \tau_{jt}^{(2)} \tag{31}$$

where

$$\log \tau_{ijt}^{(1)} \;\stackrel{\text{def}}{=}\; \log A_{ijt} - \log K_{it} - \beta \log \mathcal{R}_{ijt} \tag{32}$$

$$\log \tau_{jt}^{(2)} \;\stackrel{\text{def}}{=}\; \log \left[\sum_{\iota=1}^{N} (\tau_{\iota jt}\, \mathcal{R}_{\iota jt})^{\beta} \cdot K_{\iota t} \right] - \log A_{jt} \tag{33}$$

Importantly, the term $\tau_{ijt}^{(1)}$ is directly measurable in the data since we observe bilateral positions A_{ijt}, capital stock K_{it} and risk-adjusted expected return on capital $\mathcal{R}_{ijt}$. We provide a full derivation of these formulas in Appendix B.

Data on bilateral positions comes from the restated matrices provided by the *Global Allocation of Capital Project* (GCAP - Coppola et al., 2021). It contains information on many countries from 2007 to 2017 and on Euro Area countries from 2014 to 2020. The data on MPK_{it} and K_{it} is the same we used in sections 4 and 3 and comes from the Penn World Tables.

To estimate $\tau_{jt}^{(2)}$, we apply the same strategy we used to identify τ_{jt}^{out}. More specifically, we match the own share w_{jjt} which gives the following expression

$$\log \tau_{jt}^{(2)} \;=\; \left(\frac{1 - w_{jjt}}{w_{jjt}} \cdot \frac{\mathcal{R}_{jt}^{\beta} K_{jt}}{\sum_{\iota \neq j} \tau_{ijt}^{(1)}\, \mathcal{R}_{\iota t}^{\beta} K_{\iota t}} \right)^{\frac{1}{\beta}} \tag{34}$$

This dataset provided by the *Global Allocation of Capital Project* doesn't have information about investments by domestic investors in domestic assets. For this reason, our measure of the own investment share w_{jjt} is the same as the one constructed in the previous section and given by equation (22).

Our final sample includes countries that are in the GCAP dataset with information on both origin and destination, in the PWT and in the External Wealth of Nations dataset for the year 2015, 2016 and 2017.

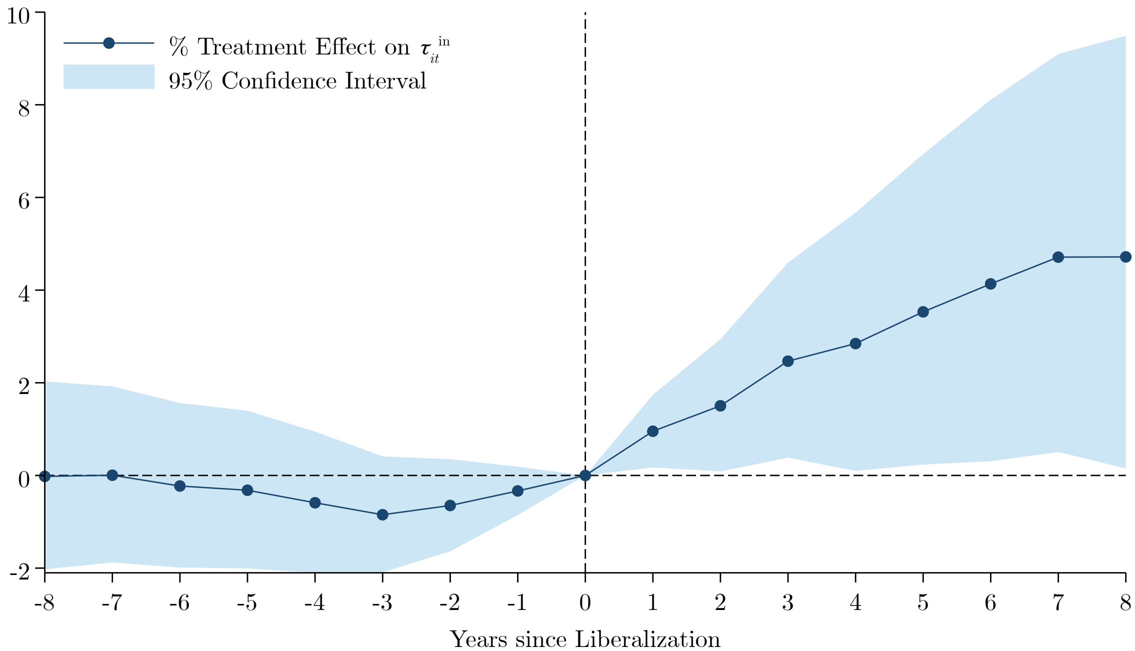
Figure 2 shows a scatter plot of both sets of RFO wedges in 2015. The graph reveals a clear, tight linear relationship between both measures of RFO wedges, which further supports our interpretation of the wedges as meaningful measures of barriers to asset trade across borders.

5.3 Event Study: Emerging Markets Financial Liberalizations

In the third validation exercise we take a closer look at the dynamics of our in-wedges (τ_{it}^{in}). In particular, we study their evolution following episodes of financial liberalization in emerging markets documented by Bekaert and Harvey (2000, henceforth BH). If indeed our interpretation of the RFO wedges as measures of *de facto* openness is correct, we should observe a positive treatment effect on the in-wedge following a liberalization event.

To perform our analysis, we employ the staggered difference-in-differences estimator of Callaway and Sant'Anna (2021). This estimator identifies the average treatment effect of liberalization episodes using the differential timing of the liberalization. The key identifying assumption is that of parallel trends: in the absence of liberalization, the evolution of the in-wedge for any liberalized group country would have followed a similar trend to that of the untreated control group.

Figure 3: Event Study - Emerging Market Liberalizations and In-Wedges



Because BH focus on emerging markets, our event-study sample only includes countries whose GDP per capita was below $25,000 in 1995 which we define as low-income countries in the rest of the paper. We believe that this is a demanding test, as it doesn't exploit the substantial cross-sectional heterogeneity between between high-income and low-income countries. The dependent variable is the log of τ_{it}^{in}, so that changes over time due to the treatment effect correspond to percentage changes.

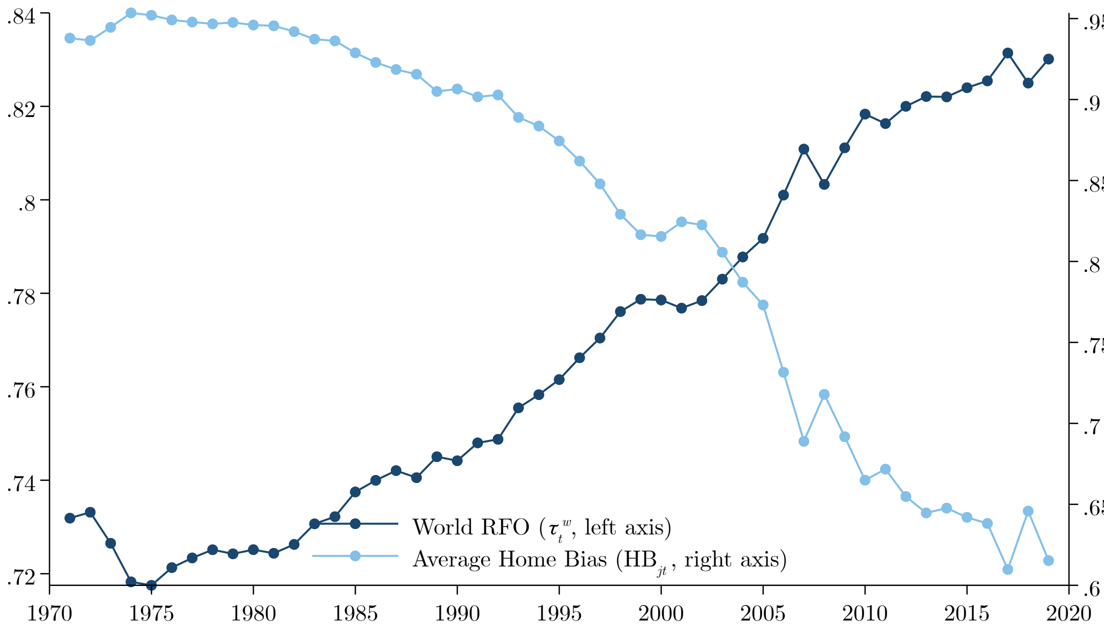
The results of our event study are shown in Figure 3. We find that the RFO wedges respond to liberalization gradually, with a cumulative increase of 4.7% by the eight year since liberalization. By the sixth year, the magnitude of the effect is 4.1%; this figure is economically and significantly significant at the 95% confidence level. These results support the validity of the RFO wedges as measures of *de facto* financial openness.

In Appendix D, we confirm the robustness of our results to the use of alternative estimator of Sun and Abraham (2021).

6 Patterns of De Facto financial openness

We are now ready to analyze the past five decades of financial globalization through the lens of our RFO wedges. We uncover two important stylized facts: countries have become significantly more open over time on average, but the pace and direction at which barriers have declined have been deeply heterogeneous across countries, a phenomenon we call *Unbalanced Financial Globalization.*

Figure 4: World financial openness



6.1 World financial openness

The time series of our World RFO measure (τ_t^w), which is shown in Figure 4 (darker line, left axis), confirms that the global economy has experienced a tremendous increase in financial openness. The implicit tax rate on capital income faced by a typical international investor has decreased significantly over the past five decades. In 1971, the World RFO was 0.73, implying that the average implicit tax on gross returns from international investment was about 27%. After 1980, World RFO has progressively increased to reach almost 0.83 in 2019, which corresponds to an implicit tax of 17%, which is still a very high level.

One implication of this increasing financial openness is the declining home bias—the share of portfolios invested in domestic assets—as shown by the lighter line in Figure 4. Following Coeurdacier and Rey (2013), home bias for country j is defined as:

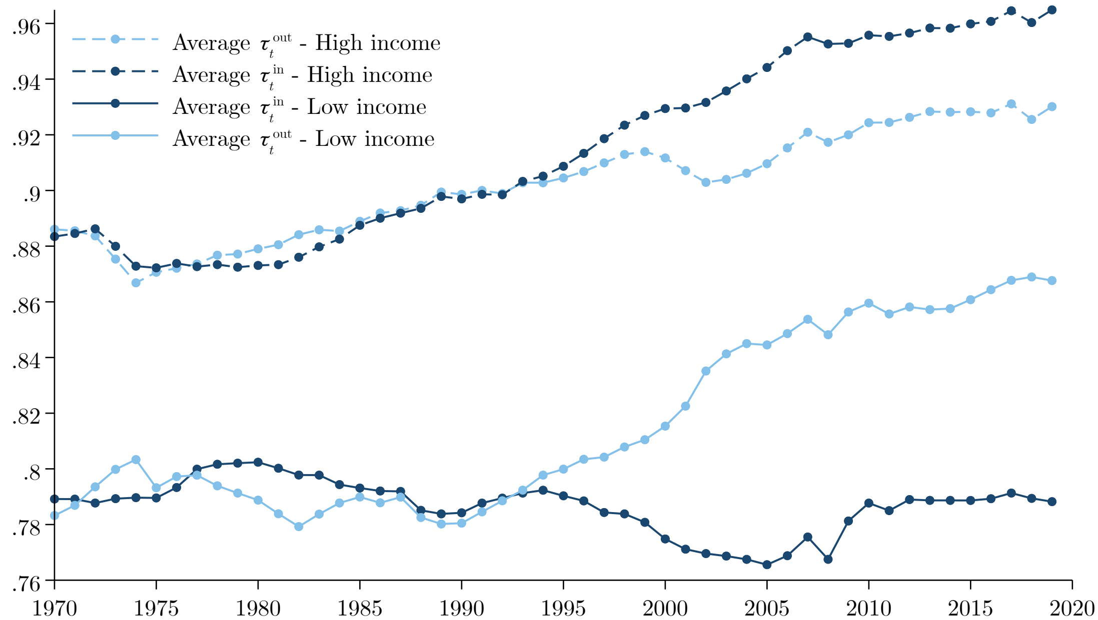
$$\mathrm{HB}_{jt} \overset{\mathrm{def}}{=} 1 - (1 - w_{jjt}) \frac{\sum_{i=1}^{n} K_{it}}{\sum_{\iota \neq j} K_{\iota t}} \tag{35}$$

This measure is equal to one when all of j's wealth is invested in domestic assets, and is equal to zero when the share invested in domestic assets equals j's share of the world capital stock. In Figure 4, we compute the cross-country average by weighting countries according to their PPP$ GDP in 1995. Overall, we find that home bias has declined from 0.94 in 1971 to 0.61 in 2019.[9]

The change in the World RFO is also consistent with another well-known measure of *de facto* financial globalization: the increase in the sum of external assets and liabilities relative to GDP. As mentioned in the introduction, this statistic has increased from 50% in 1971 to 300% in 2019. Similarly, the ratio of total external liabilities relative to the world capital stock has increased from about 5% in 1971 to about 60% in 2019.

[9]Using alternative weights in the computation of the average does not alter this result.

Figure 5: Revealed Financial Openness, High vs. Low Income Countries



6.2 Heterogeneity (Unbalanced Financial Globalization)

We now turn to the cross-country dispersion of our RFO wedges, and its evolution over the last five decades. We highlight the striking finding that financial globalization has been *unbalanced*, in the sense that the increase in inward financial openness has been driven disproportionately by high-income countries, while poorer countries have mainly opened to outgoing capital investment.

To show this, we split countries in our sample between low-income countries and high-income countries, based on their PPP GDP per capita in 1995 and using a threshold of $25,000. With this classification, there are 41 countries in the low-income group (denoted L) and 17 in the high-income group (denoted H). We then compute the weighted average of inward and outward openness within each group, where each country is weighted by its 1995 real GDP.

The results in Figure 5 show that in the early 1970s, high-income countries were already more financially open than low-income countries, both inwardly and outwardly. However, the gap in terms of outward openness has shrunk significantly, while the gap in inward openness has widened.

The implicit tax rate on outflows in high-income countries has decreased from 11% to 7% in high income countries, while it has decreased from 22% to just 14% in low-income countries. Over the same period, the implicit tax rate on inflows in high-income countries has decreased from 11% to just 4% over the past 50 years, while for low-income countries this number has remained stable around 21%. In relative terms, capital-rich countries have become more inwardly open (better able to attract foreign capital) while capital-scarce countries have become more outwardly open (it has become easier for capital to exit these countries).

This asymmetry, a central finding of this paper, is what we refer to as *Unbalanced Financial Globalization*. It turns out to have major implications for efficiency, the spatial allocation of investments and factor prices. This is the focus of the next section.

7 Counterfactual Analysis

After having defined and measured unbalanced financial globalization, we now return to the second question of this paper: what are the macroeconomic implications of financial globalization? In this section, we use the model fitted to the actual path of country-level macro-data since 1970 to simulate the impacts of the last five decades of financial globalization on the global allocation of capital, countries' output and income, and factor prices within countries.

7.1 A No-Globalization scenario

Our main counterfactual compares the actual path of the world economy, which corresponds to the model path with the estimated RFO wedges, to a counterfactual path in which financial globalization doesn't take place, which we refer to as the "no financial globalization scenario." To construct this counterfactual, we compute the model's equilibrium path holding the RFO wedges constant at their value in 1971 for all subsequent years.

Both scenarios share the same exogenous paths of labor supply (L_{it}), natural resources (X_{it}), factor compensation shares $(\kappa_{it}, \lambda_{it}, \xi_{it})$, total factor productivity (Ω_{it}), volatility (v_{it}) and discount parameter (σ_{it}). Changing the RFO wedges endogenously affects the paths of wealth (A_{it}), capital stocks (K_{it}) and portfolio shares $(\mathbf{W}_t)$, which in turn alters the paths of output (Y_{it}), consumption (C_{it}), wages $\left(P_{it}^L\right)$, the rental rate of natural resources $\left(P_{it}^X\right)$ and, the rates of return (MPK_{it}). By definition, the two economies are identical in 1971.

Our results are shown in Table 3. The lines "Unbalanced" show, for each variable and year, the ratio of that variable to its counterpart in the No-Globalization scenario. Following our finding that countries have opened up at very different pace, we show a subset of the variables separately for low and high-income countries. We present our results for three equidistant years, 1971, 1995 and 2019. The weights used in global averages are the 1995 PPP$ GDP $\left(\bar{Y}\right)$. The table also presents two additional scenarios, *Symmetric* and *Convergent*, which are discussed later on in the section.

7.2 World Output, MPK and Capital Allocation Efficiency

The first result we obtain from the counterfactual simulation is that financial globalization has had an adverse effect on capital allocation efficiency. Indeed, world GDP is 5.9% lower in 2019 than it would have been, had financial globalization not occurred, i.e. in a world in which the wedges τ_{ijt} had remained constant at their 1970 levels. Comparing the figures for 1995 and 2019, it is clear that output losses have occurred mostly since 1995.

The lower world GDP is due to an increasing misallocation of capital across countries. While financial globalization has led to an increase in the stock of capital per capita in high-income countries by 5.1% relative to the no-globalization world, in low-income countries it has led to a lower capital stock by 10.9% than in the counterfactual. Unbalanced financial globalization has reallocated capital from capital-scarce to capital-rich countries. Consistent with these results, differences in the returns on capital have also widened: with respect to the no-globalization scenario, the marginal product of capital is 34.2% lower in high-income countries, and 10.6% higher in low-income ones.

This finding contrasts sharply with the predictions of traditional models of capital markets integration. In these models, the removal of barriers to foreign investment leads investors to invest in capital-scarce

Table 3: Counterfactual Analysis (No-Globalization Scenario = 100)

Statistic	Scenario	1971	1995	2019
World GDP	Unbalanced*	100	100.54	94.12
$= \sum_{i=1}^{n} Y_{it}$	Symmetric	100	100.81	105.68
	Convergent	100	102.83	123.64
Variance of log GDP/Capita	Unbalanced*	100	97.42	103.39
$= \text{var}_{\,i\in \text{H}\cup\text{L}} \left[\log\left(Y_{it}/\text{pop}_{it}\right)\right]$	Symmetric	100	100.51	88.02
	Convergent	100	93.38	75.78
Capital/Employee - High Income C.	Unbalanced*	100	100.06	105.09
$= \text{mean}_{\,i\in \text{H}} \left(K_{it}/L_{it}\right)$	Symmetric	100	99.32	77.39
	Convergent	100	98.42	56.53
Capital/Employee - Low Income C.	Unbalanced*	100	107.29	89.08
$= \text{mean}_{\,i\in \text{L}} \left(K_{it}/L_{it}\right)$	Symmetric	100	102.96	143.66
	Convergent	100	109.40	278.34
Real Wage - High Income Countries	Unbalanced*	100	100.65	103.41
$= \text{mean}_{\,i\in \text{H}} \left(P_{it}^{L}\right)$	Symmetric	100	100.31	86.75
	Convergent	100	100.36	80.24
Real Wage - Low Income Countries	Unbalanced*	100	101.70	90.22
$= \text{mean}_{\,i\in \text{L}} \left(P_{it}^{L}\right)$	Symmetric	100	101.46	115.72
	Convergent	100	108.05	169.00
Return on Capital - High Income C.	Unbalanced*	100	71.55	65.83
$= \text{mean}_{\,i\in \text{H}} \left(\text{MPK}_{it}\right)$	Symmetric	100	99.01	116.15
	Convergent	100	79.94	99.27
Return on Capital - Low Income C.	Unbalanced*	100	100.35	110.61
$= \text{mean}_{\,i\in \text{L}} \left(\text{MPK}_{it}\right)$	Symmetric	100	100.01	98.82
	Convergent	100	89.95	74.83
Return on Portfolio - High Income C.	Unbalanced*	100	100.08	91.91
$= \text{mean}_{\,j\in \text{H}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_{t}\right)$	Symmetric	100	98.03	112.07
	Convergent	100	97.03	130.38
Return on Portfolio - Low Income C.	Unbalanced*	100	103.31	101.60
$= \text{mean}_{\,j\in \text{L}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_{t}\right)$	Symmetric	100	98.23	94.40
	Convergent	100	91.12	76.73

Table Notes: *refers to the equilibrium actually observed in the data. All figures are relative to the No-Globalization scenario. All summary statistics are weighted by 1995 real GDP $\left(\bar{Y}\right)$. H and L denote, respectively, the sets of high and low-income countries (1995 PPPGDP per capita above/below $25,000).

countries where returns are high, and capital to migrate from capital-rich to capital-poor countries. This in turn raises world GDP and decreases income inequality across countries.

These traditional predictions implicitly assume that countries open at a similar pace and in a similar direction. But when the pace and direction of capital market opening is heterogeneous across countries, the misallocation of capital may worsen over time. To better understand this idea, it is useful to consider the following stylized situation. Suppose a subset of countries improves their RFO wedge (become more attractive for international capital). This directly improves foreign investors' perceived returns in these countries, thus attracting investment. Whether the allocation of capital improves or worsens depends on the distribution of capital before the policy change. If capital is already misallocated towards the subset of countries that became more financially open, the policy change on the margin leads to an exacerbation of capital inequality and the capital returns differential, thus leading to further capital misallocation.

The fact that wealthier countries have become relatively more inwardly open, while poorer ones have become relatively more outwardly open explains the increase in capital misallocation over time shown in Table 3. In other words, unbalanced financial globalization has led to an upstream reallocation of capital: from capital-scarce, high-MPK, low-income countries to capital-rich, low-MPK, high-income countries.

7.3 Cross-country Inequality

A second important result is that unbalanced financial globalization has led to an increase in inequality of output per capita across countries. The line "Variance of log GDP per capita" in Table 3 shows the effect of unbalanced financial globalization on cross-country income dispersion. Relative to a counterfactual world without globalization, inequality, as measured by the variance of log GDP per capita, is 3.4% higher in 2019. In sum, our analysis indicates that the globalization of financial markets has exacerbated income differences across countries.

Through the lens of a traditional model of financial integration, this result is equally counterintuitive. However, it can again be rationalized by looking at relative changes in the capital stock per employee. Capital markets integration affects GDP per capita only by affecting the relative scarcity of capital across countries. In our model, unbalanced financial globalization further increased the capital stock of high-income, capital-rich countries and further depressed the capital stock of capital-scarce, low-income countries, thus exacerbating not only capital misallocation, but also pre-existing income gaps across countries.

7.4 Wages

Next, we look at how financial globalization has affected the relative remuneration of factors of production in each country, thus affecting the distribution income between workers and the owners of capital.

As shown in Table 3, in high-income countries wages are 3.4% higher relative to the no-globalization scenario. The increase in wages is the natural consequence of the higher marginal product of labor resulting from higher capital-labor ratios.

These findings again contrast with the canonical view that financial globalization has worsened the conditions of workers and benefited capital-owners in high-income countries (as argued for example by Stiglitz, 2012). This view is based on the implicit assumption that countries become more financially open at similar paces and that, as a result, capital indeed migrates from high-income to poor countries, lowering the marginal product of labor and thus wages in rich countries. This assumption is clearly not supported by our RFO wedges: we find that wage earners in high-income countries have benefited from the upstream reallocation of capital in the form of higher wages.

In low-income countries, wages are 9.8% lower in 2019 than in the no-globalization scenario, reflecting a decline in the capital-labor ratio. It is striking to see that financial globalization has further exacerbated inequality across workers located in rich and poor countries, echoing the increasing the variance of GDP per employee.

7.5 Balanced Financial Globalization

In the previous section, we argued that the past five decades of de facto financial liberalization, characterized by deep unevenness and directional asymmetries, worsened the global allocation of capital, depressing world output and increasing cross-country inequality. These results are in sharp contrast with standard models of capital market integration, which predict instead that liberalization should *improve* allocative efficiency and reduce international inequality. A crucial question is thus to what extent does the *unbalanced* nature of globalization contribute to generate these counterintuitive results.

To reconcile our findings with traditional models, and to further demonstrate that the unbalanced nature of financial globalization is indeed the cause of these unexpected results, we construct two *balanced* globalization scenarios (echoing the analysis of Di Giovanni, Levchenko and Zhang, 2014).

In the first scenario, which we call *Symmetric*, all countries decrease their barriers to outward and inward investment at the same pace. Keeping the World RFO path the same as in the actual economy, we construct the counterfactual RFO wedges for this scenario (τ_{ijt}^{sym}) as follows:

$$\tau_{ijt}^{\text{sym}} \overset{\text{def}}{=} \tau_{ij,1970} \cdot \frac{\tau_t^w}{\tau_{1970}^w} \qquad \text{for } i \neq j \tag{36}$$

When countries become *symmetrically* more open, their initial differences in financial openness persist over time. As a result, low-income countries, which were already less open than high-income countries in the 1970s, remain so until 2019. In this scenario, significant barriers to investment remain in 2019 on average, as shown in section 6.

In the second balanced financial globalization scenario, which we call *Convergent,* all heterogeneity in inward and outward openness progressively disappears by 2019, while keeping the World RFO path the same as in the actual economy. Specifically, we assume that the path of RFO wedges is given by

$$\log \tau_{ijt}^{\text{con}} \overset{\text{def}}{=} \frac{2019 - t}{49} \cdot \log \tau_{ijt}^{\text{sym}} + \frac{t - 1970}{49} \cdot \log \tau_t^w \qquad \text{for } n \neq j \tag{37}$$

which implies that the bilateral wedges τ_{ijt} are all equal to τ_t^w in 2019 (except for $i = j$, obviously).

As in the no-globalization scenario, both balanced counterfactual scenarios share the same paths of all other exogenous variables (L_{it}, X_{it}, κ_{it}, λ_{it}, ξ_{it}, Ω_{it}, σ_{it}) as the baseline scenario and the model endogenously generates the paths of the following variables: A_{it} , K_{it}, w_{ijt}, Y_{it}, $P_{it}^{L;}$, P_{it}^{X} and MPK_{it}. By definition, all four economies are identical in 1970. The results are reported in the lines *Symmetric* and *Convergent* in Table 3 and all variables are relative to the no-financial globalization scenario.

Our results confirm the idea that financial globalization didn't have to lead to a worsening of the capital allocation and cross-country inequality. In the *symmetric* scenario world output would have been 5.7% higher, while in the *convergent* counterfactual it would have been 23.6% higher than in the no-globalization scenario.

In both counterfactuals, capital undergoes a massive reallocation from capital-rich to capital-poor countries. In low-income countries in 2019, the capital stock per employee is 43.6% higher in the *symmetric* scenario and 178.3% higher in the *convergent* scenario. Wages are 15.7% and 69% higher, respectively. For rich countries, we observe the exact opposite: capital per employee is 22.6% and 43.5% lower and wages are 13.2% and 19.8% lower, respectively. Cross-country inequality, measured as the variance of log GDP per capita, would have been 12% lower in the *symmetric* scenario and 24.2% lower in the *convergent* scenario, relative to the no-globalization scenario.

8 Robustness Checks, Extensions and Discussion

In this section, we investigate the robustness of our previous findings to several concerns: (i) the country coverage of our sample, (ii) the fact that government bonds are included in external liabilities and assets, (iii) the fact that all debt and loans are included, and (iv) the inclusion of risk in the portfolio shares.

8.1 Alternative Panel (shorter, wider)

Although the 58 countries in our baseline sample account for roughly 70% of global GDP in 2019, one concern is that the remaining part of the world economy may affect our conclusions. We address this concern by expanding country coverage at the cost of shortening the sample period. Due to data limitations, we start the analysis in 1993, which yields a panel of 94 countries covering approximately 90% of world GDP. The full list of countries is reported in Appendix Table 6.

In this broader sample, the patterns of unbalanced financial globalization are less pronounced, as shown in Figure 8. Nevertheless, the counterfactual results in Appendix Table 5 remain qualitatively unchanged. In particular, relative to a counterfactual in which wedges are held constant at their 1993 levels, world output in 2019 is still 2.4% lower along the observed path of financial globalization. While quantitatively smaller than in the baseline, this finding corroborates our core result that financial globalization has, on average, led to greater capital misallocation rather than improved efficiency. Strikingly, in a convergent version of globalization, GDP would have been 19% higher than without globalization.

Consistent with an increased misallocation, income per capita dispersion across countries is 8.4% higher in 2019 relative to the no-globalization counterfactual, while the effects on capital-output ratios and factor remunerations remain qualitatively similar but more muted.

The attenuation of the effects in the wider sample is informative. It suggests that the financial integration of countries added to the analysis (including former Soviet and transition economies) doesn't fully follow the ones of low-income countries of our baseline sample. While we chose to focus on this country grouping to keep our analysis concise, these results suggest that there is additional interesting heterogeneity within income groups that contributes to capital misallocation.

8.2 The Role of Government Debt

The literature has documented the important role played by sovereign debt in accounting for upstream capital flows and the allocation puzzle (Gourinchas and Jeanne, 2013 and Alfaro, Kalemli-Ozcan and Volosovych, 2014). To address the concern that our results may be in part shaped by sovereign financial flows, we would ideally exclude governments' international assets and liabilities from the Wealth of Nations dataset. Unfortunately the dataset doesn't break down debt assets and liabilities between sovereign and private issuers, and there's a dearth of other data sources with information on government international positions with a global coverage. The main source used in the literature on sovereign flows is the World Bank's *International Debt Statistics Database* (the successor of *Global Development Finance*), and it covers only developing countries which is too limited a sample for our global approach.[10]

Instead we leverage the fact that the External Wealth of Nations dataset breaks down assets and liabilities by financial instruments (equity, bonds, FDI, and other) and that an overwhelming share of government debt is in bonds, and exclude a fraction of bonds from the liabilities of all countries. To calibrate this fraction, we compute the share of government bonds in total foreign bonds holdings in the portfolios of investors located in the U.S. – a country for which detailed data has been made available by the *Global Allocation of Capital Project* based on the work by Coppola et al. (2021) and Maggiori et al. (2020). We find that, on average, 45% of bonds are government bonds. We assume this fraction is the same across countries, and to ensure consistency of global bonds liabilities and assets, we also remove this fraction from the holdings of bonds on the asset side of all countries.

We find that our counterfactual results are robust, albeit quantitatively smaller, as shown in Table 7. World output is 4.2% lower in 2019 than in a world in which the wedges τ_{ijt} had remained constant, and the dispersion of income per capital across countries is 3.7% higher. We also find very similar results for the capital to output ratios and factor remunerations. The quantitatively smaller effects are consistent with the view in the literature that government flows play a role. However, we find that they account only for a small fraction of the difference between the unbalanced scenario and the balanced scenarios: in 2019, world output would have been 4.8% higher in the *symmetric* scenario and 25% higher in the *convergent* scenario.

8.3 Using Equity Positions Only

A related concern with our baseline measures of external assets and liabilities is that they include instruments that may not be tightly connected to claims on the capital returns. Arguably, FDI and equities are the most tightly connected to these claims. In this sub-section, we make the extreme assumption that only FDI and equities are connected to claims on capital returns, and accordingly we consider alternative measures of external assets and liabilities which exclude derivatives, bank loans and debt securities and only keep FDI and equities.

Our results, shown in Appendix G, suggest slightly more muted effects of financial globalization, which is consistent with what our findings in the previous robustness exercise where we excluded a fraction of debt flows. More specifically, we find that the world GDP is 3.6% lower relative to a scenario with no financial globalization. Out counterfactual balanced financial globalization would have instead led to a 9.6% and 22.0% higher world GDP in the *symmetric* and *convergent* scenarios, respectively, relative to a scenario with no financial globalization.

8.4 The Role of Risk

Finally, we investigate the sensitivity of our wedges and our counterfactual results to our measurement of the time-varying volatility of TFP shocks (v_{it}). One potential concern is that our model-consistent estimates of v_i are imperfect proxy of the true risk faced by international investors.

[10] This dataset is also one of the underlying sources used by Alfaro, Kalemli-Ozcan & Volosovich (2014) to construct their dataset of net private and public capital flows.

To address this concern, in this subsection we consider an alternative calibration of the model in which there is no cross-country heterogeneity in the volatility of TFP shocks. More specifically, we assume $v_{it} = v_t$ for all i and t. The results of this exercise are shown in Appendix H.

We find that our conclusions are robust to removing heterogeneity in risk exposures across countries. As shown in Table 9 in Appendix G, the implied effects of unbalanced financial globalization on misallocation and inequality are nearly identical to our baseline model. World output in 2019 would have been 5.9% higher in a world without financial globalization (the same as in our baseline model), and cross-country income dispersion is 3.1% higher than it would have been without globalization (versus 3.4% in the baseline). The upstream reallocation of capital is also similar, with capital per employee 5.1% higher in high-income countries and 11.1% lower in low-income countries relative to no globalization. This robustness suggests that cross-country differences in measured TFP volatility are not a key driver of our findings. Instead, the asymmetric patterns of financial integration across rich and poor countries—captured by our RFO wedges—are the primary mechanism behind the upstream flow of capital and consequent efficiency losses.

9 Conclusions

In this paper we provide three novel contributions to the literature on international capital markets integration and capital allocation. First, we develop a wedge accounting exercise in a multi-country model of international investment and production, in order estimate new measures of Revealed Financial Openness. Our methodology uses publicly available data for a large panel of countries since 1970. We validate our RFO measures in several ways.

Second, using our RFO wedges, we document that while all countries as a whole are significantly more financially open in 2019 than in 1970, rich countries have become relatively more inwardly open, while lower income countries have become relatively more outwardly open: we used the term *Unbalanced Financial Globalization* to describe these patterns.

Third, we find that the uneven pace of de facto financial liberalization has led to a worsening of the global allocation of capital, more extreme cross-country inequality, higher wages and lower returns to capital in high-income countries, and lower wages and higher returns to capital in poor countries. This is in contrast with the predictions of traditional models of financial markets integration. A balanced globalization would have increased world GDP and reduced inequality across countries.

The key innovation of our paper with respect to the existing literature is to provide a rigorous theoretical and empirical treatment of spatial heterogeneity, and to show how accounting for this heterogeneity in the pace of de facto financial liberalization has important implications on how we assess the real effects of international capital markets integration.

This paper opens up avenues for future research. First, more work is needed to shed light on the reasons why countries have opened at different pace, to what extent this *de facto* openness is the result of deliberate policy decisions, and whether these policy decisions may have been optimal responses to the international economic environment. Second, our counterfactual analysis holds exogenous, although not constant, a few factors that shape the implications of financial globalization and that might also be affected by it, such as the labor shares and the saving rates. We believe these are important avenues for future research.

These findings suggest important policy implications. For financial integration to deliver on its promises there is an important role for further coordination across countries to foster a more balanced financial globalization. For example, while international organizations like the IMF already suggests that countries should find their own pace based on their characteristics, our findings highlight that capital account reforms should consider the spillovers across countries and should be assessed relative to the degree of opening of the rest of the world.

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Unbalanced Financial Globalization - Online Appendix

Damien Capelle and Bruno Pellegrino

A Microfoundations for the Logit Asset Demand System

In this appendix, we discuss the potential microfoundations for our asset demand system in equation (11). We present three possible theoretical foundations that lead to the same logit functional. All the microfoundations below are discussed more in detail in Appendix Pellegrino et al. (2025). Here we provide a brief overview.

A.1 Rational Inattention Microfoundation (Information Frictions)

Under this microfoundation, investors face constraints on their ability to process information about investment opportunities across countries. Following Matějka and McKay (2015) and using the closed-form results of Pellegrino (2023), we model investors as agents who optimally allocate their limited attention across potential investment destinations. Investors receive signals about returns in different countries, but acquiring precise information is costly. This cost is proportional to the reduction in uncertainty (measured by Shannon entropy) achieved through information acquisition.

Under rational inattention, investors choose to remain partially uninformed about some investment opportunities when the cost of acquiring information exceeds the expected benefit. This leads to a probabilistic choice model where the probability of investing in a country increases with its expected return but is also affected by the precision of investors' information about that country.

The resulting asset demand system takes the logit form used in our model, where portfolio allocations depend on risk-adjusted returns raised to a power that reflects investors' information processing capacity. Higher information processing costs lead to less responsive portfolio adjustments to changes in fundamentals.

A.2 Extreme Value Theory Microfoundation

An alternative foundation for our logit asset demand system comes from the assumption that investors face heterogeneous transaction costs when investing across borders. Production occurS in discrete units called "plants" each containing a small amount of capital.

For each potential investment, investors draw an idiosyncratic transaction cost from a Gumbel distribution (Extreme Value Type 1). The systematic component of these costs varies by country pair, reflecting factors like distance, regulatory differences, and monitoring costs.

When investors maximize their returns net of these stochastic transaction costs, their behavior can be described by a logit probability model. This approach has strong parallels to discrete choice models in international trade, where the flows of goods also follow gravity-like patterns. This microfoundation emphasizes the role of real transaction costs in shaping international investment patterns, rather than information processing constraints. Both approaches, however, yield mathematically equivalent asset demand systems at the aggregate level.

A.3 Characteristics Approach

A third microfoundation for logit asset demand rests on the work of Koijen and Yogo (2019), who develop a demand system for securities based on asset characteristics.

In this framework, investors observe various characteristics of potential investment destinations and form portfolios based on these attributes. Under certain parametric assumptions and a specific form for investor preferences, this approach generates a logit structure for portfolio shares.

The characteristics approach can accommodate country-specific attributes as well as bilateral factors that affect the attractiveness of investments from particular origins to particular destinations. However, connecting these characteristics to other objects in our model requires ad-hoc assumptions.

B Additional Derivations

B.1 Derivation of Bilateral Wedges

Without loss of generality, we write the bilateral wedge τ_{ijt} as the product

$$\tau_{ijt} = \tau_{ijt}^{(1)} \cdot \tau_{jt}^{(2)}. \tag{38}$$

Using the definition of portfolio shares $w_{ijt} = A_{ijt}/A_{jt}$ and taking the log, we obtain

$$\begin{aligned}\beta\left(\log \tau_{ijt}^{(1)} + \log \tau_{jt}^{(2)}\right) \equiv& \log A_{ijt} - \log A_{jt} - \log K_{it} - \beta \log R_{ijt} \\ &+ \log\left[\sum_{\iota=1}^{N} \left(\tau_{\iota jt} R_{\iota jt}\right)^{\beta} K_{\iota t}\right].\end{aligned}$$

We assign all i-specific terms to $\tau_{ijt}^{(1)}$ and define

$$\beta \log \tau_{ijt}^{(1)} \equiv \log A_{ijt} - \log K_{it} - \beta \log R_{ijt}$$

which can be constructed directly from observables.

To recover $\tau_{jt}^{(2)}$, we proceed as in the identification of the outward wedge. Starting from the definition of the domestic portfolio share, we write

$$1 - w_{jjt} = \frac{\sum_{\iota \neq j} \left(\tau_{\iota t}^{(1)} \tau_{jt}^{(2)} R_{\iota t}\right)^{\beta} K_{\iota t}}{\sum_{\iota} \left(\tau_{\iota t}^{(1)} \tau_{jt}^{(2)} R_{\iota t}\right)^{\beta} K_{\iota t}} = \frac{(\tau_{jt}^{(2)})^{\beta} \sum_{\iota \neq j} \left(\tau_{\iota t}^{(1)} R_{\iota t}\right)^{\beta} K_{\iota t}}{\sum_{\iota} \left(\tau_{\iota t}^{(1)} \tau_{jt}^{(2)} R_{\iota t}\right)^{\beta} K_{\iota t}}.$$

Taking logs yields

$$\log(1 - w_{jjt}) = \beta \log \tau_{jt}^{(2)} + \log \sum_{\iota \neq j} \left(\tau_{\iota t}^{(1)} R_{\iota t}\right)^{\beta} K_{\iota t} - \log \sum_{\iota} \left(\tau_{\iota t}^{(1)} \tau_{jt}^{(2)} R_{\iota t}\right)^{\beta} K_{\iota t}.$$

Rearranging terms gives

$$\beta \log \tau_{jt}^{(2)} = \log(1 - w_{jjt}) - \log \sum_{\iota \neq j} \left(\tau_{\iota t}^{(1)} R_{\iota t}\right)^{\beta} K_{\iota t} + \log w_{jjt} - \log \left(R_{jt}^{\beta} K_{jt}\right),$$

where we used $w_{jjt} = A_{jjt}/A_{jt}$.

Exponentiating both sides yields

$$\tau_{jt}^{(2)} = \left[\frac{1 - w_{jjt}}{w_{jjt}} \cdot \frac{R_{jt}^{\beta} K_{jt}}{\sum_{\iota \neq j} \left(\tau_{\iota t}^{(1)} R_{\iota t}\right)^{\beta} K_{\iota t}}\right]^{\frac{1}{\beta}},$$

which completes the proof.

B.2 Optimal Saving Rate

We start from the household recursive value:

$$V_{jbt} \stackrel{\text{def}}{=} (1 - \sigma_{jt}) \log C_{jbt} + \sigma_{jt} \mathbb{E}_{jt} (V_{jbt+1}). \tag{39}$$

Denote I_{jbt} the income of cohort b at time t in country j. It is given by

$$I_{jbt} = \begin{cases} P_{jt}^{L} L_{jb} + P_{jt}^{X} X_{jb} + T_{jb} + \mathcal{E}_{jb} & \text{if} \quad t = b \\ (\mathbf{w}_{jbt} \cdot \mathbf{R}_{jt}) A_{jbt-1} & \text{if} \quad t > b \end{cases}$$

We conjecture that the value function takes the form $V_{jbt} = \eta_{1jt} \log(I_{jbt}) + \eta_{0jt}$ where η_{1jt} and η_{0jt} are two time and country specific (but common to all cohorts) variables. Denote s_{jbt} the saving rate at time t. For cohorts born before the current period $b < t$, substituting in the previous expression yields

$$\begin{aligned} \eta_{1jt} \log(I_{jbt}) + \eta_{0jt} &= \max_{s_{jbt}, \mathbf{w}_{jbt+1} \in \Delta^n} (1 - \sigma_{jt}) \log(1 - s_{jbt}) I_{jbt} \\ &\quad + \sigma_{jt} \mathbb{E}_{jt} (\eta_{1jt+1} \log(A_{jbt+1}) + \eta_{0jt+1}) \\ \eta_{1jt} \log(I_{jbt}) + \eta_{0jt} &= \max_{s_{jbt}, \mathbf{w}_{jbt+1} \in \Delta^n} (1 - \sigma_{jt}) \log(1 - s_{jbt}) I_{jbt} \\ &\quad + \sigma_{jt} \mathbb{E}_{jt} \left(\eta_{1jt+1} \log \left(\left(\mathbf{w}'_{jbt+1} \mathbf{R}_{jt+1}\right) \cdot s_{jbt} I_{jbt}\right) + \eta_{0jt+1}\right). \end{aligned}$$

Identifying all the terms in $\log(I_{jbt})$ implies

$$\eta_{1jt} = (1 - \sigma_{jt}) + \sigma_{jt} \eta_{1jt+1}.$$

Iterating forward this equation, we find that η_{1jt} is equal to 1 in all periods:

$$\eta_{1jt} = (1 - \sigma_{jt}) + \sum_{t'=t}^{\infty} \prod_{t''=t}^{t'} \sigma_{jt''} \left(1 - \sigma_{jt''+1}\right) = 1.$$

Collecting the remaining terms yields

$$\eta_{0jt} = \max_{s'_{jbt}} (1-\sigma_{jt}) \log(1-s_{jbt}) + \sigma_{jt}\, \eta_{1jt+1} \log(s_{jbt})$$
$$+ \sigma_{jt}\, \eta_{1jt+1} \max_{\mathbf{w}_{jbt+1} \in \Delta^n} \mathbb{E}_{jt} \log\left(\mathbf{w}'_{jbt+1} \mathbf{R}_{jt+1}\right) + \sigma_{jt}\, \eta_{0jt+1}.$$

The decision about how to allocate the portfolio $\mathbf{w}_{jbt+1}$ is independent from the decision about how much to save s_{jbt}. We can thus solve these two problems separately. Using $\eta_{1jt} = 1$ and taking the first order condition with respect to the saving rate, we obtain

$$\frac{1-\sigma_{jt}}{1-s_{jbt}} = \frac{\sigma_{jt}}{s_{jbt}} \Rightarrow s_{jbt} = \sigma_{jt}$$

An important implication is that the saving rate is common to all cohorts, $s_{jbt} = s_{jt}$.

Given that the portfolio shares are common to all cohorts, η_{0jt} is common across all cohorts and independent of b.

C Additional Tables and Figures

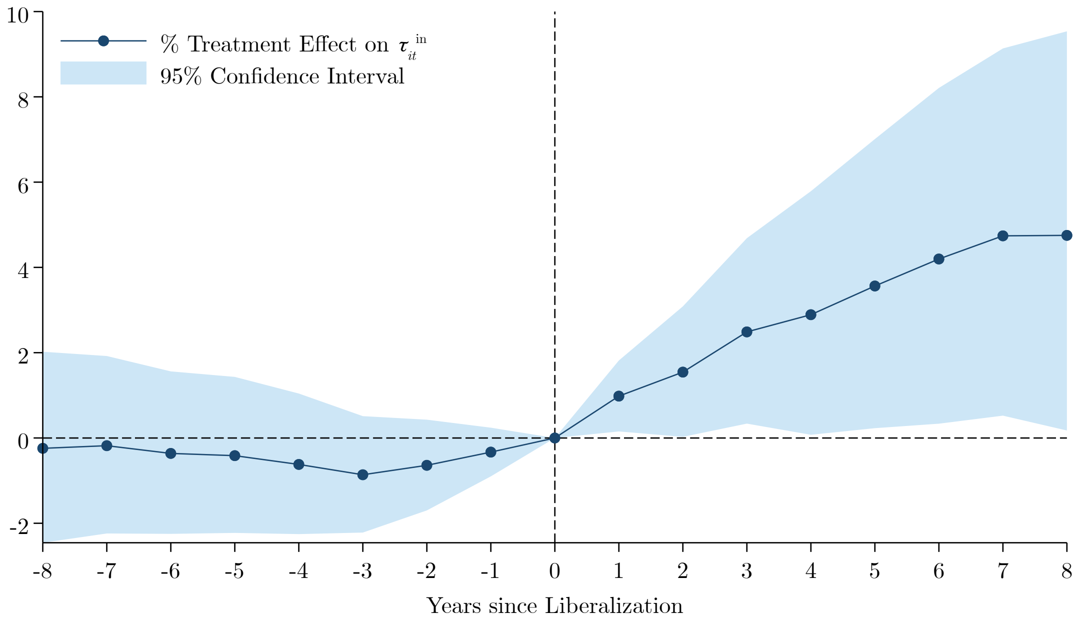
Table 4: List of Countries in the Long Panel

ARG	Argentina	JAM	Jamaica
AUS	Australia	JOR	Jordan
AUT	Austria	JPN	Japan
BOL	Bolivia	KEN	Kenya
BRA	Brazil	LKA	Sri Lanka
BRB	Barbados	MAR	Morocco
CAN	Canada	MEX	Mexico
CHL	Chile	MYS	Malaysia
CIV	Côte d'Ivoire	NER	Niger
CMR	Cameroon	NGA	Nigeria
COL	Colombia	NOR	Norway
CRI	Costa Rica	NZL	New Zealand
DEU	Germany	PER	Peru
DNK	Denmark	PHL	Philippines
DOM	Dominican Republic	PRY	Paraguay
ECU	Ecuador	QAT	Qatar
EGY	Egypt	RWA	Rwanda
ESP	Spain	SAU	Saudi Arabia
FIN	Finland	SEN	Senegal
FRA	France	SWE	Sweden
GAB	Gabon	TCD	Chad
GRC	Greece	THA	Thailand
GTM	Guatemala	TUN	Tunisia
HND	Honduras	TUR	Turkey
IDN	Indonesia	TZA	Tanzania
IND	India	URY	Uruguay
IRN	Iran	USA	United States
ISR	Israel	ZAF	South Africa
ITA	Italy	ZMB	Zambia

D Event Study: Alternative Estimator

In this appendix, we repeat the event study analysis of subsection 5.3 using an alternative diff-in-diff estimator. In Figure 6 we use the estimator by Sun and Abraham (2021).

Figure 6: Event Study - EM Liberalizations and In-Wedges (Sun and Abraham estimator)



E Results with Short Panel

In this appendix we reproduce Figures 4-5 and Table 3, using the short panel (95 countries, 1993-2019), instead of the long panel (58 countries, 1971-2019).

Figure 7: World financial openness

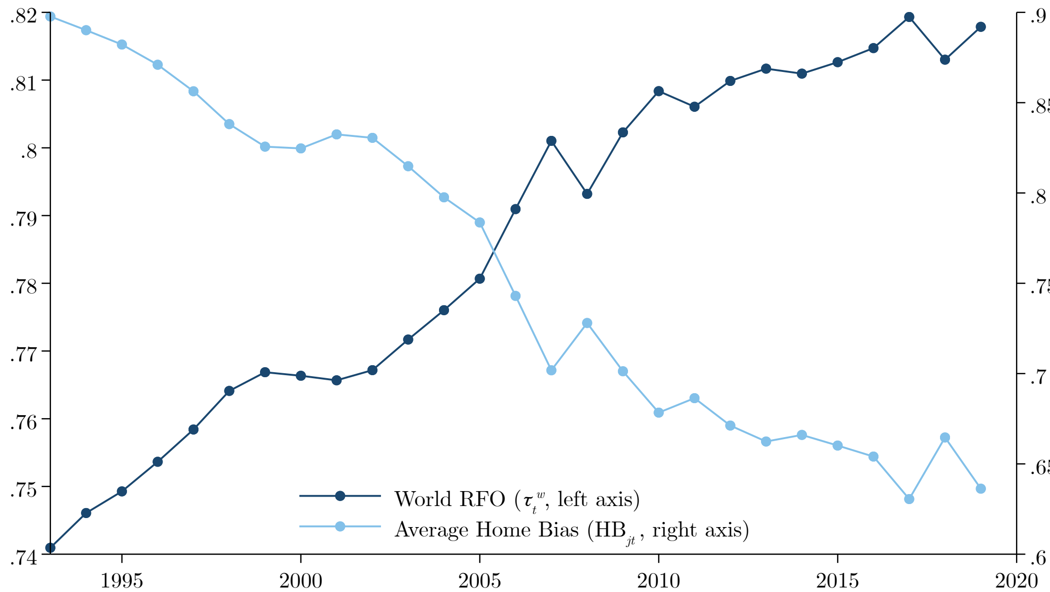


Figure 8: Revealed Financial Openness, High vs. Low Income Countries

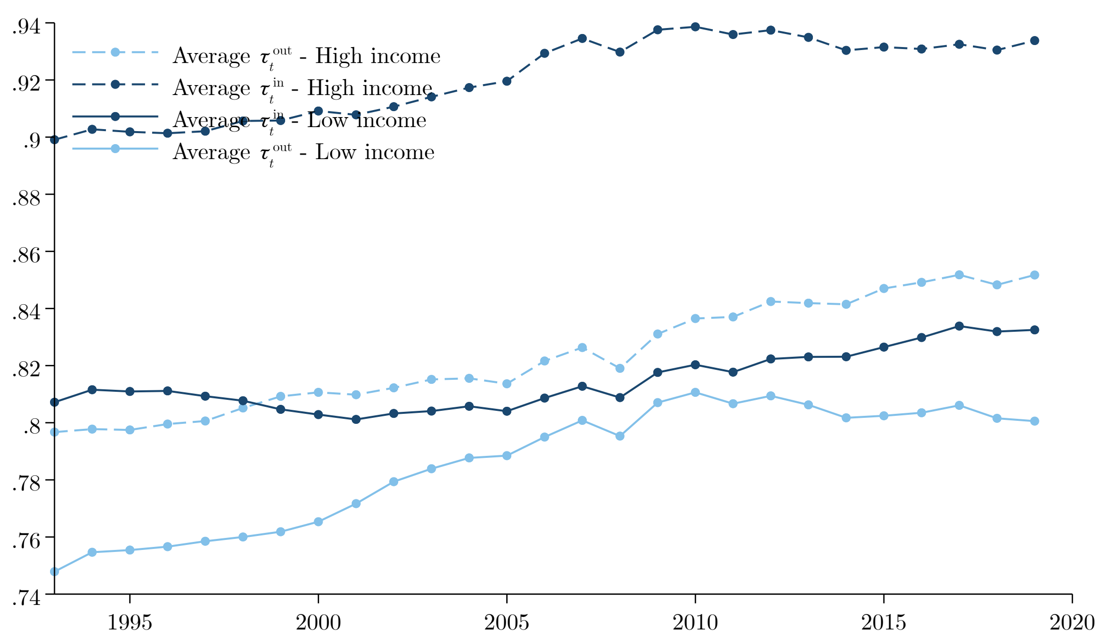


Table 5: Counterfactual Analysis (No-Globalization Scenario = 100)

Statistic	Scenario	1993	2019
World GDP	Unbalanced*	100	97.64
$= \sum_{i=1}^{n} Y_{it}$	Symmetric	100	100.07
	Convergent	100	118.92
Variance of log GDP/Capita	Unbalanced*	100	108.44
$= \text{var}_{i \in \text{H} \cup \text{L}} \left[\log \left(Y_{it}/\text{pop}_{it}\right)\right]$	Symmetric	100	100.54
	Convergent	100	77.76
Capital/Employee - High Income C.	Unbalanced*	100	101.99
$= \text{mean}_{i \in \text{H}} \left(K_{it}/L_{it}\right)$	Symmetric	100	100.18
	Convergent	100	55.68
Capital/Employee - Low Income C.	Unbalanced*	100	95.63
$= \text{mean}_{i \in \text{L}} \left(K_{it}/L_{it}\right)$	Symmetric	100	102.24
	Convergent	100	165.36
Real Wage - High Income Countries	Unbalanced*	100	101.57
$= \text{mean}_{i \in \text{H}} \left(P_{it}^{L}\right)$	Symmetric	100	98.87
	Convergent	100	79.36
Real Wage - Low Income Countries	Unbalanced*	100	96.61
$= \text{mean}_{i \in \text{L}} \left(P_{it}^{L}\right)$	Symmetric	100	101.36
	Convergent	100	132.45
Return on Capital - High Income C.	Unbalanced*	100	98.70
$= \text{mean}_{i \in \text{H}} \left(\text{MPK}_{it}\right)$	Symmetric	100	104.81
	Convergent	100	145.78
Return on Capital - Low Income C.	Unbalanced*	100	107.02
$= \text{mean}_{i \in \text{L}} \left(\text{MPK}_{it}\right)$	Symmetric	100	101.65
	Convergent	100	83.13
Return on Portfolio - High Income C.	Unbalanced*	100	102.09
$= \text{mean}_{j \in \text{H}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_{t}\right)$	Symmetric	100	100.58
	Convergent	100	139.30
Return on Portfolio - Low Income C.	Unbalanced*	100	98.74
$= \text{mean}_{j \in \text{L}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_{t}\right)$	Symmetric	100	98.96
	Convergent	100	85.06

Table Notes: *refers to the equilibrium actually observed in the data. All figures are relative to the No-Globalization scenario. All summary statistics are weighted by 1995 real GDP $\left(\bar{Y}\right)$. H and L denote, respectively, the sets of high and low-income countries (1995 PPPGDP per capita above/below $25,000).

Table 6: List of Countries in the Short Panel

AGO	Angola	GRC	Greece	OMN	Oman
ARG	Argentina	GTM	Guatemala	PAN	Panama
AUS	Australia	HND	Honduras	PER	Peru
AUT	Austria	HUN	Hungary	PHL	Philippines
BEN	Benin	IDN	Indonesia	POL	Poland
BFA	Burkina Faso	IND	India	PRT	Portugal
BGR	Bulgaria	IRN	Iran	PRY	Paraguay
BOL	Bolivia	ISR	Israel	QAT	Qatar
BRA	Brazil	ITA	Italy	ROU	Romania
BRB	Barbados	JAM	Jamaica	RUS	Russia
BWA	Botswana	JOR	Jordan	RWA	Rwanda
CAF	Central African Rep.	JPN	Japan	SAU	Saudi Arabia
CAN	Canada	KEN	Kenya	SEN	Senegal
CHL	Chile	KGZ	Kyrgyz Republic	STP	Sao Tome and Principe
CHN	China	KOR	South Korea	SUR	Suriname
CIV	Cote d'Ivoire	KWT	Kuwait	SVK	Slovak Republic
CMR	Cameroon	LKA	Sri Lanka	SVN	Slovenia
COL	Colombia	LSO	Lesotho	SWE	Sweden
CPV	Cape Verde	LTU	Lithuania	SWZ	Swaziland
CRI	Costa Rica	LVA	Latvia	TCD	Chad
CZE	Czech Republic	MAR	Morocco	TGO	Togo
DEU	Germany	MEX	Mexico	THA	Thailand
DJI	Djibouti	MKD	Macedonia	TUN	Tunisia
DNK	Denmark	MNG	Mongolia	TUR	Turkey
DOM	Dominican Rep.	MRT	Mauritania	TZA	Tanzania
ECU	Ecuador	MYS	Malaysia	URY	Uruguay
EGY	Egypt	NAM	Namibia	USA	United States
ESP	Spain	NER	Niger	UZB	Uzbekistan
EST	Estonia	NGA	Nigeria	ZAF	South Africa
FJI	Fiji	NIC	Nicaragua	ZMB	Zambia
FRA	France	NOR	Norway		
GAB	Gabon	NZL	New Zealand		

F Results excluding Government Bonds

In this appendix we reproduce Figures 4-5 and Table 3 using an alternative dataset where we removed 45% of the bond assets, to correct for the presence of government bonds in our dataset.

FIGURE 9: WORLD FINANCIAL OPENNESS

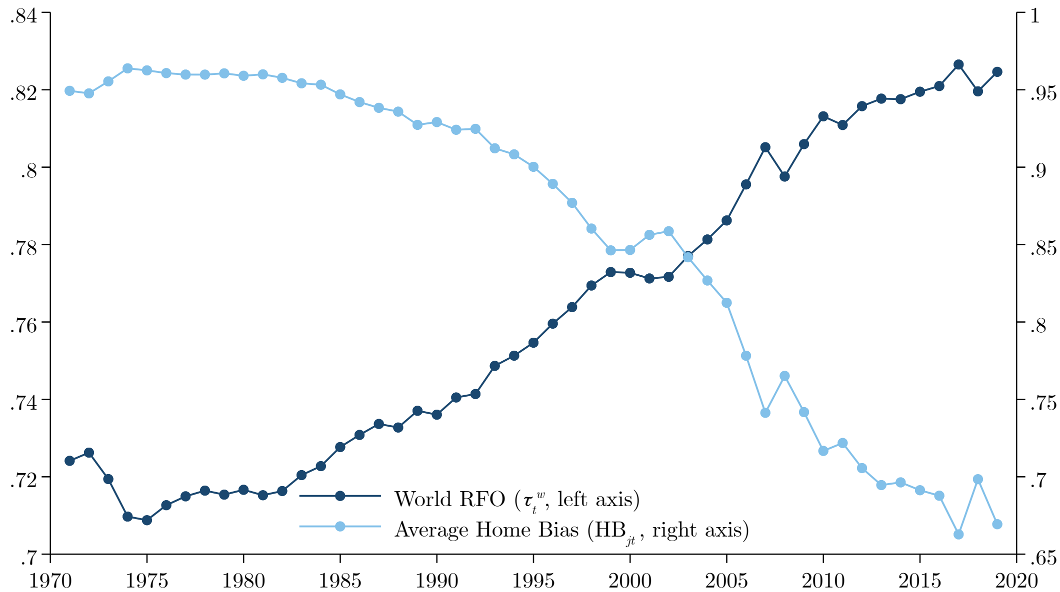


FIGURE 10: REVEALED FINANCIAL OPENNESS, HIGH VS. LOW INCOME COUNTRIES

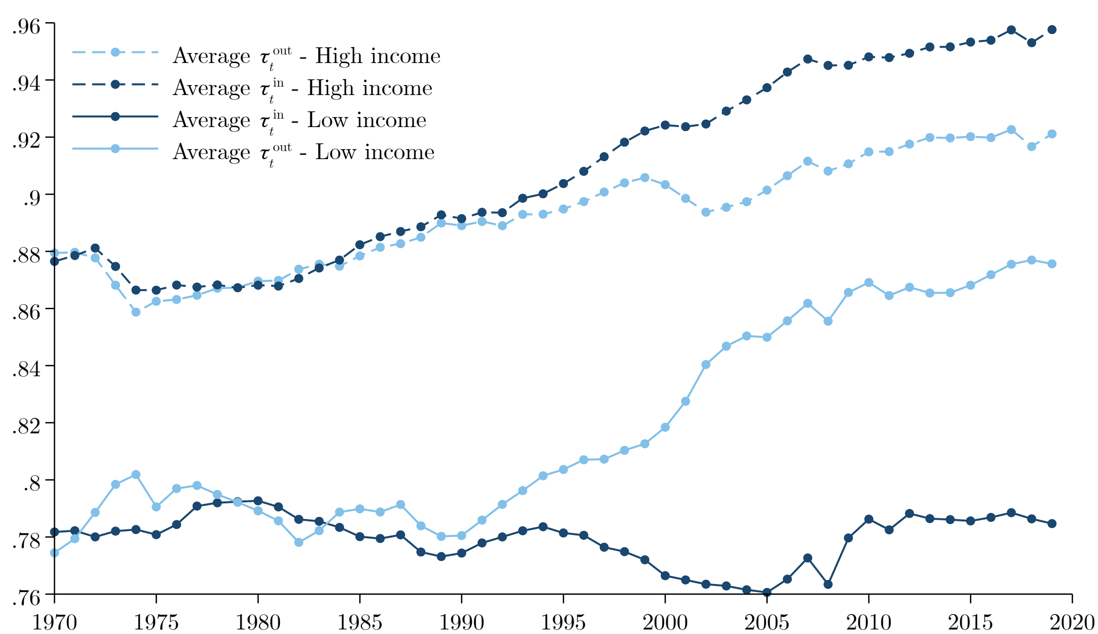


Table 7: Counterfactual Analysis (No-Globalization Scenario = 100)

Statistic	Scenario	1971	1995	2019
World GDP	Unbalanced*	100	100.54	95.76
$= \sum_{i=1}^{n} Y_{it}$	Symmetric	100	100.74	104.78
	Convergent	100	102.61	124.99
Variance of log GDP/Capita	Unbalanced*	100	99.75	103.75
$= \text{var}_{i \in \text{H} \cup \text{L}} \left[\log\left(Y_{it}/\text{pop}_{it}\right)\right]$	Symmetric	100	100.17	85.34
	Convergent	100	94.51	76.04
Capital/Employee - High Income C.	Unbalanced*	100	100.47	103.69
$= \text{mean}_{i \in \text{H}} \left(K_{it}/L_{it}\right)$	Symmetric	100	99.56	82.30
	Convergent	100	98.80	58.57
Capital/Employee - Low Income C.	Unbalanced*	100	102.73	89.15
$= \text{mean}_{i \in \text{L}} \left(K_{it}/L_{it}\right)$	Symmetric	100	101.90	137.88
	Convergent	100	106.63	289.66
Real Wage - High Income Countries	Unbalanced*	100	100.96	102.72
$= \text{mean}_{i \in \text{H}} \left(P_{it}^{L}\right)$	Symmetric	100	100.35	88.73
	Convergent	100	100.56	81.25
Real Wage - Low Income Countries	Unbalanced*	100	100.42	91.40
$= \text{mean}_{i \in \text{L}} \left(P_{it}^{L}\right)$	Symmetric	100	101.25	114.70
	Convergent	100	106.92	173.25
Return on Capital - High Income C.	Unbalanced*	100	71.63	66.89
$= \text{mean}_{i \in \text{H}} \left(\text{MPK}_{it}\right)$	Symmetric	100	99.20	113.36
	Convergent	100	80.06	98.25
Return on Capital - Low Income C.	Unbalanced*	100	102.54	111.20
$= \text{mean}_{i \in \text{L}} \left(\text{MPK}_{it}\right)$	Symmetric	100	99.33	95.46
	Convergent	100	91.17	73.79
Return on Portfolio - High Income C.	Unbalanced*	100	99.03	93.91
$= \text{mean}_{j \in \text{H}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_t\right)$	Symmetric	100	98.12	111.00
	Convergent	100	96.13	130.29
Return on Portfolio - Low Income C.	Unbalanced*	100	104.05	102.25
$= \text{mean}_{j \in \text{L}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_t\right)$	Symmetric	100	98.37	93.57
	Convergent	100	91.64	74.78

Table Notes: *refers to the equilibrium actually observed in the data. All figures are relative to the No-Globalization scenario. All summary statistics are weighted by 1995 real GDP $\left(\bar{Y}\right)$. H and L denote, respectively, the sets of high and low-income countries (1995 PPPGDP per capita above/below $25,000).

G Results with only Equities and FDI

In this appendix we reproduce Figures 4-5 and Table 3 using an alternative dataset for external assets and liabilities where we removed all debt assets and liabilities, and kept only equities and FDIs.

Figure 11: World financial openness

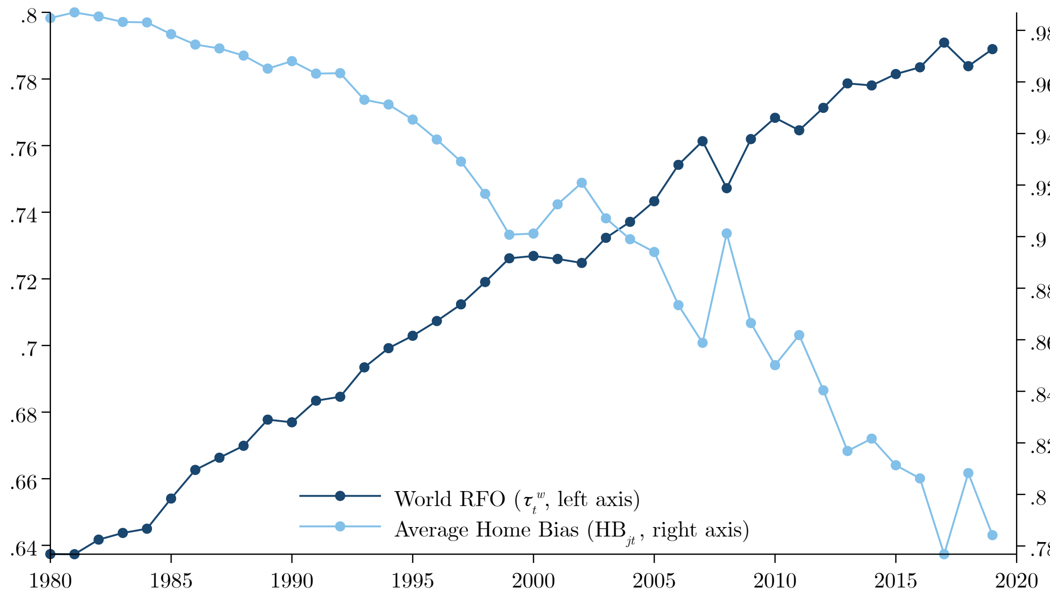


Figure 12: Revealed Financial Openness, High vs. Low Income Countries

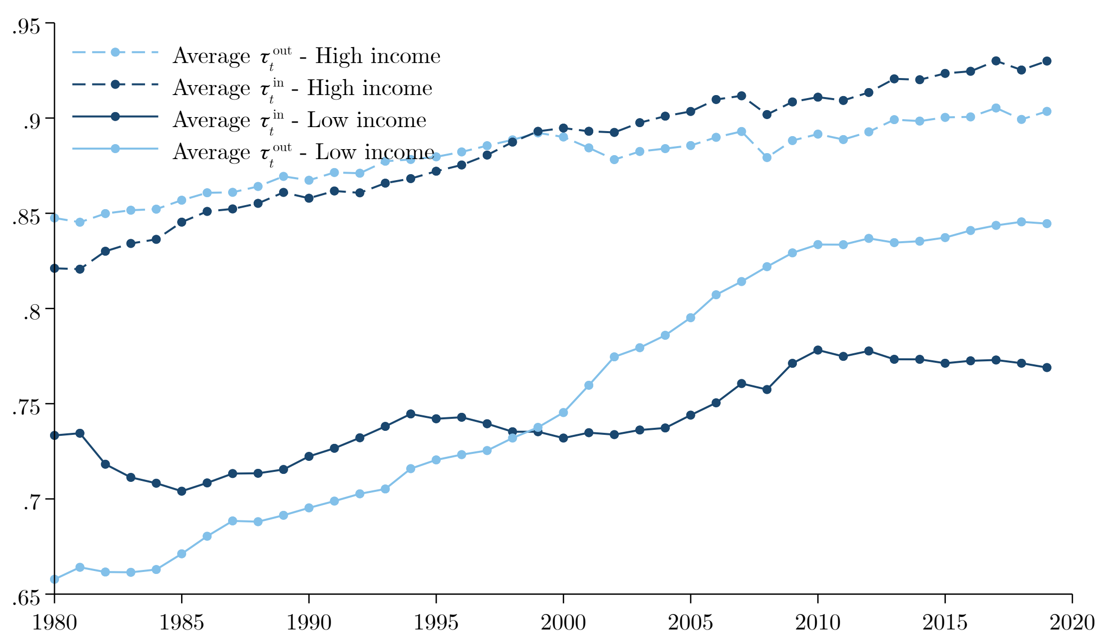


Table 8: Counterfactual Analysis (No-Globalization Scenario = 100)

Statistic	Scenario	1980	1999	2019
World GDP	Unbalanced*	100	98.66	96.37
$= \sum_{i=1}^{n} Y_{it}$	Symmetric	100	102.09	109.57
	Convergent	100	102.36	122.00
Variance of log GDP/Capita	Unbalanced*	100	101.44	102.42
$= \text{var}_{i \in \text{H} \cup \text{L}} \left[\log\left(Y_{it}/\text{pop}_{it}\right)\right]$	Symmetric	100	92.81	71.92
	Convergent	100	94.86	84.11
Capital/Employee - High Income C.	Unbalanced*	100	99.67	100.54
$= \text{mean}_{i \in \text{H}} \left(K_{it}/L_{it}\right)$	Symmetric	100	96.13	76.32
	Convergent	100	97.74	70.37
Capital/Employee - Low Income C.	Unbalanced*	100	97.17	91.87
$= \text{mean}_{i \in \text{L}} \left(K_{it}/L_{it}\right)$	Symmetric	100	124.48	197.77
	Convergent	100	115.30	275.49
Real Wage - High Income Countries	Unbalanced*	100	99.62	100.37
$= \text{mean}_{i \in \text{H}} \left(P_{it}^{L}\right)$	Symmetric	100	98.11	85.95
	Convergent	100	99.57	86.57
Real Wage - Low Income Countries	Unbalanced*	100	95.89	92.38
$= \text{mean}_{i \in \text{L}} \left(P_{it}^{L}\right)$	Symmetric	100	112.89	136.71
	Convergent	100	109.81	168.63
Return on Capital - High Income C.	Unbalanced*	100	101.41	100.45
$= \text{mean}_{i \in \text{H}} \left(\text{MPK}_{it}\right)$	Symmetric	100	103.63	126.99
	Convergent	100	100.40	128.77
Return on Capital - Low Income C.	Unbalanced*	100	106.95	107.28
$= \text{mean}_{i \in \text{L}} \left(\text{MPK}_{it}\right)$	Symmetric	100	90.66	82.05
	Convergent	100	91.35	72.46
Return on Portfolio - High Income C.	Unbalanced*	100	97.55	96.64
$= \text{mean}_{j \in \text{H}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_t\right)$	Symmetric	100	101.90	117.90
	Convergent	100	99.32	120.34
Return on Portfolio - Low Income C.	Unbalanced*	100	106.13	102.89
$= \text{mean}_{j \in \text{L}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_t\right)$	Symmetric	100	90.64	82.00
	Convergent	100	91.32	72.36

Table Notes: *refers to the equilibrium actually observed in the data. All figures are relative to the No-Globalization scenario. All summary statistics are weighted by 1995 real GDP $\left(\bar{Y}\right)$. H and L denote, respectively, the sets of high and low-income countries (1995 PPPGDP per capita above/below $25,000).

H Results with Symmetric Risk

In this appendix we reproduce Figures 4-5 and Table 3 using an alternative calibration of the model where we assume that countries are symmetrical in terms of their TFP volatility ($v_{it} = v_t$).

Figure 13: World financial openness

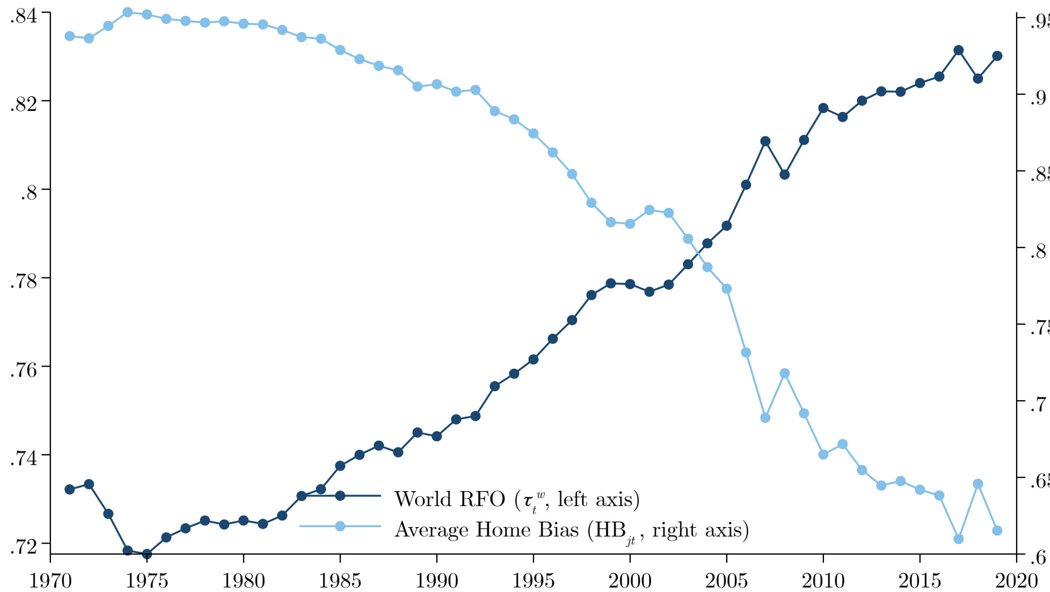


Figure 14: Revealed Financial Openness, High vs. Low Income Countries

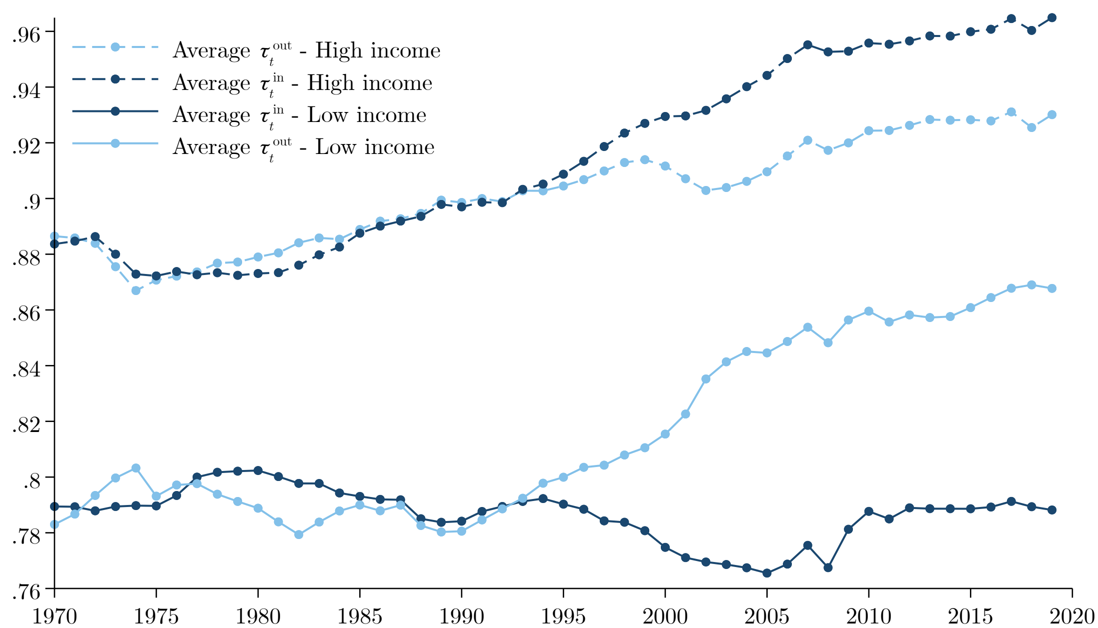


Table 9: Counterfactual Analysis (No-Globalization Scenario = 100)

Statistic	Scenario	1970	1999	2019
World GDP	Unbalanced*	100	100.55	94.08
$= \sum_{i=1}^{n} Y_{it}$	Symmetric	100	100.80	105.74
	Convergent	100	102.83	123.57
Variance of log GDP/Capita	Unbalanced*	100	97.37	103.09
$= \mathrm{var}_{i \in \mathrm{H} \cup \mathrm{L}} \left[\log \left(Y_{it}/\mathrm{pop}_{it}\right)\right]$	Symmetric	100	100.50	88.06
	Convergent	100	93.34	75.80
Capital/Employee - High Income C.	Unbalanced*	100	100.06	105.15
$= \mathrm{mean}_{i \in \mathrm{H}} \left(K_{it}/L_{it}\right)$	Symmetric	100	99.33	77.29
	Convergent	100	98.42	55.96
Capital/Employee - Low Income C.	Unbalanced*	100	107.31	88.87
$= \mathrm{mean}_{i \in \mathrm{L}} \left(K_{it}/L_{it}\right)$	Symmetric	100	102.92	144.14
	Convergent	100	109.41	280.48
Real Wage - High Income Countries	Unbalanced*	100	100.67	103.44
$= \mathrm{mean}_{i \in \mathrm{H}} \left(P_{it}^{L}\right)$	Symmetric	100	100.30	86.78
	Convergent	100	100.35	79.92
Real Wage - Low Income Countries	Unbalanced*	100	101.71	90.10
$= \mathrm{mean}_{i \in \mathrm{L}} \left(P_{it}^{L}\right)$	Symmetric	100	101.44	115.88
	Convergent	100	108.05	169.15
Return on Capital - High Income C.	Unbalanced*	100	70.87	65.13
$= \mathrm{mean}_{i \in \mathrm{H}} \left(\mathrm{MPK}_{it}\right)$	Symmetric	100	99.02	115.85
	Convergent	100	79.49	98.88
Return on Capital - Low Income C.	Unbalanced*	100	100.33	110.59
$= \mathrm{mean}_{i \in \mathrm{L}} \left(\mathrm{MPK}_{it}\right)$	Symmetric	100	100.02	98.83
	Convergent	100	89.94	75.16
Return on Portfolio - High Income C.	Unbalanced*	100	100.09	91.82
$= \mathrm{mean}_{j \in \mathrm{H}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_{t}\right)$	Symmetric	100	98.06	111.90
	Convergent	100	97.03	131.06
Return on Portfolio - Low Income C.	Unbalanced*	100	103.31	101.62
$= \mathrm{mean}_{j \in \mathrm{L}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_{t}\right)$	Symmetric	100	98.25	94.39
	Convergent	100	91.13	77.07

Table Notes: *refers to the equilibrium actually observed in the data. All figures are relative to the No-Globalization scenario. All summary statistics are weighted by 1995 real GDP $\left(\bar{Y}\right)$. H and L denote, respectively, the sets of high and low-income countries (1995 PPPGDP per capita above/below $25,000).