Unbalanced Financial Globalization

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Abstract

We use a dynamic spatial general equilibrium model of international investment and production to investigate the macroeconomic implications of the last five decades of financial globalization. We develop a wedge accounting framework to estimate country- and time-varying measures of Revealed Capital Account Openness (RKO). We show that these wedges are identified for a large panel of countries using limited public data on national accounts and external asset and liability positions available since the 1970s. We uncover striking cross-country differences in the pace of financial account 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 led to poorer capital allocation (a 5.8% decrease in world GDP), a 5.2% rise in cross-country income inequality, lower wages in poorer countries, and reduced capital costs in wealthier nations. In contrast, if countries had opened their financial account at a uniform pace, improvements in the allocation of capital would have led to a reduction in income inequality, and higher world GDP. These findings underscore the crucial role of spatial heterogeneity in shaping the real impact of international capital markets integration.

JEL classification: F2, F3, F4, F6
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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 has 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 materialized (Lucas, 1990; Obstfeld and Taylor, 2005; Monge-Naranjo, Sánchez and Santaeulalia-Llopis, 2019). As highlighted by a recent literature, 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 (Mendoza, Quadrini and Rios-Rull, 2009; Broner and Ventura, 2016; Buera and Shin, 2017). To assess the impacts of financial globalization, it thus seems 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 degree of de facto capital account openness of a large number of developed and developing countries over time using a dynamic spatial general equilibrium model of international investment and production in the style of Pellegrino et al. (2021). We develop a wedge accounting framework that allows us to estimate time-varying measures of *Revealed Capital Account Openness* (RKO): conditional on the model, these measures capture all impediments to asset trade at the country level. We finally use the estimated model and RKO wedges since to dissect 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 every period and firms use capital, labor and energy to produce a tradable good with a local technology. Although the model allows for rich heterogeneity across countries, it remains tractable: this makes the estimation very transparent.

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 *de facto* financial openness. We estimate these RKO 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.

Our wedge accounting framework offers a solution to two challenges. The first is the lack of cross-border bilateral investment data predating the 2000s, which makes it difficult to straightforwardly infer cross-border investment frictions: 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 RKO wedges summarize all these impediments into an easily-interpretable shadow tax on incoming and outgoing investment. Our wedges thus have a similar flavor as trade costs estimated from

gravity models or Revealed Comparative Advantage in the trade literature (Balassa, 1965).

The source of identification of the inward and outward RKO 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 given its return on capital and the observed external assets of all other countries. Likewise, the observed domestic portfolio share in excess of that predicted by a frictionless model identifies barriers to outgoing foreign investment.

We validate our estimated RKO wedges in three complementary ways. First, we show that they correlate strongly (with the expected sign) with several known barriers to international investment, including measures of *de jure* capital controls, capital taxation and political risk. Second, we show that they also strongly correlate with asset trade costs estimated from a 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 capital account 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 RKO wedges. First, countries have become significantly more open over time on average. The average implicit tax on gross returns faced by investors who invest across borders has been steadily decreasing, from 35% in 1971 to just 5% in 2019. Second, we detect important asymmetries in the pace and direction in which barriers to international asset trade have declined across countries. Importantly, higher-income countries have increased their inward and outward openness earlier and faster than poorer countries. 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 RKO wedges fixed at their 1970 levels. This comparison delivers three striking findings.

First, the uneven decline in barriers has resulted in a worsening of the allocation of capital across countries and a lower world output. Had the RKO wedges stayed at their 1970 levels, global output in 2019 would be 5.8% higher. This is driven by the fact that countries with initially high levels of revealed capital account openness—typically, high-income countries—have outpaced the others in further opening up their capital account and decreasing barriers to incoming investment. By raising the perceived rates of returns on capital relative to those in low-income countries, high-income countries were able to attract investment from the rest of the world. As a result, capital has migrated from capital-scarce to capital-rich countries, worsening the allocation of capital and further pushing down the local rate of returns on capital in high-income countries. While this result is consistent with the Lucas puzzle (Lucas, 1990) and other important papers that have documented higher observed returns on capital in emerging markets (David, Henriksen and Simonovska, 2014; Monge-Naranjo, Sánchez and Santaeulalia-Llopis, 2019) a likely sign of capital misallocation— we are the first to show that this misallocation has been exacerbated by the uneven decline in barriers to international investment.

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 5.2% higher than it would have been in a world with no financial globalization. Third, financial globalization has lowered wages and increased the return on capital in low-income countries, and vice-versa in high-income countries. Relative to our

counterfactual no-financial globalization scenario, wages in low-income countries are lower by as much as 11% in 2019, while the rate of return on capital is higher by as much as 12.5%. The opposite is true in high-income countries. Interestingly, while the returns on capital in high-income countries have declined due to the influx of capital, the returns on portfolio of investors have increased due to the increased diversification opportunities to invest in higher-return countries.

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 RKO wedges improve at the same, average, pace across countries and in the second version, that they converge to the same average value by 2019. These findings confirm that the unevenness of financial globalization is behind the surprising worsening of the allocation of capital, the decline of world output and the increase in inequality across countries over time. Overall, our paper highlights that it is crucial to account for spatial heterogeneity and the relative pace at which countries open up, 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 potential inclusion of government debt, (iii) restricting our investment data to equity positions, (iv) the inclusion of risk in the portfolio shares, (v) the model specification for the households savings and (vi) using wedges estimated from bilateral positions.

Related literature. This paper contributes to the rich empirical literature on the drivers and effects of financial globalization. Lane and Milesi-Ferretti (2008) and Lane and Milesi-Ferretti (2018) provide an empirical investigation of the patterns of financial globalization. We extensively use their data on external assets and liabilities in this paper. Henry (2007) and Chari et al. (2012) show that stock market liberalization episodes in emerging economies lead to a temporary increase in capital inflows, growth and wages. At the firm-level, Forbes (2007) concludes that financial opening in emerging countries is associated with a decline in the cost of capital, which is consistent with the core mechanism in our model. Extensive reviews and discussions of the literature are provided by Ghosh et al. (2010), Magud et al. (2018) and Erten et al. (2021). The range of estimates of the impact of financial globalization is wide and there is little consensus in the literature, partially reflecting different definitions of capital flows different sample of countries used (Forbes, 2007) as well as the endogeneity of financial liberalization episodes and the multiplicity of channels.

We also contribute to the literature on the distributional consequences of financial globalization. Furceri and Loungani (2018) and Furceri, Loungani and Ostry (2019) find that episodes of financial liberalization are associated with an increase in the Gini coefficient. The analysis by Azzimonti, De Francisco and Quadrini (2014) emphasizes the role of public debt. Eichengreen et al. (2021) review the literature and find that the effect of globalization on inequality depends on the context, which is broadly consistent with our emphasis on country details and heterogeneity.

We build on theoretical papers investigating how financial development and contracting institutions can play an important role in mediating the effects of financial globalization, including Mendoza, Quadrini and Rios-Rull (2009), Mendoza and Quadrini (2010), and Broner and Ventura (2016). Boyd and Smith (1997) provide a model where financial integration precludes two countries that only differ from their initial capital stock from converging to the same steady state.

Methodologically, our work relates to a stream of papers that develop a wedge accounting framework 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, 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, which is inspired from the trade literature (Balassa, 1965; Koopman, Wang and Wei, 2014). This approach allows us to estimate the Revealed Capital Account Openness wedges in a transparent way, and to perform detailed quantifications with rich country heterogeneity.

We build on the recent set of papers that develop asset demand frameworks in international finance, particularly on Pellegrino, Spolaore and Wacziarg (2021, henceforth PSW). Our findings are consistent with those of PSW: we both find that barriers 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 capital account liberalization has proceeded faster in high-income countries than it has in low-income ones. Other related models include those of Koijen and Yogo (2020), Jiang, Richmond and Zhang (2022) and Kleinman, Liu, Redding and Yogo (2023).

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 the calibration strategy; Section 4 outlines the identification; Section 5 validates our approach; Section 6 uses our RKO wedges to document patterns of financial globalization, including its unevenness; 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 novel multi-country dynamic general equilibrium model that incorporates a logit demand system for international assets, in the style of Pellegrino et al. (2021, 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 n 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 and thus has price 1) using a three-input Cobb-Douglas production function:

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

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 (time-varying) variance of $\log \zeta_{it}$ is given by v_{it} . Following the existing literature on international capital allocation, we assume that the amount of labor and natural capital available at time t are exogenous and immobile, while reproducible capital is endogenously accumulated and mobile across countries. We follow PSW in assuming that production requires the depreciation of an exogenous stochastic fraction $(1 - \delta_{it})$ of the capital stock 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:

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

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 MPK_{it}, it is also the profit per unit of capital invested:

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

[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

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

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 their 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 an exogenous endowment ($\mathcal{E}_{jt}$). In all following periods of their life ($t > b$), agents live off capital income. The youngest cohorts are thus workers while older cohorts are capitalists.[2]

Every period, agents choose how much of the final good to consume (C_{jbt}) and how much to save in the form of capital (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 at time t on wealth saved at time $(t-1)$. We assume that they take this rate of return as exogenous, as 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:

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

where the parameter σ_{jt} is the country- and time-specific discount parameter, adjusted for the risk of death:

$$\sigma_{jt} \overset{\text{def}}{=} \theta_{jt} \left(1 - \mathfrak{D}_{jt} \right) \tag{7}$$

where θ_{jt} is a time-varying patience parameter. Note that we have normalized the value of death to 0 and we conveniently defined σ_{jt} so that the discount rate is equal to $\theta_{jt}\left(1-\mathfrak{D}_{jt}\right)$. 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 expected utility in equation (6) subject

[2]This assumption allows us to seamlessly integrate a logit asset demand framework Koijen and Yogo (2019) in a dynamic GE model that can be solved globally outside of steady-state in closed form and that can thus be inverted to perform wedge accounting.

to the following constraints:

$$C_{jbt} + A_{jbt} \;=\; \begin{cases} P_{jt}^{L} L_{jb} + P_{jt}^{X} X_{jt} + \mathcal{T}_{jt} + \mathcal{E}_{jt} & \text{if} \quad t = b \\ R_{jt} A_{jbt-1} & \text{if} \quad t > b \end{cases} \tag{8}$$

where R_{jt} is the rate of return earned on invested capital between time t and time $t+1$.

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

$$C_{jt} \overset{\text{def}}{=} \sum_{b \leq t} C_{jbt}; \qquad A_{jt} \overset{\text{def}}{=} \sum_{b \leq t} A_{jbt}; \tag{9}$$

Since only the youngest cohort supply 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 setup, characterized by this 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:

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

$$C_{jt} \quad \overset{\text{def}}{=} \quad \sum_{b \leq t} C_{jbt} \quad = \quad (1 - \sigma_{jt}) \left(R_{jt} A_{jt} + P_{jt}^{L} L_{jt} + P_{jt}^{X} X_{jt} + \mathcal{E}_{jt} \right) \tag{11}$$

2.4 Asset Demand and Portfolio Shares

We assume that (international) investment is managed by intermediaries who use a logit asset demand system (Koijen and Yogo, 2019). For expositional purposes, we shall assume here that the asset demand system follows a specific functional form. w_{ijt} is the share of country j wealth that is invested in destination country i at time t, and it is given by the following expression:

$$w_{ijt} \;=\; \frac{\left(\tau_{ijt} \cdot \mathcal{R}_{ijt-1} \right)^{\beta} \cdot K_{it}}{\sum_{\iota=1}^{I} \left(\tau_{ijt} \cdot \mathcal{R}_{\iota jt-1} \right)^{\beta} \cdot K_{\iota t}} \tag{12}$$

where $\mathcal{R}_{ijt-1}$ is the risk-adjusted expected return on capital (at time $t-1$, when the investment decision is made), and is defined as follows:

$$\mathcal{R}_{ijt-1} \;=\; \exp\left(-\frac{1}{2} v_{it} \right) \left(1 + \mathbb{E}_{t-1} \mathrm{MPK}_{it} - \delta \right) \tag{13}$$

v_i (as mentioned previously) is the variance of the productivity shock ζ_{it}. This definition of the risk-adjusted return on capital is not arbitrary: it is a result of the micro-foundations of this asset demand

system described by PSW. They show that this asset demand system we use can be microfounded in more than one way. We also provide a discussion of the microfoundations in Appendix A.

τ_{ijt} is a wedge that distorts investment from country i to country j at time t. We conceptualize it as a summary statistic of all distortions affecting international investment between these two countries. We assume this to be either a behavioral wedge or a tax that is rebated as a lump sum to the same agents on which it is levied; it distorts international portfolios, but it does not impact the aggregate resource constraint.

This logit formulation is a feature of several recent models of demand for international assets (Pellegrino, Spolaore and Wacziarg, 2021; Koijen and Yogo, 2020; Jiang, Richmond and Zhang, 2022). There are two factors that make this asset demand framework especially attractive in our setting. First, it allows us to take our model to the data using the limited country-level information available since the 1970. Second, it renders our model highly tractable, allowing us to capture the de facto capital account openness of countries using the wedges τ_{ijt}, which can be recovered from observable data.

2.5 Market Clearing

All markets clear. There are i markets for labor and i markets for natural resources. 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. Market clearing implies

$$K_{it} \;=\; \sum_{j=1}^{I} A_{ijt}; \qquad A_{jt} \;=\; \sum_{i=1}^{I} A_{ijt} \tag{14}$$

which can be rewritten in matrix form as follows:

$$\mathbf{K}_t \;=\; \mathbf{W}_t\,\mathbf{A}_t \quad : \quad \begin{bmatrix} K_{1t} \\ K_{2t} \\ \vdots \\ K_{It} \end{bmatrix} = \begin{bmatrix} w_{11t} & w_{12t} & \cdots & w_{I1t} \\ w_{21t} & w_{22t} & \cdots & w_{I2t} \\ \vdots & \vdots & \ddots & \vdots \\ w_{I1t} & w_{I2t} & \cdots & w_{IIt} \end{bmatrix} \begin{bmatrix} A_{1t} \\ A_{2t} \\ \vdots \\ A_{It} \end{bmatrix} \tag{15}$$

Because the portfolio shares $\mathbf{W}_t$ depend on the rates of return vector $\mathbf{MPK}_t$, 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 such that equation (15) holds.

2.6 Government Budget Constraint

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

$$\mathcal{T}_{jt} \;=\; \mathfrak{D}_{jt-1}R_{jt}A_{jbt} \tag{16}$$

2.7 Revealed Capital Account Openness

We now introduce the concept of *Revealed Capital Account Openness* (RKO), τ_{ijt}, which is our original approach to measuring the openness of a country's capital account. The RKO 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. Consistent with this idea, the term $(1 - \tau_{ijt})$ is the implicit tax rate that an investor located in j has to pay on the (gross) return on an investment located in country i.

Because (as we show) these wedges are revealed by observable investment patterns, they provide a *de facto* measure of a country's capital account openness. In that sense, they are analogous to Revealed Comparative Advantage (RCA) in international trade (Balassa, 1965; Koopman, Wang and Wei, 2014). This contrasts with the common approach in the literature based on *de jure* openness, such as capital controls. Our *de facto* measure is more appealing than this common approach for at least two reasons: many factors shape the true degree of openness and some of them are difficult to measure (*e.g.* political risk); and *de jure* measures don't fully capture the degree of enforcement (*e.g.* of capital controls).

Consistent with the notion that RKO wedges capture all impediments to international investment, the following proposition shows that, without these barriers, the equilibrium allocation is efficient in the sense that it maximizes GDP.

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

Proof. Substituting inside equation (12), we obtain $w_{ijt} = \mathcal{R}^{\beta}_{ijt-1} K_{it} / (\sum_{\iota=1}^{n} \mathcal{R}^{\beta}_{\iota jt-1} K_{\iota t})$. 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 $\mathcal{R}^{\beta}_{ijt-1} = \sum_{\iota=1}^{n} \mathcal{R}^{\beta}_{\iota jt-1} w_{\iota jt}$, 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. □

The RKO wedges should thus be interpreted as capturing *all* distortions that cause the world economy to deviate from the efficient allocation of the available capital across countries. Proposition 1 is useful as a benchmark to clarify the interpretation of the RKO wedges. One shouldn't however conclude that the removal of all distortions, $\tau_{ijt} = 1$, is necessarily optimal in a welfare second-best sense, or even assume that this allocation would be implementable in practice. For example, distortions-inducing policies may be second best (*e.g.* capital controls can provide macroeconomic stabilization) and several distortions are outside the control of governments (*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[3] (L_{it}), the real capital stock measured in constant prices (K_{it}), the labor compensation share $\left(\lambda_{it} \equiv P^{L}_{it} L_{it} / Y_{it}\right)$, real output measured in PPP at constant prices (Y_{it}), consumption (C_{it}) and the rate of depreciation of capital (δ_t).

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

[3] Whether we use human capital-adjusted employment or simple employed persons is irrelevant to our findings. This choice only shifts that measured total factor productivity (z) but it does not affect the results of the counterfactual.

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 $K_{jt} \geq \widetilde{K}_{jt}$. 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 B. 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 the selected nature of this sample, by repeating in section 8 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 18.5. This value is based on the estimates of Koijen and Yogo (2020) of a demand system for international assets. They report demand-price 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.

The other parameter which we need to calibrate is the expected rate of capital depreciation: we set this to 3.8%, based on average values from the Penn World Table.

4 Identification and Wedge Accounting

In this section we explain how, starting from the assumption that the model is the true data-generating process, we can recover all of the unobserved quantities as a function of the observable data. The mapping of the model to the data, along with the calibration of parameters and the identification of unobserved 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 $(1 - \lambda_{it} - \xi_{it})$. The second 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).

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

The next step consists of recovering the productivity shocks ζ_{it} . Using the previously-recovered MPK, we compute the gross returns $(1 + \text{MPK}_{it} - \delta)$. Because the expectation at $t-1$ of the gross return is simply the gross return divided by ζ_{it}, we can identify ζ_{it} from the $t-1$ expectation of the gross return.

Since the expectation $\mathbb{E}_{t-1}(1 + \text{MPK}_{it} - \delta)$ is not observed in the data, we proxy it with a Hodrick-Prescott filter with smoothing parameter 6.25. We thus recover ζ_{it}, as well as the time-varying shock volatility v_{it}, as the 10-year moving average of the squared log cyclical component.

4.2 Identification of the RKO wedges

We now show how to identify the wedges (τ_{ijt}) from the data, assuming our model is the data-generating process. If we observed bilateral investment positions, we could directly back out the wedges by using equation.12[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 2000s with only a few countries. Instead, our wedge accounting framework relies on the panel of the aggregate external asset and liability positions for each country as well as the panel of domestic portfolio shares, which we can construct for a large set of countries since 1970.

First, we impose some structure on the RKO 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 the incoming capital investment into country i, and an out-wedge τ_{jt}^{out} – applied by the origin country – which captures the barriers to the outgoing capital investment 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 barriers to international investment are related to policies set at the country level—such as capital controls on inward or outward investment and capital taxation—or characteristics of the destination or origin countries—such as political risk or central bank independence. Like the overall RKO wedge (τ_{it}), the inward (τ_{it}^{in}) and outward (τ_{jt}^{out}) RKO wedges of country j can be interpreted as the summary statistics of all impediments to incoming and outgoing investments, respectively.

We start with identifying the inward wedges τ_{jt}^{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

[5] We do so in subsection 8.1 for most recent years in order to validate the multilateral wedges.

share:

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

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 (15), in terms of observables 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 have a system of I identifying equations that can be used to identify the I-dimensional vector $\boldsymbol{\tau}_t^{\text{in}}$.

It is important to note that because the system is homogeneous of degree 1 in $\boldsymbol{\tau}_t^{\text{in}}$, this vector is only identified up to a multiplicative constant. This is however not a problem because the wedge product $\tau_{it}^{\text{in}} \cdot \tau_{jt}^{\text{out}}$ 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.

Intuitively (21) identifies the barriers $\boldsymbol{\tau}_t^{\text{in}}$: 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.

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

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

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

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

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 Capital Account Openness & Normalization

Next, we propose a statistic of overall capital account openness, which we call the "World Capital Account Openness" (WKO), and we use to normalize our wedges. The WKO is defined as the GDP-weighted average of bilateral RKO 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 Unobserved Variables

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

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

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

To recover κ_{it}, we use the constant return to scale assumption and the fact that we observe λ_{it} and 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 to our measurement exercise, since we only need to identify the product $\Omega_{it} X_{it}^{\xi_{it}}$. This in turn can be easily recovered from the production function given by equation 1

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

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

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 (10):

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

Note that we don't need to separately identify the probability of death and the patience-parameter. We just need to know the discount factor σ_{jt}.

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

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	= 18.5 (Pellegrino et al., 2021)
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	$A^{-}_{jt} = K_{jt} + \tilde{A}^{-}_{jt} - \widetilde{K}_{jt}$
w_{jjt}	Domestic Portfolio Share	$w_{jjt} = \left(K_{jt} - \widetilde{K}_{jt}\right) / A^{-}_{jt}$
τ^{in}_{it}	RKO In-Wedge	(normalized) solution to equation system (21)
τ^{out}_{jt}	RKO Out-Wedge	$\tau^{\text{out}}_{jt} = \left(\frac{1-w_{jjt}}{w_{jjt}} \cdot \frac{\mathcal{R}^{\beta}_{ijt-1} \cdot K_{jt}}{\sum_{\iota \neq j} \left(\tau^{\text{in}}_{\iota t} \cdot \mathcal{R}_{\iota j t-1}\right)^{\beta} K_{\iota t}} \right)^{\frac{1}{\beta}}$
$\tilde{w}_{ijt}$	External Portfolio Shares	$\tilde{w}_{ijt} = \frac{\left(\tau^{\text{in}}_{it} \cdot \mathcal{R}_{ijt-1}\right)^{\beta} \cdot K_{it}}{\sum_{\iota \neq j} \left(\tau^{\text{in}}_{\iota t} \cdot \mathcal{R}_{\iota j t-1}\right)^{\beta} \cdot K_{\iota t}}$
σ_{it}	Saving Rate	$\sigma_{jt} = A^{-}_{jt} / \left(A^{+}_{jt} + \mathcal{T}_{jT} + P^{L}_{jt} L_{jt} + P^{X}_{jt} X_{jt} + \mathcal{E}_{jt} \right)$

Table 2: Correlation of the RKO Wedges with External Measures

Wedge	Predictor	Source	Correlation (ρ)
$\sqrt{\tau_{it}^{\text{in}}\,\tau_{it}^{\text{out}}}$	Capital Account Openness	Chinn and Ito (2008)	0.40***
τ_{it}^{out}	Outward Capital Controls	Fernández et al. (2015)	-0.10*
τ_{it}^{in}	Inward Capital Controls	Fernández et al. (2015)	-0.41***
τ_{it}^{in}	Political Risk Safety	ICRG	0.61***
τ_{it}^{in}	Tax Rate on External Capital	Pellegrino et al. (2021)	-0.31**

Table Notes: ***p-value< 0.01; **p-value< 0.05; *p-value< 0.1. p-values use country-clustered standard errors (except for Tax Rate on External Capital, which is a purely cross-sectional variable).

5 Validation

After calibrating the model and applying our wedge accounting framework, we now validate our estimated RKO 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 asset trade costs estimated from a gravity equation on bilateral positions, (iii) the estimated implicit tax persistently declines after known episodes of capital account liberalization. Overall, these validation exercises provide empirical support to the interpretation of our wedges as measures of *de facto* capital account openness.

5.1 Correlations with *De Jure* Measures of Openness

To begin, we use two widely-used measures of de jure capital account openness – both derived from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAR) database, which documents country-level policy measures that affect 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 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.

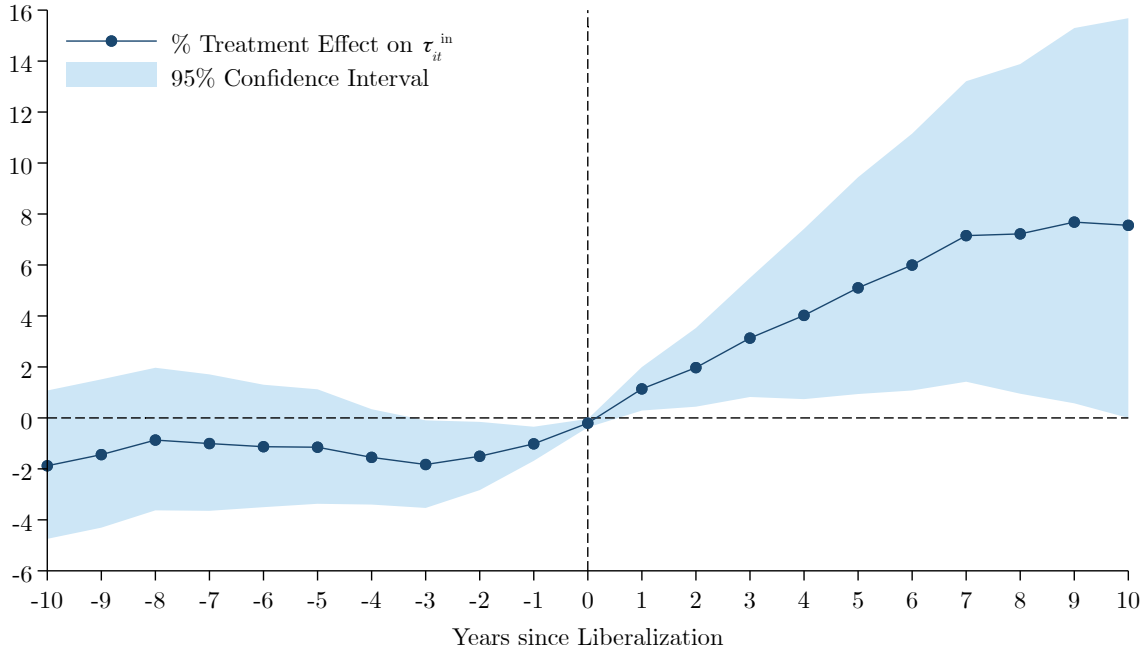
We also use the Political Risk Score, published by the International Country Risk Guide (ICRG), which combines information on risk of expropriation, of payment delays and on profits repatriation. The ICRG dataset covers 137 countries since 1984.

Finally, we use a measure of the tax rate on external capital in the destination country, using the database of bilateral, treaty-adjusted composite capital tax rates of Pellegrino et al. (2021).

For each of the five variables, we find that the estimated correlations are large in absolute value (0.36 on average) and have the expected sign. They are also statistically significant, with p-values below 1%, except

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

Figure 1: Event Study - Emerging Market Liberalizations and In-Wedges



for taxation ($1\% < p < 5\%$) and outward capital controls ($5\% < p < 10\%$).[8]

Although we do not see this analysis as providing a causal identification of the drivers, it supports our interpretation of our wedges as measures of *de facto* openness.

5.2 Event Study: Financial Liberalizations in Emerging Markets

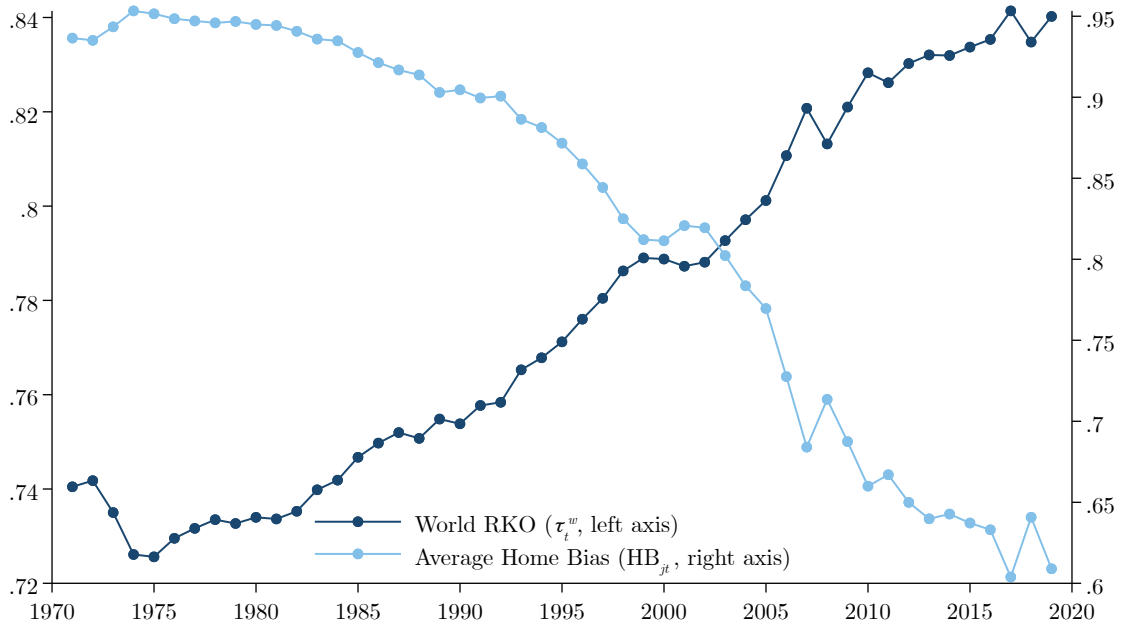
The third validation exercise looks at the path of our in-wedges (τ_{it}^{in}) following episodes of emerging market liberalization documented by Bekaert and Harvey (2000, henceforth BH). If indeed our interpretation of the RKO wedges as measures of de facto openness is correct, we should observe a positive treatment effect on the in-wedge following a liberalization event.

To perform our analysis, we employ the staggered difference-in-differences estimator of Roth and Sant'Anna (2023). This estimator identifies the average treatment effect of liberalizations using the differential timing of the liberalization. The key identifying assumption is that of parallel trends: that is, 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.

Because BH only consider emerging markets, we only include, in our event-study sample, countries whose GDP per capita was below $25,000 in 1995 (which we define as low-income countries). We believe this is a demanding test for our model, as it doesn't exploit a substantial source of cross-sectional variation in the data - namely, that 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.

[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.

Figure 2: World Capital Account Openness



The results of our event study are shown in Figure 1. We find that the RKO wedges respond to liberalization gradually, with a cumulative increase of 7.7% by the tenth year since liberalization. By the sixth year, the magnitude of the effect is 6%; this figure is economically and significantly significant (at the 95% confidence level). These results support the validity of the RKO wedges as measures of de facto capital account openness.

In Appendix C, we confirm the robustness of our results to the use of alternative estimators by Sun and Abraham (2021) and Callaway and Sant'Anna (2021).

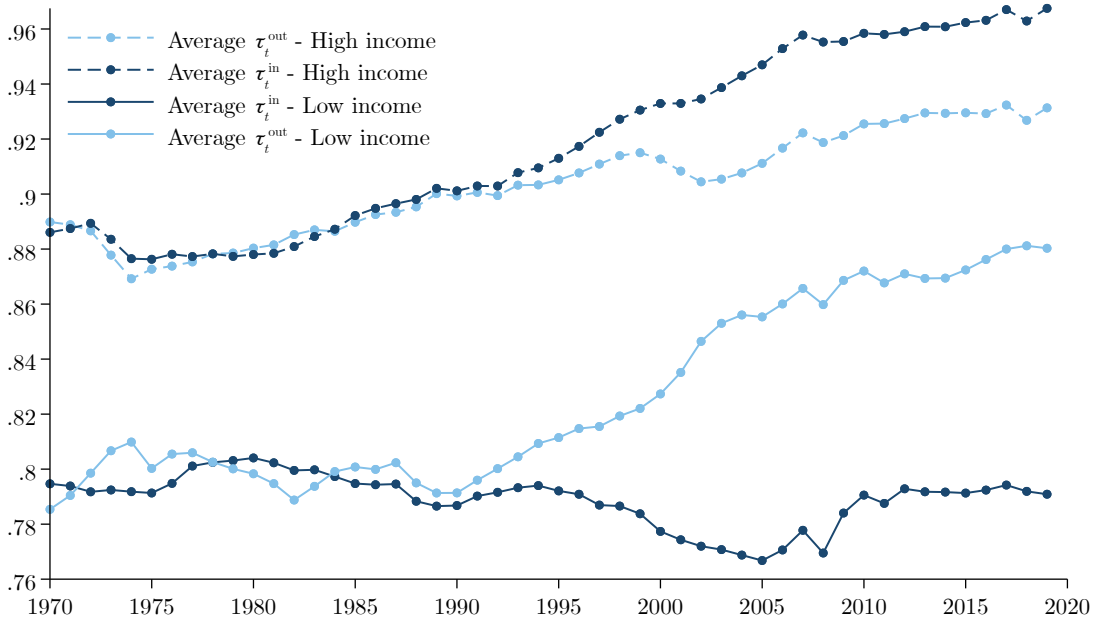
6 Patterns of De Facto Capital Account Openness

We are now ready to study the five decades of financial globalization through the lens of our RKO 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 has been deeply heterogeneous across countries, a phenomenon we call *unbalanced financial globalization*.

6.1 World Capital Account Openness

The time series of our World RKO measure, τ_t^w, which is shown in Figure 2 (darker line, left axis), confirms that the global economy has experienced a tremendous increase in capital account 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 RKO was 0.74, implying that the average implicit tax on gross returns from international investment was about 26%. World financial markets were practically in a state of autarky. After 1980, World RKO has progressively increased to reach almost 0.95 in 2019, which corresponds to an implicit tax of 5%. Because this is a tax on *gross* returns, this is still a very high level.

FIGURE 3: REVEALED CAPITAL ACCOUNT OPENNESS, HIGH VS. LOW INCOME COUNTRIES



One implication of this increasing openness in the capital account is the declining home bias (the share of portfolios invested in domestic assets) as shown by the lighter line in Figure 2. Following Coeurdacier and Rey (2013), home bias for country j is defined as:

$$\text{HB}_{jt} \overset{\text{def}}{=} 1 - (1 - w_{jjt}) \frac{\sum_{i=1}^{n} K_{it}}{\sum_{\iota \neq j} K_{\iota t}} \tag{31}$$

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 2, 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 0.84 in 1971 to 0.59 in 2019.[9]

The change in the World RKO is also consistent other 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.

6.2 Heterogeneity (Unbalanced Financial Globalization)

We now turn to the cross-country dispersion of our RKO 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 world capital account openness documented above has been driven disproportionately by high-income countries.

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

To show this, we split countries in our sample between low-income countries, and high-income countries, using as a threshold PPP GDP/capita of $25,000 in 1995. 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 3 show that in the early 1970s, high-income countries were already more financially open than low-income countries, both inwardly as well as 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 20% to just 12 % 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 poor countries this number has remained stable at 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 RKO 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 RKO 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}) and patience parameters (σ_{it}). Changing the RKO 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 and Capital Allocation Efficiency

The first result we obtain from the counterfactual simulation is that financial globalization has had an adverse effect on allocative efficiency. Indeed, world GDP is 5.8% 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 happened 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 15.1% 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 36.4% lower in high-income countries, and 12.6% 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 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 set of countries lowers their barriers to incoming international investment. This directly improves foreign investors' perceived return 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 the countries that opened their capital account already had more capital to begin with, the policy change leads to an exacerbation of capital inequality and capital returns differential, thus leading to further 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, has been 1.8% higher in 1995 and 5.2% 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.

TABLE 3: COUNTERFACTUAL ANALYSIS (NO-GLOBALIZATION SCENARIO = 100)

Statistic	**Scenario**	1971	1995	2019
World GDP	Unbalanced*	100	100.38	94.22
$= \sum_{i=1}^{n} Y_{it}$	Symmetric	100	100.95	105.32
	Convergent	100	102.93	124.62
Variance of log GDP/Capita	Unbalanced*	100	99.24	105.24
$= \text{var}_{i \in \text{H} \cup \text{L}} \left[\log \left(Y_{it} / \text{pop}_{it} \right) \right]$	Symmetric	100	99.98	86.04
	Convergent	100	93.09	75.16
Capital/Employee - High Income C.	Unbalanced*	100	100.66	105.06
$= \text{mean}_{i \in \text{H}} \left(K_{it} / L_{it} \right)$	Symmetric	100	99.28	78.86
	Convergent	100	98.39	53.94
Capital/Employee - Low Income C.	Unbalanced*	100	102.15	84.87
$= \text{mean}_{i \in \text{L}} \left(K_{it} / L_{it} \right)$	Symmetric	100	103.84	145.99
	Convergent	100	109.82	299.72
Real Wage - High Income Countries	Unbalanced*	100	100.96	103.41
$= \text{mean}_{i \in \text{H}} \left(P_{it}^{L} \right)$	Symmetric	100	100.35	87.10
	Convergent	100	100.43	78.83
Real Wage - Low Income Countries	Unbalanced*	100	100.09	89.08
$= \text{mean}_{i \in \text{L}} \left(P_{it}^{L} \right)$	Symmetric	100	102.01	116.80
	Convergent	100	108.45	175.23
Return on Capital - High Income C.	Unbalanced*	100	71.05	65.59
$= \text{mean}_{i \in \text{H}} \left(\text{MPK}_{it} \right)$	Symmetric	100	98.85	115.69
	Convergent	100	79.77	101.28
Return on Capital - Low Income C.	Unbalanced*	100	102.23	112.55
$= \text{mean}_{i \in \text{L}} \left(\text{MPK}_{it} \right)$	Symmetric	100	99.12	96.25
	Convergent	100	89.66	73.55
Return on Portfolio - High Income C.	Unbalanced*	100	99.19	91.82
$= \text{mean}_{j \in \text{H}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_{t} \right)$	Symmetric	100	97.81	111.91
	Convergent	100	96.69	132.87
Return on Portfolio - Low Income C.	Unbalanced*	100	104.11	102.75
$= \text{mean}_{j \in \text{L}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_{t} \right)$	Symmetric	100	97.94	93.88
	Convergent	100	90.56	75.20

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).

Because capital is the only movable factor in our model, 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 that of capital-scarce, low-income countries, thus exacerbating not only capital misallocation, but also pre-existing income gaps across countries.

7.4 Wages

Finally, 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 liberalize their capital accounts 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 RKO wedges. While we share the view that investors in high-income countries have benefited from increased investment opportunities, we also 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 11% 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 uneven pace at which countries opened up worsened the global allocation of capital, depressing world output and increasing cross-country inequality. These results are in sharp contrast with the predictions of traditional models of capital market integration, which predict the exact opposite. A crucial question is 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.

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 RKO path the same as in the actual economy, we construct the counterfactual RKO wedges for this scenario (τ_{ijt}^{sym}) as follows:

$$\tau_{ijt}^{\text{sym}} \quad \stackrel{\text{def}}{=} \quad \tau_{ij,1970} \cdot \frac{\tau_t^w}{\tau_{j,1970}^w} \qquad \text{for } i \neq j \tag{32}$$

When countries open up symmetrically, their initial differences in capital account 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 RKO path the same as in the actual economy. Specifically, we assume that the path of RKO wedges is given by

$$\log \tau_{ijt}^{\text{con}} \quad \stackrel{\text{def}}{=} \quad \frac{2019-t}{49} \cdot \log \tau_{ijt}^{\text{sym}} + \frac{t-1970}{49} \cdot \log \tau_t^w \qquad \text{for } n \neq j \tag{33}$$

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 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 in general have to lead to a worsening of the capital allocation and cross-country inequality. In the *symmetric* scenario world output would have been 5.2% higher, while in the *convergent* counterfactual it would have been 24.6% higher (again, respect to no-globalization).

In both these counterfactuals, capital undergoes a massive reallocation from capital-rich to capital-poor countries. In low-income countries in 2019, the capital stock per employee 45% in the *symmetric* scenario and 300% in the *convergent* scenario. Wages are 16% and 75% higher, respectively. For rich countries, we observe the exact opposite: capital/employee decreases by 21.1% and 46% and wages decrease by 13% and 21.1%, respectively. Cross-country inequality, measured as the variance of log GDP per capita, would have been 14% lower in the *symmetric* scenario and 24.8% 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 potential inclusion of government debt, (iii) the fact that all debt and loans are included, (iv) the inclusion of risk in the portfolio shares, (v) the model specification for the households savings and (vi) using wedges estimated from bilateral positions.

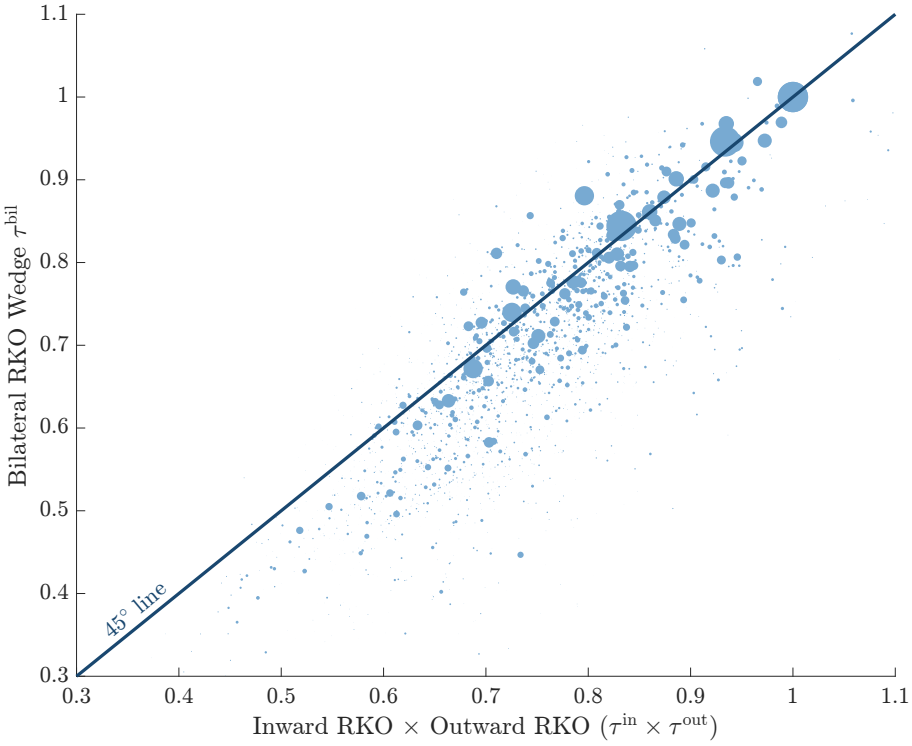
8.1 Estimating Bilateral Wedges from Bilateral Positions

In recent years, data on bilateral investment positions has become available, allowing for the estimation of bilateral RKO wedges, τ_{ijt} , without assuming they are the product of separate 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 (12), one can decompose τ_{ijt} as the product of two terms: the first 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 country $\mathcal{R}_{ijt}$. The second is origin- and year-specific. Specifically:

$$\tau_{ijt} \;=\; \tau_{ijt}^{(1)} \cdot \tau_{jt}^{(2)} \tag{34}$$

Figure 4: RKO Wedges Derived from Bilateral and Multilateral Positions



where

$$\log \tau_{ijt}^{(1)} \overset{\text{def}}{=} \log A_{ijt} - \log K_{it} - \beta \log \mathcal{R}_{ijt} \tag{35}$$

$$\log \tau_{jt}^{(2)} \overset{\text{def}}{=} \log \left[\sum_{\iota=1}^{N} \left(\tau_{\iota jt} \mathcal{R}_{\iota jt} \right)^{\beta} \cdot K_{\iota t} \right] - \log A_{jt} \tag{36}$$

Importantly, the term $\tau_{ijt}^{(1)}$ is directly measurable in the data since we can measure bilateral positions A_{ijt}, capital stock K_{it} and risk-adjusted expected return on capital $\mathcal{R}_{ijt}$ in the data. 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

$$\log \tau_{jt}^{(2)} = \left(\frac{1 - w_{jjt}}{w_{jjt}} \cdot \frac{\mathcal{R}_{jt}^{\beta} K_{jt}}{\sum_{n \neq j} \tau_{ijt}^{(1)} \mathcal{R}_{it}^{\beta} K_{it}} \right)^{\frac{1}{\beta}} \tag{37}$$

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 the origin and destination), in the PWT and in the External Wealth of Nations dataset for the year 2015, 2016 and 2017.

Figure 4 shows a scatter plot of both sets of RKO wedges in 2015. The graph reveals a clear linear relationship between both measures of RKO wedges, which further supports our interpretation of the wedges as meaningful measures of barriers to asset trade across borders.

8.2 Alternative Panel (shorter, wider)

Although the set of 58 countries included in our baseline analysis covers 70% of global GDP in 2019, one concern is that missing the remaining 30% of the world economy may bias our results. We address this concern by broadening the set of countries included in the analysis. To address the data limitations, we restrict the sample period to the last three decades and start our analysis in 1993. Our shorter panel contains 94 countries, which account for approximately 90% of world GDP. The full list of countries is given in Appendix in Table 6.

Our previous findings become slightly less striking but are qualitatively unchanged, as shown in Table 5 in Appendix. On the implications for capital efficiency, we find that the world output is 2.4% lower today than in a world in which the wedges τ_{ijt} had remained constant. The increase in the dispersion of income per capita across countries is 8.3% somewhat larger than in our baseline findings +5.3%. We also find very similar results for the capital to output ratios and the factor remunerations. As is the case for the baseline model, we find that the balanced globalization scenarios have diametrically opposite implications.

8.3 The Role of Government Debt

The literature has documented the important role played by sovereign liabilities in accounting for upstream capital flows and the allocation puzzle (Gourinchas and Jeanne, 2013; 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 this dataset doesn't break down assets and liabilities by public and private agents. and it difficult to find other data sources with information on government international positions with a global coverage. The main dataset used in the literature on sovereign flows, the World Bank's *International Debt Statistics Database* (the successor of *Global Development Finance*), covers only developing countries which is too limited a sample for our global approach.[10]

Instead we take advantage of the fact that the External Wealth of Nations dataset breaks down assets and liabilities by financial instruments (equity, bonds, FDI, other) and that an overwhelming share of government debt is in bonds, by excluding 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 we have such data thanks to the *Global Allocation of Capital Project* which is based on the work in 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 4.3% lower today than in a world in which the wedges τ_{ijt} had remained constant, and the

[10]This dataset is also one of the underlying sources used by Alfaro et al. (2014) to construct their dataset of net private and public capital flows.

dispersion of income per capital across countries is 3.7% higher. We also find very similar results for the capital to output ratios and the factor remunerations. The quantitatively smaller effects support the idea that government flows matter to some extent, which is consistent with the results in Gourinchas and Jeanne (2013) and Alfaro et al. (2014). However, they account only for a small fraction of the difference with the *symmetric* and *convergent* scenarios: in 2019, world output would have been 4.8% higher in the *symmetric* scenario and 25% higher in the *convergent* scenario.

8.4 Using Equity Positions Only

One concern with our baseline measure of external assets and liabilities is that it includes 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 an alternative measure of external assets and liabilities which removes derivatives, bank loans and debt securities and only keep FDI and equities.

Our results, shown in Appendix F, suggest slightly more muted effects of financial globalization, which is consistent with what we found in the previous robustness exercise where we excluded a fraction of debt flows. More specifically, we find that the world GDP has broadly been unaffected by the increased financial openness of countries over time. While a more balanced financial globalization would have led to a higher world GDP and a better allocation of capital still, quantitatively the gains relative to the actual globalization are slightly smaller.

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 Capital Account Openness. Our methodology uses publicly available data for a large panel of countries since 1970. We validate our RKO measures in several ways.

Second, using our RKO wedges, we document that while all countries as a whole are significantly more open to financial trade 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, the uneven pace of capital account opening has led to a worsening of the global allocation of capital, more extreme cross-country inequality, and relatively higher wages and lower returns to capital in high-income countries with respect to poor countries, 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 capital account opening 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 redistributive 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 (12). 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. (2021). 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 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

C Event Study: Alternative Estimators

In this appendix, we repeat the event study analysis of subsection 5.2 using alternative diff-in-diff estimators. Figure 5 presents estimates based on the estimator by Callaway and Sant'Anna (2021), while Figure 6 presents estimates based on the estimator by Sun and Abraham (2021).

Figure 5: Event Study - EM Liberalizations and In-Wedges (Callaway and Sant'Anna (2021) estimator)

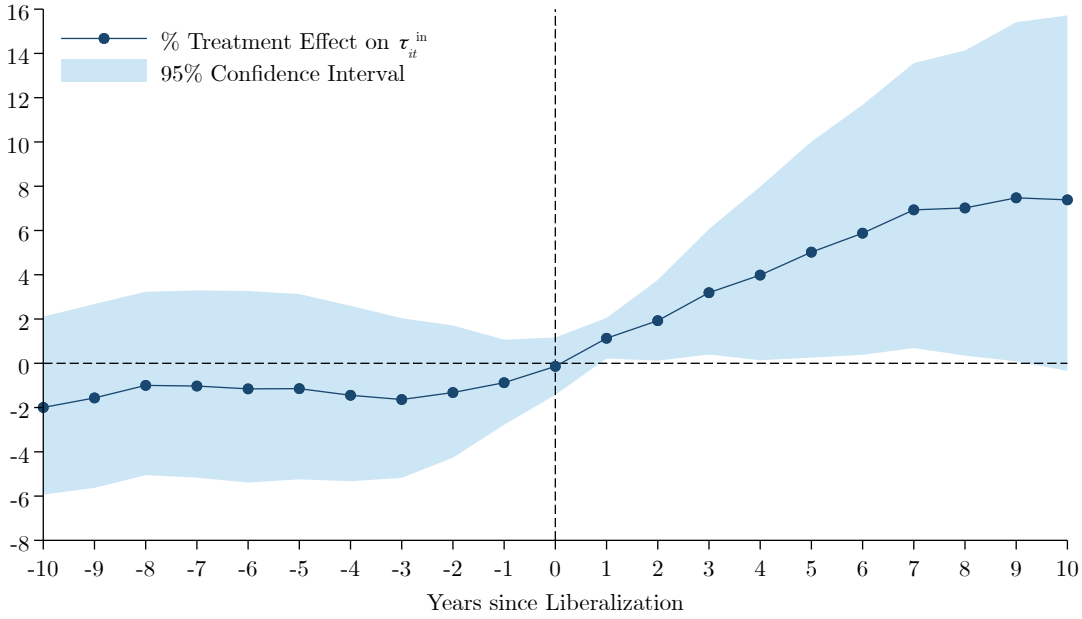
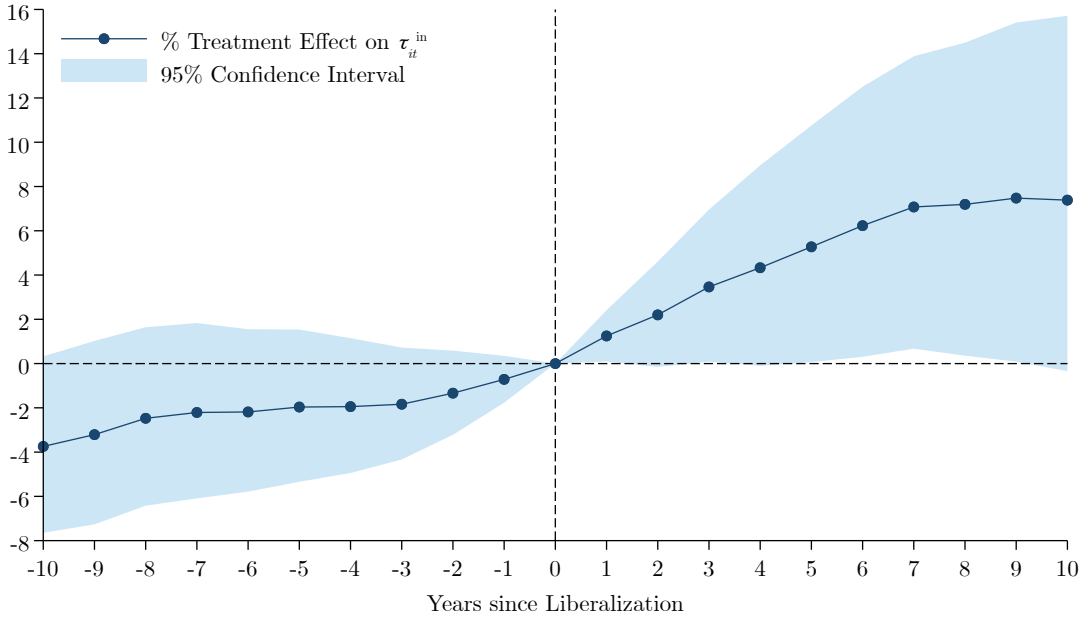


Figure 6: Event Study - EM Liberalizations and In-Wedges (Sun and Abraham (2021) estimator)



D Results with Short Panel

In this appendix we reproduce Figures 1-2 and Tables 2-3, using the short panel (95 countries, 1993-2019), instead of the long panel (58 countries, 1971-2019).

Figure 7: World Capital Account Openness

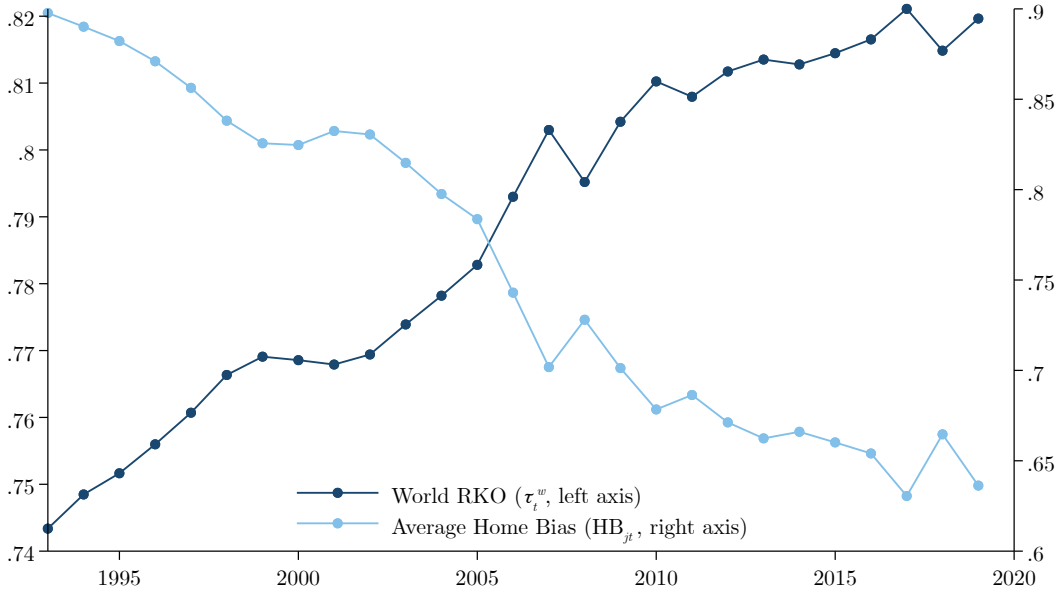


Figure 8: Revealed Capital Account Openness, High vs. Low Income Countries

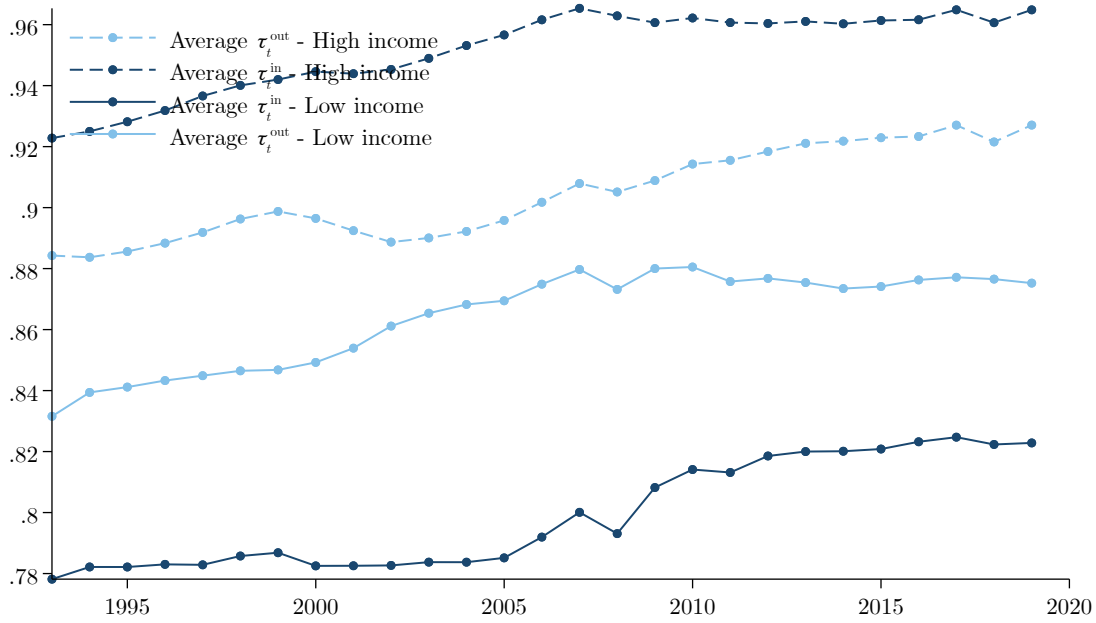


TABLE 5: COUNTERFACTUAL ANALYSIS (NO-GLOBALIZATION SCENARIO = 100)

Statistic	**Scenario**	1993	2019
World GDP $= \sum_{i=1}^{n} Y_{it}$	Unbalanced*	100	97.66
	Symmetric	100	100.05
	Convergent	100	119.01
Variance of log GDP/Capita $= \text{var}_{i\in\text{H}\cup\text{L}} [\log (Y_{it}/\text{pop}_{it})]$	Unbalanced*	100	108.31
	Symmetric	100	100.63
	Convergent	100	77.52
Capital/Employee - High Income C. $= \text{mean}_{i\in\text{H}} (K_{it}/L_{it})$	Unbalanced*	100	101.87
	Symmetric	100	100.13
	Convergent	100	55.28
Capital/Employee - Low Income C. $= \text{mean}_{i\in\text{L}} (K_{it}/L_{it})$	Unbalanced*	100	95.67
	Symmetric	100	102.23
	Convergent	100	166.16
Real Wage - High Income Countries $= \text{mean}_{i\in\text{H}} (P_{it}^{L})$	Unbalanced*	100	101.54
	Symmetric	100	98.85
	Convergent	100	79.15
Real Wage - Low Income Countries $= \text{mean}_{i\in\text{L}} (P_{it}^{L})$	Unbalanced*	100	96.63
	Symmetric	100	101.33
	Convergent	100	132.70
Return on Capital - High Income C. $= \text{mean}_{i\in\text{H}} (\text{MPK}_{it})$	Unbalanced*	100	98.73
	Symmetric	100	104.82
	Convergent	100	146.27
Return on Capital - Low Income C. $= \text{mean}_{i\in\text{L}} (\text{MPK}_{it})$	Unbalanced*	100	106.96
	Symmetric	100	101.79
	Convergent	100	83.03
Return on Portfolio - High Income C. $= \text{mean}_{j\in\text{H}} (\mathbf{w}'_{jt}\,\mathbf{MPK}_t)$	Unbalanced*	100	102.12
	Symmetric	100	100.59
	Convergent	100	139.75
Return on Portfolio - Low Income C. $= \text{mean}_{j\in\text{L}} (\mathbf{w}'_{jt}\,\mathbf{MPK}_t)$	Unbalanced*	100	98.78
	Symmetric	100	99.01
	Convergent	100	85.05

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 $(\bar{Y})$. 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		

E Results excluding Government Bonds

In this appendix we reproduce Figures 1-2 and Tables 2-3 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 Capital Account Openness

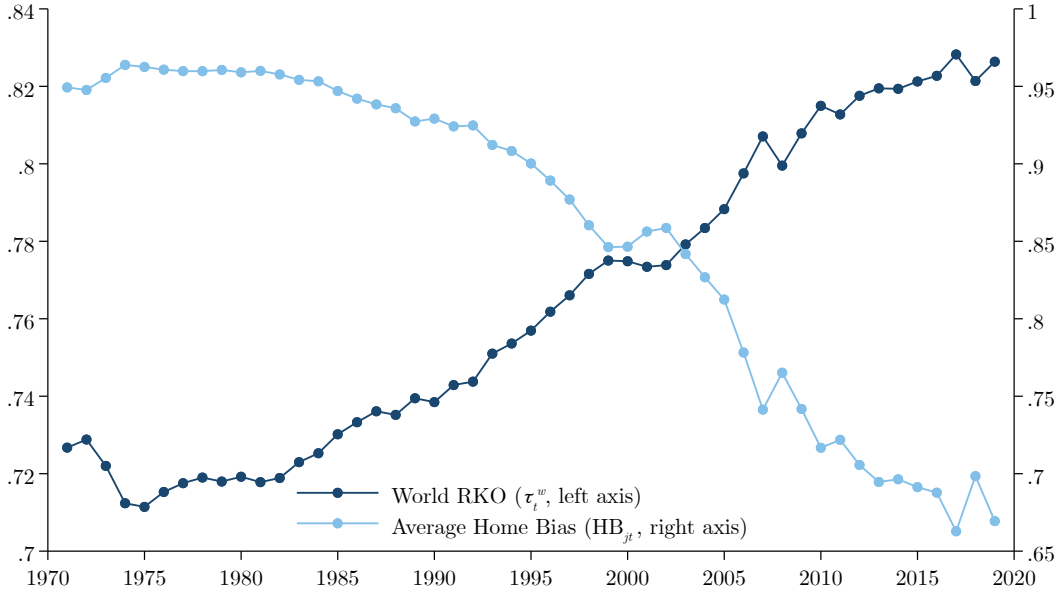


Figure 10: Revealed Capital Account Openness, High vs. Low Income Countries

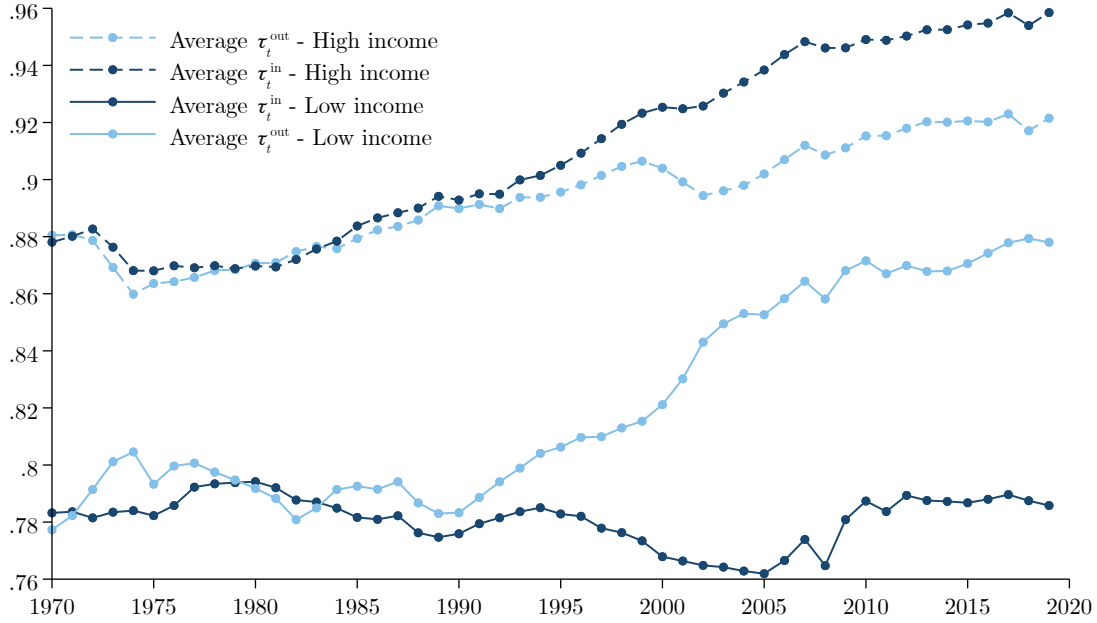


TABLE 7: COUNTERFACTUAL ANALYSIS (NO-GLOBALIZATION SCENARIO = 100)

Statistic	**Scenario**	1971	1995	2019
World GDP	Unbalanced*	100	100.53	95.69
$= \sum_{i=1}^{n} Y_{it}$	Symmetric	100	100.74	104.81
	Convergent	100	102.63	125.02
Variance of log GDP/Capita	Unbalanced*	100	99.70	103.76
$= \text{var}_{i\in\text{H}\cup\text{L}} [\log (Y_{it}/\text{pop}_{it})]$	Symmetric	100	100.20	85.53
	Convergent	100	94.42	75.88
Capital/Employee - High Income C.	Unbalanced*	100	100.46	103.70
$= \text{mean}_{i\in\text{H}} (K_{it}/L_{it})$	Symmetric	100	99.56	82.30
	Convergent	100	98.77	58.20
Capital/Employee - Low Income C.	Unbalanced*	100	102.73	88.96
$= \text{mean}_{i\in\text{L}} (K_{it}/L_{it})$	Symmetric	100	101.91	137.98
	Convergent	100	106.80	290.87
Real Wage - High Income Countries	Unbalanced*	100	100.95	102.72
$= \text{mean}_{i\in\text{H}} (P_{it}^{L})$	Symmetric	100	100.36	88.80
	Convergent	100	100.55	81.06
Real Wage - Low Income Countries	Unbalanced*	100	100.42	91.30
$= \text{mean}_{i\in\text{L}} (P_{it}^{L})$	Symmetric	100	101.25	114.72
	Convergent	100	107.03	173.56
Return on Capital - High Income C.	Unbalanced*	100	71.63	66.84
$= \text{mean}_{i\in\text{H}} (\text{MPK}_{it})$	Symmetric	100	99.18	113.24
	Convergent	100	80.03	98.50
Return on Capital - Low Income C.	Unbalanced*	100	102.50	111.23
$= \text{mean}_{i\in\text{L}} (\text{MPK}_{it})$	Symmetric	100	99.36	95.54
	Convergent	100	91.05	73.70
Return on Portfolio - High Income C.	Unbalanced*	100	99.03	93.78
$= \text{mean}_{j\in\text{H}} (\mathbf{w}'_{jt}\,\mathbf{MPK}_t)$	Symmetric	100	98.11	110.80
	Convergent	100	96.14	130.54
Return on Portfolio - Low Income C.	Unbalanced*	100	104.13	102.33
$= \text{mean}_{j\in\text{L}} (\mathbf{w}'_{jt}\,\mathbf{MPK}_t)$	Symmetric	100	98.39	93.62
	Convergent	100	91.55	74.72

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 $(\bar{Y})$. H and L denote, respectively, the sets of high and low-income countries (1995 PPPGDP per capita above/below $25,000).

F Results with only Equities and FDI

In this appendix we reproduce Figures 1-2 and Tables 2-3 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 Capital Account Openness

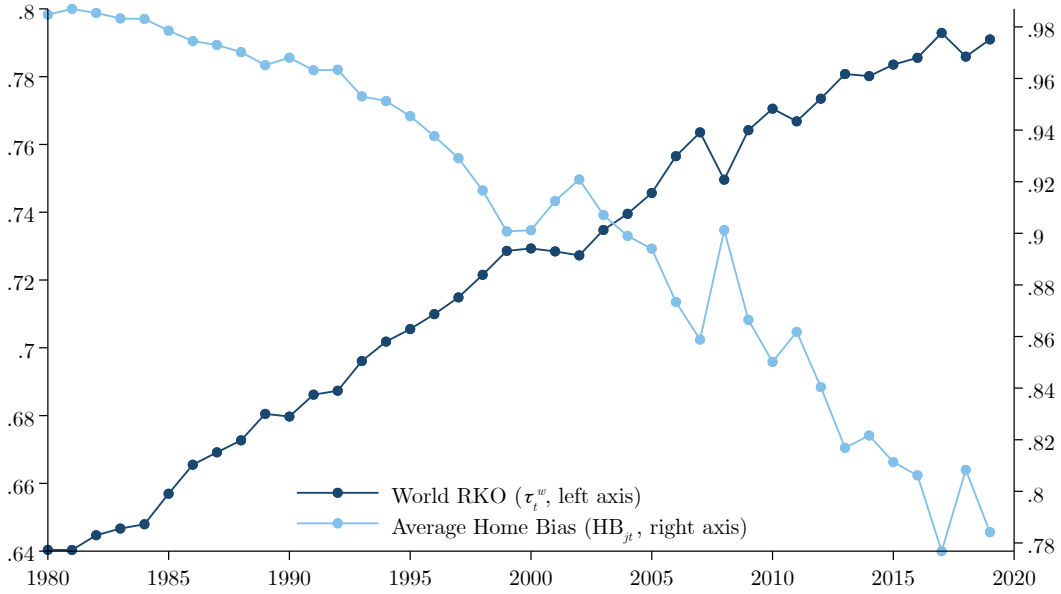


Figure 12: Revealed Capital Account Openness, High vs. Low Income Countries

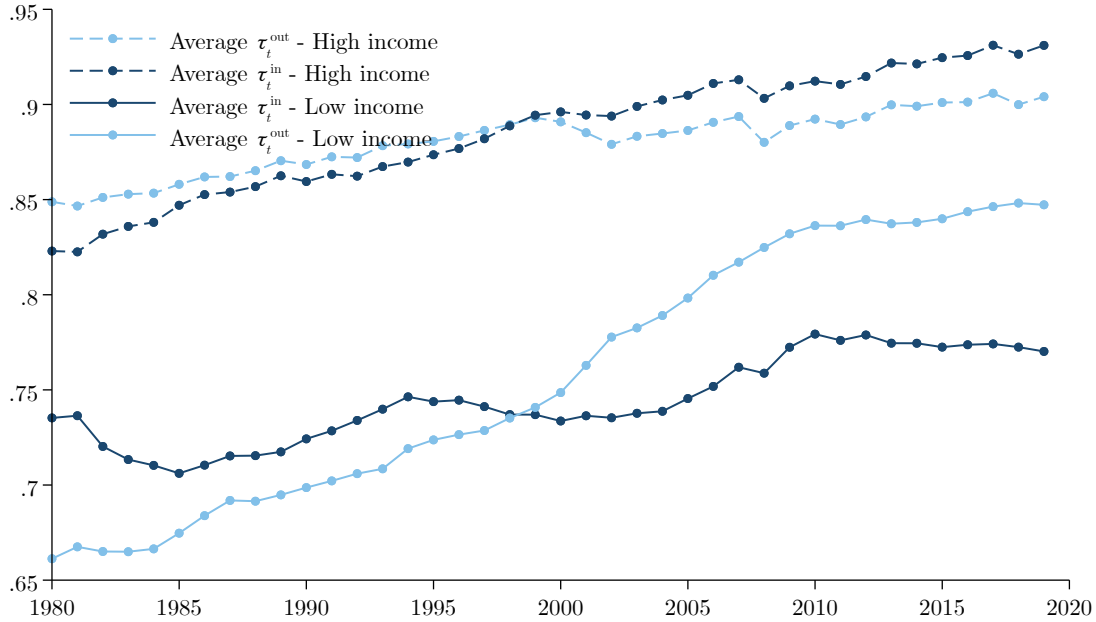


TABLE 8: COUNTERFACTUAL ANALYSIS (NO-GLOBALIZATION SCENARIO = 100)

Statistic	**Scenario**	1980	1999	2019
World GDP	Unbalanced*	100	98.65	96.29
$= \sum_{i=1}^{n} Y_{it}$	Symmetric	100	102.09	109.61
	Convergent	100	102.38	122.06
Variance of log GDP/Capita	Unbalanced*	100	101.47	102.52
$= \text{var}_{i\in\text{H}\cup\text{L}} [\log (Y_{it}/\text{pop}_{it})]$	Symmetric	100	92.80	71.86
	Convergent	100	94.80	84.06
Capital/Employee - High Income C.	Unbalanced*	100	99.68	100.54
$= \text{mean}_{i\in\text{H}} (K_{it}/L_{it})$	Symmetric	100	96.12	76.23
	Convergent	100	97.70	70.02
Capital/Employee - Low Income C.	Unbalanced*	100	97.08	91.61
$= \text{mean}_{i\in\text{L}} (K_{it}/L_{it})$	Symmetric	100	124.57	197.65
	Convergent	100	115.53	276.94
Real Wage - High Income Countries	Unbalanced*	100	99.62	100.37
$= \text{mean}_{i\in\text{H}} (P_{it}^{L})$	Symmetric	100	98.10	85.96
	Convergent	100	99.56	86.39
Real Wage - Low Income Countries	Unbalanced*	100	95.81	92.22
$= \text{mean}_{i\in\text{L}} (P_{it}^{L})$	Symmetric	100	112.91	136.65
	Convergent	100	109.91	168.97
Return on Capital - High Income C.	Unbalanced*	100	101.40	100.45
$= \text{mean}_{i\in\text{H}} (\text{MPK}_{it})$	Symmetric	100	103.63	126.89
	Convergent	100	100.41	129.15
Return on Capital - Low Income C.	Unbalanced*	100	107.03	107.41
$= \text{mean}_{i\in\text{L}} (\text{MPK}_{it})$	Symmetric	100	90.66	82.05
	Convergent	100	91.28	72.41
Return on Portfolio - High Income C.	Unbalanced*	100	97.52	96.51
$= \text{mean}_{j\in\text{H}} (\mathbf{w}'_{jt}\,\mathbf{MPK}_t)$	Symmetric	100	101.89	117.72
	Convergent	100	99.32	120.57
Return on Portfolio - Low Income C.	Unbalanced*	100	106.21	103.02
$= \text{mean}_{j\in\text{L}} (\mathbf{w}'_{jt}\,\mathbf{MPK}_t)$	Symmetric	100	90.65	81.99
	Convergent	100	91.26	72.31

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 $(\bar{Y})$. H and L denote, respectively, the sets of high and low-income countries (1995 PPPGDP per capita above/below $25,000).