Unbalanced Financial Globalization*

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Abstract

Using a novel dynamic spatial equilibrium model of international investment and production that embeds a demand system for international assets, we develop a wedge accounting framework to estimate country- and time-varying measures of Revealed Capital Account Openness (RKO). These wedges are identified for a large panel of countries using 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 opened up much faster than poorer ones, a phenomenon we call Unbalanced Financial Globalization. Counterfactual simulations show that this unbalanced financial globalization has led to poorer capital allocation (a 1.4% decrease in world GDP), a 10% 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 country heterogeneity in shaping the real impact of international capital markets integration.

JEL classification: F200, F300, F400, F600

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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 address these issues by introducing a novel heterogeneous-country dynamic general equilibrium model that incorporates a demand system for international assets. We then develop a wedge accounting framework to estimate time-varying measures of *Revealed Capital Account Openness* (RKO) which capture all impediments to asset trade at the country level. We finally use the estimated 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.

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). This asset demand system endogenously generates a network of bilateral investments across countries consistent with empirical evidence. 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 which makes the estimation very transparent.

Using the structure of the model, we develop a wedge accounting framework in the style of Chari, Kehoe, and McGrattan (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. 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.

Our wedge accounting framework offers a solution to two challenges. First, cross-border bilateral investments data are very scarce before the 2000s, which has made it difficult to measure asset trade frictions for many countries over a long time period. The appeal of our measurement framework is that it relies on 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 equations or Revealed Comparative Advantage in the trade literature (Balassa, 1965).

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 faced by investors to invest abroad has been steadily decreasing by a cumulative 18 percentage points from 1970 to 2019. Second, we find that financial globalization has been deeply unbalanced. The pace at which barriers to international asset trade have declined has been very heterogeneous 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 1.4% 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 9.8% 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 10% in 2019, while the rate of return on capital is higher by as much as 6.9%. 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 the rich country-level details 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 fact that governments bonds are included, (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.

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 (2019) 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, like Koijen and Yogo (2020), Pellegrino, Spolaore, and Wacziarg (2021) and Jiang, Richmond, and Zhang (2022). 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.

The remainder of the paper is organized as follows. Section 2 introduces the model of the world economy with cross-border investments and section 3 develops the wedge accounting methodology. Section 4 introduces the data used for the estimation of the model and the calibration strategy and 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 and 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 Koijen and Yogo (2019, henceforth KY), 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 $n \in \{1, 2, ..., N\}$ to denote the country that receives the investment, and the subscript $j \in \{1, 2, ..., N\}$ to denote the country where investors are located. For example, A_{njt} denotes the aggregate investment from j to n at time t.

In each country, there is a representative firm that produces a homogeneous tradable good (which is the numéraire of this economy and thus has price 1) using a three-input Cobb-Douglas production function:

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

where K_{nt} is the reproducible capital, L_{nt} is human capital and X_{nt} is natural resources.[1] 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. Production implies the depreciation of an exogenous fraction δ_t of the capital stock.

Investors own the capital stock and are the residual claimants on the profits of the representative firm. Taking the wage rate P_{nt}^{L} and the rental rate of natural resources P_{nt}^{X} as given, the representative firm in n maximizes profits (Π_n), which

[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).

are defined as follows:

$$\Pi_{nt} \stackrel{\text{def}}{=} \max_{L_{nt}, X_{nt}} Y_{nt} - P^L_{nt} L_{nt} - P^X_{nt} X_{nt}.$$

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

$$P^L_{nt} = \lambda_{nt} \frac{Y_{nt}}{L_{nt}}; \qquad P^X_{nt} = \xi_{nt} \frac{Y_{nt}}{X_{nt}}. \tag{2}$$

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

$$MPK_{nt} \stackrel{\text{def}}{=} \kappa_{nt} \frac{Y_{nt}}{K_{nt}} \equiv \frac{\Pi_{nt}}{K_{nt}}. \tag{3}$$

Finally, the aggregate resource constraint is given by

$$\sum_{n=1}^{n} Y_{nt} + (1 - \delta_t) K_{nt} + \mathcal{E}_{nt} = \sum_{n=1}^{n} C_{nt} + K_{nt+1} \tag{4}$$

where C_{nt} is the aggregate consumption of country n at time t, and $\mathcal{E}_{nt}$ is an exogenous endowment of output in country n at time t, a residual source of income that we introduce so that equation (4) 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 Yaari (1965) and Blanchard (1985).

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

$$V_{jbt} \stackrel{\text{def}}{=} (1 - \sigma_{jt}) \log C_{jbt} + \sigma_{jt} \, \mathbb{E}_t \left(V_{jbt+1} \right) \tag{5}$$

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

$$\sigma_{jt} \stackrel{\text{def}}{=} \frac{\theta_{jt}\left(1-\mathfrak{D}_{jt}\right)}{1+\theta_{jt}(1-\mathfrak{D}_{jt})}$$

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.

In the first year of their life $(t = b)$, the newly born representative agent is endowed with L_{jbt} units of labor and X_{jbt} units of natural resources. They supply both inelastically to firms, from which they collect labor earnings $P^L_{jbt}L_{jbt}$, and natural resources rents $P^X_{jbt}X_{jbt}$. In this period of their life, they also receive government transfers $\left(T_{jbt}\right)$ and an exogenous endowment $\left(\mathcal{E}_{jbt}\right)$. In all following periods of their life $(t > b)$, agents live off capital income, namely $L_{jbt} = X_{jbt} = 0$ for $t > b$. 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}), how much to save in the form of capital (A^-_{jbt}) and how to allocate their wealth across different assets. We denote A^-_{jbt} the wealth saved at time t by the representative agent born at time b in country j and A^+_{jtb} the terminal value of the wealth saved at time $(t-1)$, which includes capital income as shown in equation (6).[3]

Each period, agents also have to decide how to allocate their savings across n different assets, which correspond to the claims on capital in each destination country. Denoting $\mathbf{w}_{jtb}$ the vector of portfolio shares, the representative agent born at time b in country j thus seeks to maximize its expected utility in equation (5)

[2]This assumption allows us to seamlessly integrate KY's asset demand framework 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.

[3]For clarity, we adopt the same notation as KY, except for the introduction of the $(^+,^-)$ superscripts. We use these superscripts to capture the fact that, in our setting, the agent's portfolios are *not* self-financing - that is, agents might add funds to the invested wealth or withdraw them between periods. By definition, the investor j's portfolio would be self-financing if $A^+_{jbt} = A^-_{jbt}$. We use the $(^+,^-)$ superscripts to highlight that A^-_{jbt} is associated with a negative cashflow (cash is converted into portfolio holdings), while A^+_{jbt} is associated with a positive cashflow (the liquidation of the portfolio holdings at the end of the investment period).

subject to the following constraints:

$$[\text{Wealth Law of Motion}]: \quad A^{+}_{jbt+1} = \left(\mathbf{w}_{jbt+1} \cdot \mathbf{R}_{jt+1}\right) A^{-}_{jbt} \tag{6}$$

$$[\text{Budget Constraint}]: \quad C_{jbt} + A^{-}_{jbt} = \begin{cases} P^{L}_{jt} L_{jb} + P^{X}_{jt} X_{jb} + T_{jb} + \mathcal{E}_{jb} & \text{if} \quad t = b \\ A^{+}_{jbt} & \text{if} \quad t > b \end{cases} \tag{7}$$

$$[\text{Portfolio Constraint}]: \quad \mathbf{w}_{jbt+1} \in \Delta^N \qquad (\Delta^N \text{ is the } N\text{−simplex}) \tag{8}$$

where $\mathbf{w}_{jbt+1}$ is the vector of portfolio weights and $\mathbf{R}_{jt+1}$ is the vector of (stochastic) net asset returns at time $t+1$. Net asset returns are net of capital depreciation and of the implicit taxes to international investment which we introduce in the following section. The first constraint defines the return on the agent's entire portfolio and the second is the time t budget constraint. The third constraint says that portfolio weights should sum to unity and cannot be negative (short-sale constraints), as in KY.

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

$$C_{jt} \stackrel{\text{def}}{=} \sum_{b \leq t} C_{jbt}; \qquad A^{-}_{jt} \stackrel{\text{def}}{=} \sum_{b \leq t} A^{-}_{jbt}; \qquad A^{+}_{jt} \stackrel{\text{def}}{=} \sum_{b \leq t} A^{+}_{jbt}.$$

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 the class of models with 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 (see Appendix B for a formal proof). This fraction is given by σ_{jt}. Aggregate saving and consumption are therefore equal to:

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

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

In addition, in Appendix B we show that the maximized utility is log-linear in wealth A_{jbt}^{+}:

$$V_{jbt} \;=\; \log A_{jbt}^{+} + \text{constant}. \tag{10}$$

This expression will prove useful in solve the optimal portfolio problem, to which we now turn.

2.4 Asset Demand and Portfolio Shares

We now consider the agents' portfolio decision which builds on Koijen and Yogo (2019). When agents in j invest in country n, they receive, for every unit of capital invested, a proportional share of the profits and un-depreciated capital. However, agents face investment frictions. Specifically, we assume that the capital income of country n that is owed to investors from country j is subject to a stochastic repatriation wedge ζ_{nbt}, that is unknown at time $t-1$ and a deterministic wedge on capital income τ_{njt}, which is known at time $t-1$. At time t, the financial return $\left(R_{njbt}\right)$ from investing a unit of capital in country n is given

$$R_{njbt} \;=\; \zeta_{nbt} \left(1 + \tau_{njt} MPK_{nt} - \delta_t\right)$$

where MPK_{nt} is the physical marginal rate of return on capital. The stochastic wedge ζ_{nbt} is distributed i.i.d. across investors, with mean one and covariance-variance matrix across assets, Σ_t^{ζ}, which is allowed to vary with time.

The stochastic wedge makes capital income risky and is a tractable and reduced-form way to model financial markets risk, that still allows us to quantify our model, despite data limitations. Both the stochastic, ζ_{nbt}, and the deterministic wedges, τ_{njt}, are rebated back to the newly born households as lump sum transfers (see Section 2.6). They therefore distort portfolios, but they do not impact the aggregate resource constraint.

As shown above in equation (10), the portfolio that maximizes the agents' expected value coincides with the portfolio that maximizes the agents' expected (log) value of wealth. We can write the asset allocation problem as:

$$\max_{\mathbf{w}_{jbt+1} \in \Delta^n} \mathbb{E}_t \left(\log A^{+}_{jbt+1}\right).$$

Following KY, we posit that, at time t, the information set of investors in country j about country n used to forecast R_{njbt+1} is given by the following variables: the marginal return on capital net of the deterministic wedge, $\tau_{njt+1} MPK_{nt+1}$, the capital stock K_{nt+1}, and other observed characteristics of country n at date t, which we denote x_{nt}. Like KY, we separate size (K_{nt+1}) from the other characteristics. This "gravity" term is consistent with several empirical studies that have highlighted the importance of country size in explaining international portfolios (Portes and Rey, 2005).

Importantly, this asset allocation problem of agent j is exactly analogous to the one analyzed by KY. They show that, under certain restrictions, including that ζ_{nbt} has a one-factor structure and that its expectations and factor loadings depend on the above-mentioned characteristics alone, the optimal portfolio of investors located in j can be approximated by a hedonic-logit specification. We provide a formal proof in Appendix B.2 that this holds in our model as well and that the portfolio shares are given by:

$$w_{njt} \;=\; \frac{\exp\left(\boldsymbol{\beta}_x' \, \mathbf{x}_{nt-1}\right) \cdot \left(\tau_{njt} \, MPK_{nt}\right)^{\beta_r} \cdot K_{nt}^{\beta_0}}{\sum_{\iota=1}^{N} \exp\left(\boldsymbol{\beta}_x' \, \mathbf{x}_{\iota t-1}\right) \cdot \left(\tau_{\iota jt} \, MPK_{\iota t}\right)^{\beta_r} \cdot K_{\iota t}^{\beta_0}} \tag{11}$$

Our choice of which characteristics to include is informed both by data availability as well as by our own judgement of what information the investors can reasonably use to forecast next period returns.

This logit formulation is a feature of several recent models of demand for international assets (Koijen and Yogo, 2020; Pellegrino, Spolaore, and Wacziarg, 2021; Jiang, Richmond, and Zhang, 2022). There are two factors that make this asset demand framework especially attractive in our setting. First, it can be quantified using the limited data available since the 1970. Second, in the next subsection, we show that under the parametrization $\beta_0 = 1$—which we refer to as the *Gravity* condition—, the wedge τ_{njt} as a summary statistic of all distortions to the international allocation of capital.

2.5 Market Clearing

All markets clear. There are N markets for labor and N markets for natural resources. There is one global market for final goods and the market clearing condition is given by equation (4). The capital markets are also global but partially segmented due to frictions to the free movement of capital. Let $A^{-}_{njt} = w_{njt}A^{-}_{jt}$ be the asset position of country j in country i at time t. Market clearing implies

$$K_{it} \;=\; \sum_{j=1}^{n} A^{-}_{njt}; \qquad A^{-}_{jt} \;=\; \sum_{i=1}^{n} A^{-}_{njt}$$

which can be rewritten in matrix form as follows:

$$\mathbf{K}_t \;=\; \mathbf{W}_t\,\mathbf{A}^{-}_t \quad : \qquad \begin{bmatrix} K_{1t} \\ K_{2t} \\ \vdots \\ K_{nt} \end{bmatrix} = \begin{bmatrix} w_{11t} & w_{12t} & \cdots & w_{n1t} \\ w_{21t} & w_{22t} & \cdots & w_{n2t} \\ \vdots & \vdots & \ddots & \vdots \\ w_{n1t} & w_{n2t} & \cdots & w_{nnt} \end{bmatrix} \begin{bmatrix} A^{-}_{1t} \\ A^{-}_{2t} \\ \vdots \\ A^{-}_{nt} \end{bmatrix}. \tag{12}$$

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 (12) holds.

2.6 Government Budget Constraint

The government collects revenues from three sources: accidental bequests of cohorts that died between $t-1$ and t (equal to $\mathfrak{D}_{jt-1}A^{+}_{jbt}$), repatriation shocks ($\zeta_{nt}$) and the wedges ($\tau_{njt}$). The combination of the latter two is akin to a tax on gross portfolio returns, $\bar{R}_{nt+1} = 1 + MPK_{nt} - \delta_t$. All of these revenues are transferred in a lump-sum way to the newly born cohort and the government budget constraint at time t is given by

$$T_{jt} \;=\; \mathfrak{D}_{jt-1}A^{+}_{jbt} + \mathbf{w}'_{jbt}\left(\bar{\mathbf{R}}_t - \mathbf{R}_{jt}\right)A^{-}_{jt-1}.$$

Hence, by construction, at the aggregate level we have:

$$A^{+}_{jt+1} = \sum_{b<t} \left(\mathbf{w}_{jbt+1} \cdot \bar{\mathbf{R}}_{t}\right) A^{-}_{jbt}.$$

2.7 Revealed Capital Account Openness

We now introduce the concept of *Revealed Capital Account Openness* (RKO), τ_{njt}, which is our original approach to measuring the openness of a country's capital account. The RKO wedges for destination country n and origin country j can be interpreted as the summary statistics of all impediments to investments going out of j and coming into n. Consistent with this idea, the term $(1 - \tau_{njt})$ is the implicit tax rate that an investor located in j has to pay on the return on an investment located in country n.

Because 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 $\beta_0 = 1$, (Gravity) full capital account openness ($\tau_{njt} = 1 \;\forall\, n$) yields an allocation of capital across countries that maximizes world GDP at time t.*

Proof. Substituting inside equation (11), we obtain $w_{njt} = MPK^{\beta_r}_{nt} K_{nt} / (\sum_{\imath=1}^{n} MPK^{\beta_r}_{\imath t}\, K^{\beta_0}_{\imath t})$. Because w_{njt} does not depend on j, we have $w_{njt} \propto K_{it}$. This in turn implies that the equation above simplifies to $MPK^{\beta_r}_{nt} = \sum_{\imath=1}^{n} MPK^{\beta_r}_{\imath t} w^{\beta_0}_{\imath jt}$, which doesn't depend on i. Hence, the rates of return on capital are equalized across countries, which is a necessary and sufficient condition for the maximization of world output. $\square$

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, $\tau_{njt} = 1$, 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 Wedge Accounting and Identification

To identify the RKO wedges and quantify changes to barriers to international investment over time, we develop a wedge accounting methodology in the style of Chari, Kehoe, and McGrattan (2007). This section also shows how to estimate the other exogenous variables of the model, including the saving rate (σ_{nt}) the output-capital elasticity (κ_{nt}) and the depreciation rate (δ_t).

3.1 Identification of the RKO Wedges

We now show how to identify the wedges (τ_{njt}) from moments of the data. If we observed bilateral investment positions, we could directly back out the wedges by using equation 11. But bilateral data exists for a large subset of countries only for the most recent period. 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.

Inward and Outward Wedges. First, we impose some structure on the RKO wedges. We assume that they can be decomposed as the product of an in-wedge τ_{nt}^{in} – applied by the destination country – which captures the barriers to the incoming capital investment into country n, 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:

$$\tau_{njt} \;=\; \begin{cases} 1 & \text{if} \quad n = j \\ \tau_{nt}^{\text{in}} \cdot \tau_{jt}^{\text{out}} & \text{if} \quad n \neq j \end{cases}$$

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_{nt}), the *inward* (τ_{nt}^{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.

Identifying Inward Wedges, τ_{jt}^{in}. 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:

$$\widetilde{K}_{nt} \stackrel{\text{def}}{=} \sum_{j \neq n} A_{njt} \;, \qquad \tilde{A}_{jt}^{-} \stackrel{\text{def}}{=} \sum_{n \neq j} A_{njt}^{-} \qquad \text{and} \qquad w_{jjt} \stackrel{\text{def}}{=} \frac{A_{jjt}^{-}}{A_{jt}^{-}}$$

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

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

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

$$\tilde{w}_{njt} \quad \stackrel{\text{def}}{=} \quad \frac{A_{njt}^{-}}{\tilde{A}_{jt}^{-}} \quad = \quad \frac{\exp\left(\boldsymbol{\beta}_x' \, \mathbf{x}_{nt-1}\right) \cdot \left(\tau_{nt}^{\text{in}} \, MPK_{nt}\right)^{\beta_r} \cdot K_{nt}^{\beta_0}}{\sum_{\iota \neq j} \exp\left(\boldsymbol{\beta}_x' \, \mathbf{x}_{\iota t-1}\right) \cdot \left(\tau_{\iota t}^{\text{in}} \, MPK_{it}\right)^{\beta_r} \cdot K_{\iota t}^{\beta_0}} \qquad \text{for } i \neq j$$

Notice that the term τ_{jt}^{out} has dropped out. After stacking the external portfolio shares $\tilde{w}_{njt}$ in a square matrix $\widetilde{\mathbf{W}}_t$, we can write a variant of the capital markets clearing conditions (12), in terms of observables and the vector of in-wedges $\boldsymbol{\tau}_t^{\text{in}}$:

$$\widetilde{\mathbf{K}}_t \;=\; \widetilde{\mathbf{W}}_t(\boldsymbol{\tau}_t^{\text{in}}, \mathbf{MPK}_t, \widetilde{\mathbf{K}}_t, \mathbf{X}_t) \cdot \tilde{\mathbf{A}}_t^{-} \tag{13}$$

We thus have a system of n identifying equations that can be used to identify the n-dimensional vector $\boldsymbol{\tau}_t^{\text{in}}$. 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 wedges $\tau_{nt}^{\text{in}} \cdot \tau_{jt}^{\text{out}}$ are exactly identified. If we multiply the vector of $\boldsymbol{\tau}_{nt}^{\text{in}}$ by a constant, it is offset by a division of the vector $\boldsymbol{\tau}_{jt}^{\text{out}}$ by the same factor. This rescaling doesn't affect our results. After discussing the identification of $\boldsymbol{\tau}_t^{\text{out}}$, we propose an intuitive normalization.

The reason why the capital markets clearing conditions identify the barriers impeding incoming flows of capital, $\boldsymbol{\tau}_t^{\text{in}}$, is intuitive: 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.

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

$$w_{jjt} = \frac{\exp\left(\boldsymbol{\beta}_x' \mathbf{x}_{jt}\right) \cdot MPK_{jt}^{\beta_r} K_{jt}^{\beta_0}}{\exp\left(\boldsymbol{\beta}_x' \mathbf{x}_{jt}\right) \cdot MPK_{jt}^{\beta_r} K_{jt}^{\beta_0} + \sum_{\iota \neq j} \exp\left(\boldsymbol{\beta}_x' \mathbf{x}_{\iota t}\right) \cdot (\tau_{\iota t}^{\text{in}}\, \tau_{jt}^{\text{out}}\, MPK_{\iota t})^{\beta_r} K_{\iota t}^{\beta_0}} \tag{14}$$

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

$$\tau_{jt}^{\text{out}} \;=\; \left(\frac{1 - w_{jjt}}{w_{jjt}} \cdot \frac{\exp\left(\boldsymbol{\beta}_x' \mathbf{x}_{jt}\right) \cdot MPK_{jt}^{\beta_r} K_{jt}^{\beta_0}}{\sum_{\iota \neq j} \exp\left(\boldsymbol{\beta}_x' \mathbf{x}_{\iota t}\right) \cdot \left(\tau_{\iota t}^{\text{in}}\, MPK_{\iota t}\right)^{\beta_r} K_{\iota t}^{\beta_0}} \right)^{\frac{1}{\beta_r}}. \tag{15}$$

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.

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

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

where $\bar{Y}_i$ is the GDP of country i taken in a base year.[4] We can similarly define the following indices of inward and outward openness:

$$\bar{\tau}_t^{\text{in}} \quad \stackrel{\text{def}}{=} \quad \sum_{n=1}^{N} \frac{\bar{Y}_n \cdot \tau_{nt}^{\text{in}}}{\sum_{n'=1}^{N} \bar{Y}_{i'}}; \qquad \bar{\tau}_t^{\text{out}} \stackrel{\text{def}}{=} \sum_{j=1}^{N} \frac{\bar{Y}_j \cdot \tau_{jt}^{\text{out}}}{\sum_{j'=1}^{n} \bar{Y}_{j'}}$$

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 (13). 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 $\boldsymbol{\tau}_{nt}^{\text{in}}$ and $\boldsymbol{\tau}_{jt}^{\text{out}}$ so that:

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

3.2 Recovering the 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:

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

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

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

To recover the output elasticities, λ_{nt}, ξ_{nt} and κ_{nt}, we use the cost shares in output, consistent with the optimality condition of the firm given by equation 2, and the constant return to scale assumption $\lambda_{nt} + \xi_{nt} + \kappa_{nt} = 1$.

Regarding natural resources X_{nt}, we cannot identify them separately from TFP, Ω_{nt}, 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 $\Omega_{nt} X_{nt}^{\xi_{nt}}$. This in turn can be easily recovered from the production function given by equation 1

$$\Omega_{nt} X_{nt}^{\xi_{nt}} = \frac{Y_{nt}}{K_{nt}^{\kappa_{nt}} L_{nt}^{\lambda_{nt}}}.$$

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 (9):

$$\sigma_{jt} = \frac{A_{jt}^{-}}{A_{jt}^{+} + \mathcal{T}_{jT} + P_{jt}^{L} L_{jt} + P_{jt}^{X} X_{jt} + \mathcal{E}_{jt}}.$$

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}.

Table 1: Data, Calibration and Identification Summary

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

Notation	Free Parameter	Calibrated Value
β_r	Elasticity of Portfolio Shares with respect to MPK	= 1 (Pellegrino et al., 2021)
β_0	Elasticity of Portfolio Shares with respect to size (capital stock)	= 1 (Portes and Rey, 2005)

Notation	Identified Variable	Identification
κ_{nt}	Ouput-Capital Elasticity	$\kappa_{nt} \;=\; \max(0, 1-\lambda_{nt}-\xi_{nt})$
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^{it}_{nt}	RKO In-Wedge	(normalized) solution to equation system (13)
τ^{out}_{jt}	RKO Out-Wedge	$\tau^{\text{out}}_{jt} \;=\; \left(\frac{1-w_{jjt}}{w_{jjt}} \cdot \frac{\exp\left(\boldsymbol{\beta}'_x \mathbf{x}_{jt}\right) \cdot MPK^{\beta_r}_{jt} K^{\beta_0}_{jt}}{\sum_{\iota \neq j} \exp\left(\boldsymbol{\beta}'_x \mathbf{x}_{\iota t}\right) \cdot \left(\tau^{\text{in}}_{\iota t}\, MPK_{\iota t}\right)^{\beta_r} K^{\beta_0}_{\iota t}}\right)^{\frac{1}{\beta_r}}$
$\tilde{w}_{njt}$	External Portfolio Shares	$\tilde{w}_{njt} \;=\; \frac{\exp\left(\boldsymbol{\beta}'_x \mathbf{x}_{nt}\right) \cdot \left(\tau^{\text{in}}_{nt}\, MPK_{nt}\right)^{\beta_r} \cdot K^{\beta_0}_{nt}}{\sum_{\iota \neq j} \exp\left(\boldsymbol{\beta}'_x \mathbf{x}_{\iota t}\right) \cdot \left(\tau^{\text{in}}_{\iota t}\, MPK_{\iota t}\right)^{\beta_r} \cdot K^{\beta_0}_{\iota t}}$
σ_{nt}	Saving Rate	$\sigma_{jt} \;=\; A^-_{jt} / \left(A^+_{jt} + \mathcal{T}_{jT} + P^L_{jt} L_{jt} + P^X_{jt} X_{jt} + \mathcal{E}_{jt}\right)$

4 Data and Calibration

4.1 Data Sources

The Penn World Tables (version 10) are our data source for the number of employees[5] (L_{nt}), the real capital stock measured in constant prices (K_{nt}), the labor compensation share $\left(\lambda_{nt} \equiv P^L_{nt} L_{nt} / Y_{nt}\right)$, real output measured in PPP at constant prices (Y_{nt}), consumption (C_{nt}) 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 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.[6]

The natural resources rent share $\left(\xi_{nt} \equiv P^X_{nt} X_{nt} / Y_{nt}\right)$ 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.

4.2 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 A. 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

[5]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.

[6]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.

countries, which covers 94 countries, accounts for about 90% of the world GDP, and starts in 1993.

4.3 Calibration of the portfolio elasticities β_0, β_r.

We need to calibrate two free parameters, the elasticities of portfolio shares with respect to the destination country's size, β_0, and with respect to the rate of return on capital, β_r. We start by calibrating the elasticity with respect to size to 1 for two reasons. Using a dataset of bilateral cross-border flows between 14 countries, Portes and Rey (2005) find that the elasticity of investment with respect to country size is very close to unity and never statistically different from 1 in all of their specifications. In addition, another appealing feature of calibrating this parameter to 1 is that the RKO wedges correspond to deviations from an efficient allocation of capital as shown in proposition 1.

We then calibrate the elasticity of portfolio shares with respect to the rate of return on capital - β_1. Consistent with PSW, we set it equal to 1 as well for the following reasons. Koijen and Yogo (2020) estimate a demand system for international assets and find demand-return semi-elasticities of 42 and 10.5 for short-term and long-term securities and a demand-price elasticity of 1.9 for equity. To convert the former into the elasticity to returns, we multiply 42 and 10.5 by the average interest rates, 3.6% for long-term and 1.8% for short-term securities, respectively. Averaging across both asset classes gives an elasticity of 0.85. To convert the elasticity of equity demand to price, we use the Gordon dividend growth model to obtain the elasticity of demand to return and multiply 1.9 by the rate of returns of equity minus their growth rate divided by one plus the rate of returns. We use the average MSCI world returns of 9.3% and a growth rate of world output of 2.9%, and obtain an elasticity of 1.3. It is thus natural to set β_1 equal to 1.

5 Validation

After calibrating the model and applying our wedge accounting framework, we now validate our estimated RKO wedges (τ_{nj}) 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 – all 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, which is constructed in a similar way as the country-level composite tax rate on capital in Pellegrino et al. (2021). It is obtained by combining corporate tax rates from KPMG (and supplemented by the Tax Foundation database) with withholding tax rates on dividend and interest income by the IBFD. We weight the taxes rates on equity (corporate income and dividends) and debt (interest) using the equity and debt share of the country's foreign liabilities from Lane and Milesi-Ferretti (2018).[8]

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

[8] The difference between our measure and that of PSW (and the reason why it's called tax rate on *external* capital) is that PSW use weights 4/5 and 1/5 based on domestic US data.

Table 2: Correlation of the RKO Wedges with External Measures

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

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 for taxation ($1\% < p < 5\%$) and outward capital controls ($5\% < p < 10\%$).[9]

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 Correlation with Wedges from Bilateral Positions

When data on bilateral investment positions is available, one can estimate RKO wedges τ_{njt}^{b} (the subscript b stands for bilateral) with an alternative method. Our second validation exercise compares the wedges obtained through this alternative method to our wedges derived from aggregate external positions and national accounts data.

From equation (11), one can express τ_{njt}^{b} as a function of the position of country

[9] 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.

j in country n A_{njt}, the aggregate asset of the origin country A^{-}_{jt}, the capital stock and the return on capital of the destination country K_{nt}, MPK_{nt} as well as a term that is origin- and year-specific α_{jt}:

$$\ln \tau^b_{njt} = \ln(A_{njt}) - \ln(A^{-}_{jt}) - \beta_0 \ln K_{nt} - \beta_r \ln MPK_{nt} + \alpha_{jt} \tag{16}$$

where $\alpha_{jt} = \ln \left(\sum_{\iota=1}^{N} \left(\tau^b_{\iota jt}\, MPK_{\iota t} \right)^{\beta_r} \cdot K^{\beta_0}_{\iota t} \right)$. We then eliminate α_{jt} by taking the difference with a reference country $n = 1$:

$$\ln \left(\tilde{\tau}^b_{njt} \right) = \ln \left(\frac{A_{njt}}{A_{1jt}} \right) - \beta_0 \ln \left(\frac{K_{nt}}{K_{1t}} \right) - \beta_r \ln \left(\frac{MPK_{nt}}{MPK_{1t}} \right) \tag{17}$$

with $\tilde{\tau}^b_{njt} = \frac{\tau^b_{njt}}{\tau^b_{1jt}}$. This identifies the bilateral wedges τ^b_{njt} up to an origin-specific multiplicative constant, which we denote τ^{con}_{jt}. If we observed domestic investment A_{jjt}, we could use our normalization $\tau_{jj} = 1$ to identify this constant. Given that the dataset of bilateral flows we rely on only doesn't have domestic positions, we use instead the own share w_{jjt} given by equation (14) and which we have constructed above. We then apply a similar strategy we used to identify τ^{out}_{jt}, namely

$$\tau^{\text{con}}_{jt} = \left(\frac{1 - w_{jjt}}{w_{jjt}} \cdot \frac{MPK^{\beta_r}_{jt} K^{\beta_0}_{jt}}{\sum_{n \neq j} \left(\tilde{\tau}^b_{njt}\, MPK_{nt} \right)^{\beta_r} K^{\beta_0}_{nt}} \right)^{\frac{1}{\beta_r}}. \tag{18}$$

Data on bilateral positions comes from the restated matrices provided by the *Global Allocation of Capital Project* which is based on the work in Coppola, Maggiori, Neiman, and Schreger (2021). It contains information on many countries from 2007 to 2017 and on Euro Area countries from 2014 to 2020. The data on MPK_{nt} and K_{nt} is the same we used in sections 3 and 4 and comes from the Penn World Tables. The sample includes countries that are in the *Global Allocation of Capital Project* (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 1 shows a binned scatter plot of both sets of RKO wedges in 2015. The graph reveals a clear linear relationship between both measures of RKO wedges,

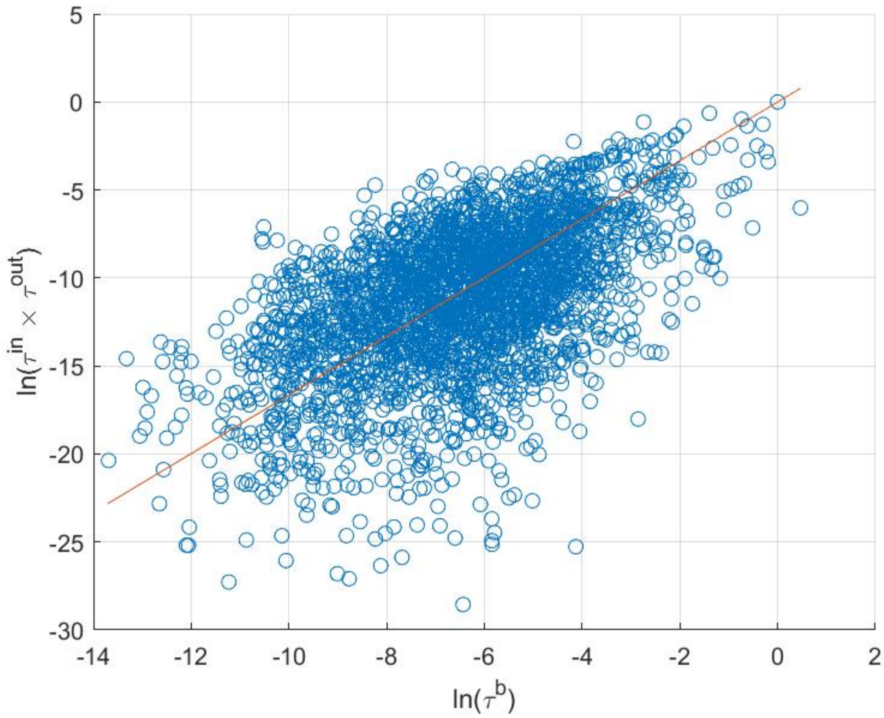


Figure 1: RKO Wedges Derived from Bilateral and Aggregate Positions

which further supports our interpretation of the wedges as meaningful measures of barriers to asset trade across borders.[10] In section 8, we also provide evidence that the results from model simulations are quantitatively similar with both sets of wedges.

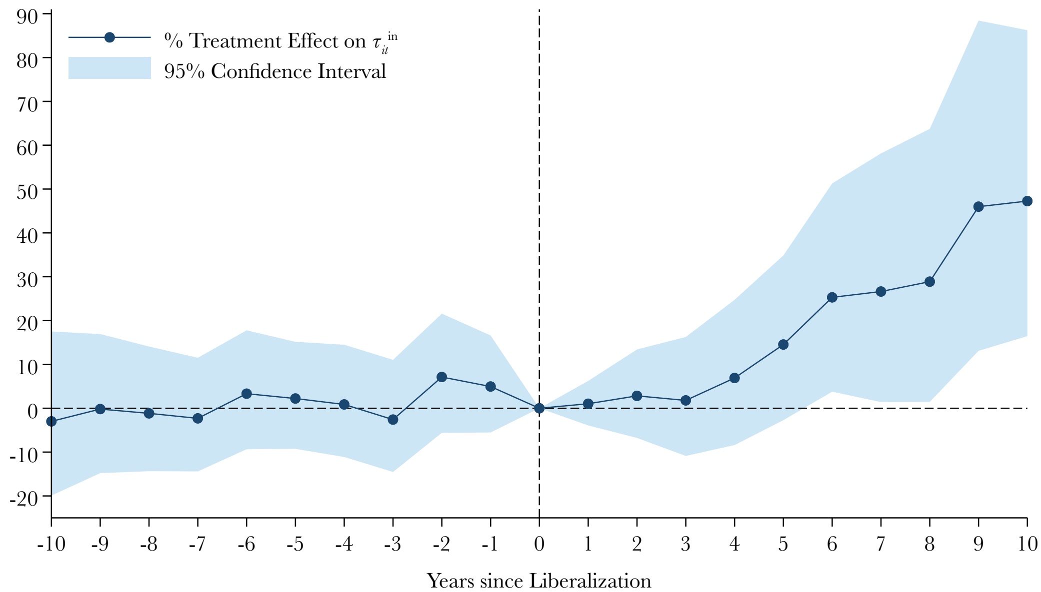
5.3 Event Study: Financial Liberalizations in Emerging Markets

The third validation exercise looks at the path of our in-wedges $\left(\tau_{nt}^{\text{in}}\right)$ 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 Callaway and Sant'Anna (2021). This estimator identifies the average

[10] In a (unreported) regression we find that the R^2 of a linear regression with no constant is around 29%.

Figure 2: Event Study - Emerging Market Liberalizations and In-Wedges



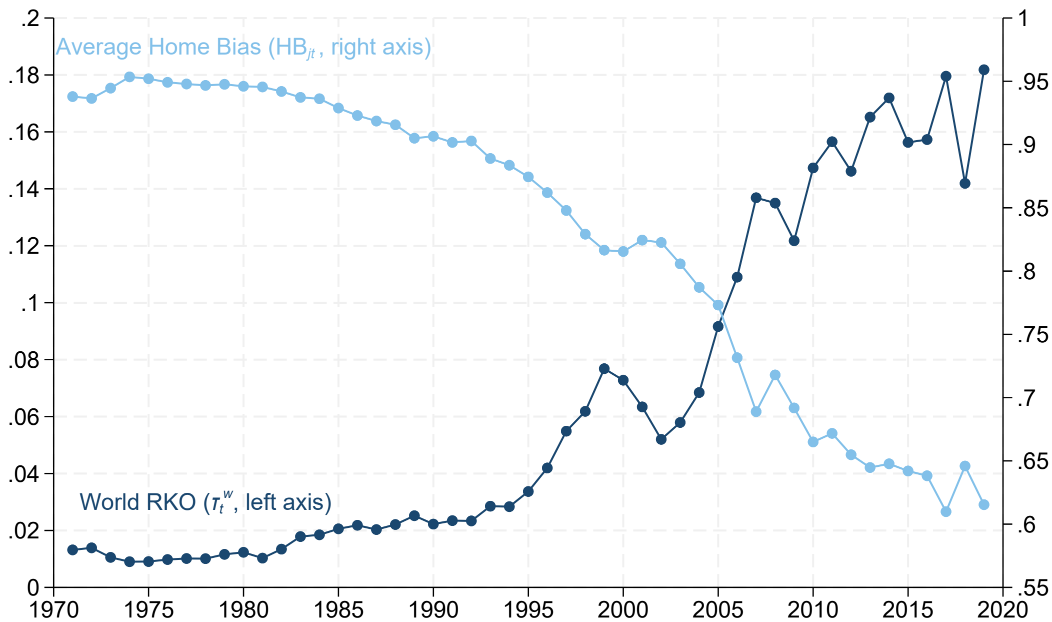
treatment effect of liberalizations using the differential timing of the liberalization. The key identifying assumption is that of parallel trends: that is, in the absence of liberalization, the evolution of the in-wedge for any liberalized group country would have followed a similar trend to that of 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_{nt}^{in}, so that changes over time due to the treatment effect correspond to percentage changes.

The results of our event study are shown in Figure 2. We find that the RKO wedges respond to liberalization gradually, with a cumulative increase of 47.2% rise by the tenth year since liberalization. By the sixth year, the magnitude of the effect is 25.3%; 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 alterna-

Figure 3: World Capital Account Openness



tive estimators by Sun and Abraham (2021) and Roth and Sant'Anna (2023). In addition, we show that the results are robust to using the average of the in and out-wedges $\left(\sqrt{\tau_{nt}^{\text{in}}\,\tau_{jt}^{\text{out}}}\right)$ instead of the in-wedges τ_{nt}^{in}.

6 Patterns of De Facto Capital Account Openness

We are now ready to investigate the patterns of the last five decades of financial globalization through the lens of the RKO wedges. We uncover two important stylized facts: countries have become significantly more open over time on average, but the pace 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 3 (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 average implicit tax was about 2%, implying that restrictions on incoming investment by the destination country and on outgoing investment from the origin country, have the combined equivalent effect of a 98% tax on returns. World financial markets were practically in a state of autarky. After 1980, World RKO has progressively increased to reach almost 20% in 2019, which corresponds to an implicit income tax on international investment returns of 80%.

One manifestation 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 3. Following Coeurdacier and Rey (2013), home bias for country j is defined as:

$$\text{HB}_{jt} \overset{\text{def}}{=} 1 - \left(1 - w_{jjt}\right) \frac{\sum_{n=1}^{N} K_{nt}}{\sum_{n' \neq j} K_{n't}}.$$

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 3, 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 0.93 in 1971 to 0.59 in 2019.[11]

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

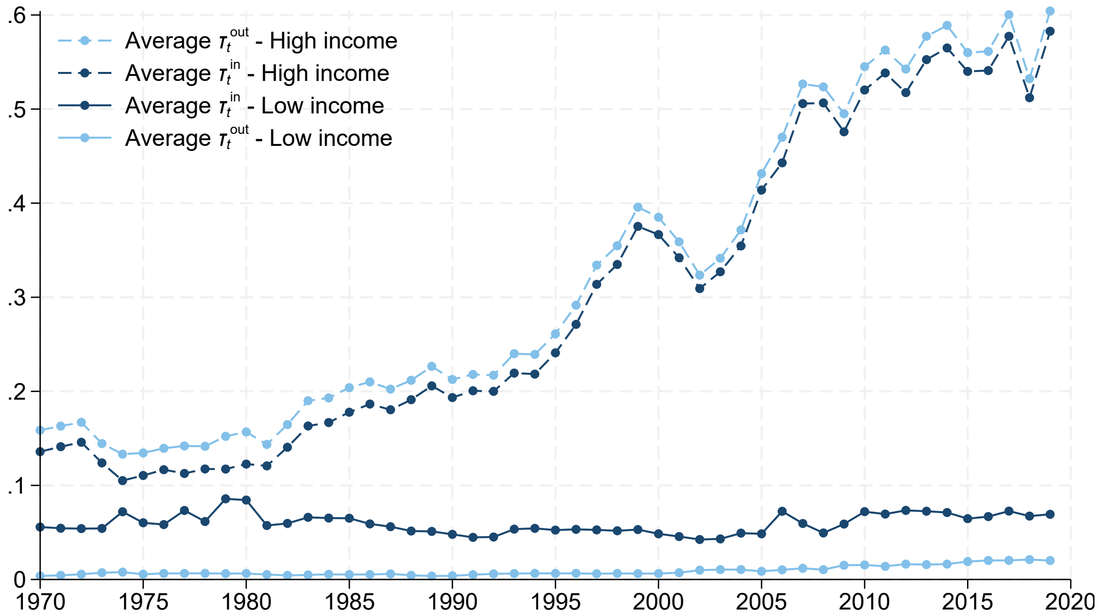
6.2 Heterogeneity (Unbalanced Financial Globalization)

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

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

countries.

Figure 4: Revealed Capital Account Openness, High vs. Low Income Countries



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 4 show that in the early 1970s, high-income countries were already more financially open than low-income countries, both inwardly as well as outwardly. More importantly, this gap has widened dramatically since then. The implicit tax rate on outflows and inflows in high-income countries has decreased by about 40 percentage points (from over 80% to just above 40%) over the past 50 years. Over the same period, the implicit tax on outflows from low-income countries has decreased by only a couple of percentage points, and the tax on inflows has essentially stagnated. This asymmetry 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 documented the unbalanced nature of financial globalization, we now return to the main question of the 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 path, 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_{nt}), natural resources (X_{nt}), factor compensation shares $(\kappa_{nt}, \lambda_{nt}, \xi_{nt})$, total factor productivity (Ω_{nt}) and patience parameters (σ_{nt}). Changing the RKO wedges endogenously affects the paths of wealth $\left(A_{nt}^{-}\right)$, capital stocks (K_{nt}) and portfolio shares $(\mathbf{W}_t)$, which in turn alters the paths of output (Y_{nt}), consumption (C_{nt}), wages $\left(P_{nt}^{L}\right)$, the rental rate of natural resources $\left(P_{nt}^{X}\right)$ and, the rates of return (MPK_{nt}). 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 $(\bar{Y})$. The table also presents two additional scenarios, *Symmetric* and *Convergent* , which are discussed later on in the section.

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

Statistic	Scenario	1971	1995	2019
World GDP	Unbalanced	100	100.38	98.62
$= \sum_{n=1}^{N} Y_{nt}$	Symmetric	100	101.68	109.45
	Convergent	100	105.14	136.13
Variance of log GDP/Capita	Unbalanced	100	101.51	109.83
$= \text{var}_{n \in \text{H} \cup \text{L}} [\log(Y_{nt}/\text{pop}_{nt})]$	Symmetric	100	95.22	65.16
	Convergent	100	94.13	70.16
Capital/Employee - High Income C.	Unbalanced	100	100.78	105.96
$= \text{mean}_{n \in \text{H}} (K_{nt}/L_{nt})$	Symmetric	100	98.33	63.30
	Convergent	100	99.09	53.27
Capital/Employee - Low Income C.	Unbalanced	100	99.94	92.68
$= \text{mean}_{n \in \text{L}} (K_{nt}/L_{nt})$	Symmetric	100	106.62	161.21
	Convergent	100	109.60	318.26
Real Wage - High Income Countries	Unbalanced	100	100.85	103.30
$= \text{mean}_{n \in \text{H}} (P^L_{nt})$	Symmetric	100	100.06	80.57
	Convergent	100	101.92	77.84
Real Wage - Low Income Countries	Unbalanced	100	99.32	95.40
$= \text{mean}_{n \in \text{L}} (P^L_{nt})$	Symmetric	100	104.43	123.98
	Convergent	100	110.83	195.87
Return on Capital - High Income C.	Unbalanced	100	82.80	87.22
$= \text{mean}_{n \in \text{H}} (MPK_{nt})$	Symmetric	100	94.17	130.38
	Convergent	100	80.89	136.14
Return on Capital - Low Income C.	Unbalanced	100	102.26	106.92
$= \text{mean}_{n \in \text{L}} (MPK_{nt})$	Symmetric	100	93.08	79.62
	Convergent	100	85.25	61.61
Return on Portfolio - High Income C.	Unbalanced	100	101.63	101.79
$= \text{mean}_{j \in \text{H}} (\mathbf{w}'_{jt}\, \mathbf{MPK}_t)$	Symmetric	100	97.65	130.86
	Convergent	100	94.39	145.42
Return on Portfolio - Low Income C.	Unbalanced	100	96.37	93.23
$= \text{mean}_{j \in \text{L}} (\mathbf{w}'_{jt}\, \mathbf{MPK}_t)$	Symmetric	100	93.05	79.37
	Convergent	100	85.16	61.80

NOTES: "Unbalanced" refers to the equilibrium actually observed in the data. Figures are relative to the No-Globalization scenario. Summary statistics are weighted by 1995 real GDP ($\bar{Y}$). H and L denote the sets of high and low-income countries (1995 PPPGDP per capita above/below $25,000).

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 world GDP. Indeed, world GDP is 1.4% lower in 2019 than it would have been, had financial globalization not occurred, i.e. in a world in which the wedges τ_{njt} 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 5.6% relative to the no-globalization world, in low-income countries it has led to a lower capital stock by 14.5% 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 rate of return on capital is 8.8% lower in high-income countries, and 11.1% 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. But when the pace 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 opened up much faster than poorer ones as documented in section 6 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 1.5% higher in 1995 and 9.8% 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. 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 Factor Remuneration

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 3.3% higher, and the rate of return on capital is 12.8% lower in 2019 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. Despite the decline in the marginal product of capital domestically, the return on portfolio is 1.8% higher, as globalization has made it easier for investors in high-income countries to invest in developing countries where the returns on capital are higher.

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 in 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 4.6% lower in 2019 than in the no-globalization scenario, which reflects the decrease 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, which confirms the results that it has increased the variance of GDP per employee. The return on capital is 6.9% higher in low-income countries due to globalization in 2019, but the return on portfolios is 6.8% lower. This divergence reflects the fact that barriers to investment into high-income countries have declined much faster, which has made it appealing for investors located in low-income countries to allocate a bigger share of their portfolios in assets located in high-income countries despite the lower rate of return they offer.

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. 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_{njt}^{sym}) as follows:

$$\tau_{njt}^{\text{sym}} \quad \stackrel{\text{def}}{=} \quad \tau_{nj,1970} \cdot \frac{\tau_t^w}{\tau_{j,1970}^w} \qquad \text{for } n \neq j$$

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

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

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

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

Our results confirm the idea that financial globalization didn't have to lead to a worsening of the capital allocation and cross-country inequality. In both these counterfactual scenarios, a balanced financial globalization would have, in fact, led to higher world output by 9.5% in the *symmetric* scenario and by 36.1% in the *convergent* scenario.

In both these counterfactuals, capital undergoes a massive reallocation from capital-rich to capital-poor countries. In low-income countries, the capital stock per employee increases, in 2019, by 61.2% in the *symmetric* scenario and 218.3% in the *convergent* scenario and wages increase by 24% and 96%, respectively. For rich countries, we observe the exact opposite: capital/employee decreases by 36.6% and 46.6% and wages decrease by 20% and 22%, respectively. Cross-country inequality, measured as the variance of log GDP per capita, would have been 34.8% lower in the *symmetric* scenario and 43.7% lower in the *convergent* scenario, relative to the no-globalization scenario.

8 Robustness Checks

In this section, we investigate the robustness of our previous findings to several concerns: (i) the country coverage of our sample, (ii) the fact that governments bonds are included, (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 Alternative Panel

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 remain broadly 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_{njt} had remained constant—which is larger that the 1.4% found in our baseline results. The increase in the dispersion of income per capita across countries (+9.7%) is almost exactly the same as in our main findings (+9.8%). We also find very similar results for the capital to output ratios and the factor remunerations.

8.2 Government Flows

The literature has documented the important role played by sovereign-to-sovereign transactions 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.[12]

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. The world output is 0.7% lower today than in a world in which the wedges τ_{njt} had remained constant, and the dispersion of income per capital across countries is 7.3% 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

[12]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.

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 6.5% higher in the *symmetric* scenario and 35.2% higher in the *convergent* scenario (9.5% and 36.1% respectively, in the baseline).

8.3 Equity and FDI 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 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.

8.4 Stock Market Risk

Our baseline wedge accounting assumed that risk was symmetric accross countries. We now relax this assumption and incorporate a measure of stock market risk faced by investors in the set of characteristics used in the portfolio decisions. Denoting σ_{it} the volatility in country n at time t, the portfolio shares are now given by$w_{njt} = \frac{\left(\tau_{njt}\, MPK_{nt}\right)^{\beta r} \cdot K_{nt}^{\beta_0} \left(\sigma_{nt}^2\right)^{\beta\sigma}}{\sum_{\iota=1}^{N} \cdot \left(\tau_{\iota jt}\, MPK_{\iota t}\right)^{\beta r} \cdot K_{\iota t}^{\beta_0} \left(\sigma_{\iota t}^2\right)^{\beta\sigma}}$.

To estimate the stock market volatility, we use the panel of stock price volatility made available by the World Bank in the Global Financial Development Database originally sourced from Bloomberg. The variable is constructed as the average of the 360-day volatility of the national stock market index. Given that the elasticity of portfolio shares to returns is $\beta_r = 1$, we set the elasticity of portfolio shares to the volatility to $\beta_\sigma = -1$. This calibration is appealing because it is consistent with the mean-variance portfolio where the elasticity of portfolio shares to the mean is the same as the one to the variance.

The results, reported in Appendix G, show even worse effects of financial globalization on the misallocation of capital and world output when one accounts for stock market volatility differences across countries and time. This suggests that changes in the patterns of risks are not only not able to account for the unevenness of globalization, but that they have to some extent mitigated the unevenness.

8.5 Alternative Microfoundations of the Saving Rate

Our microfoundation for the saving rate builds on two well-known consumption-saving models: the perpetual youth and the capitalist-worker models. One advantage of this specification is that it delivers analytical solutions for the aggregate saving rate which we can then easily map to our country-year-level dataset to estimate the sequence of time preference parameters in each country.

A second advantage is that it implies that the path of aggregate saving rates remains unchanged across the three scenarios we investigate. This allows us to isolate the role played by the reallocation of international portfolios. Our results are thus robust to any alternative models that feature an *aggregate* saving rate that is exogenous to frictions to international investments. In a previous version of this paper, we showed that a model with an infinitely-lived agent with wealth in the utility shares this property, which implies that all our results exactly go through in this alternative microfoundation.

While our baseline approach holds the aggregate saving rate (σ_{nt}) unchanged across scenarios, we have also investigated a capitalist-worker version of the model in which only capitalists save, which implies constant savings *as a share of gross capital income*, $\left(A^-_{nt} = A^+_{nt}\right)$. The details of the model and the quantitative results are shown in Appendix H. All our previous findings remain broadly unchanged: the world output is 2.8% lower today than in a world in which the wedges τ_{njt} had remained constant—which is twice as large as the 1.4% found in our baseline results—and the dispersion of income per capita across countries is 12.2% higher (compared to 9.8% in our baseline results). We also find very similar results for the capital to output ratios and the factor remunerations.

8.6 Wedges from Bilateral Positions

In section 5.2, we have constructed alternative wedges, τ_{ij}^{b} based on international bilateral positions from 2015 to 2017 and showed that they correlate strongly with the wedges estimated using aggregate positions. We now provide evidence that the model delivers similar counterfactual results for both sets of wedges.

Given that we can apply these alternative wedges τ_{ij}^{b} only from 2015 to 2017, we cannot run the same historical counterfactuals from 1970 to 2019 as we did in the other robustness checks. What we do instead is to consider a very quick "converging" scenario from 2015 to 2017, in which the bilateral wedges start at their actual values in 2015, and converge to the average world RKO by 2017.[13]

The results are given in Appendix I. We find that both sets of wedges deliver results that are quantitatively very similar. When using the baseline methodology to estimate wedges, in 2017, world GDP and inequality are predicted to be, respectively, 20.95% higher and 32.89% lower in the converging counterfactual than in the unbalanced equilibrium. When using the alternative methodology, the figures are 25.17% and 38.17% respectively.

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 new multi-country model of international investment and production, and estimate new measures of Revealed Capital Account Openness, based on a wedge accounting methodology which 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 countries are significantly more open to asset trade in 2019 than in 1970, rich countries have opened up at a much faster pace than poorer countries.

[13] The formula is given by $\log \tau_{njt}^{\text{con}} \overset{\text{def}}{=} \frac{2017-t}{3} \cdot \log \tau_{njt} + \frac{t-2015}{3} \cdot \log \tau_{t}^{w} \qquad \text{for } n \neq j$

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 country 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 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

B Model Solution

B.1 Optimal Saving

We start from equation (5):

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

and we guess that there exists two time and country specific (but common to all cohorts) variables η_{1jt} and η_{0jt} such that $V_{jbt} = \eta_{1jt} \log(A^{+}_{jbt}) + \eta_{0jt}$. In addition, we denote the saving rate at time t as s_{jbt}. With these notations, substituting in the previous expression for cohorts born before the current period $b < t$, we obtain:

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

Identifying all the terms in $\log(A^{+}_{jbt})$ it must be the case that

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

and

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

Importantly the decision about how much to save s_{jbt} is independent of the decision about how to allocate the portfolio shares $\mathbf{w}_{jbt+1}$. We can thus solve these two problems separately. Iterating forward the former condition, we find that η_{1jt} is equal to 1 in all periods:

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

Using this finding and taking the first order condition with respect to the saving rate, we obtain

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

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

As we show in subsection B.2 of this appendix, in which we solve for the optimal portfolio problem, the portfolio shares are common to all cohorts. Therefore this confirms that η_{0jt} is common across all cohorts and independent of b.

Recall that we had assumed that $t > b$. For the newly born agents, it is easy to show that the same results hold. The only difference is that newly born agents start with income $P^L_{jbt}L_{jbt} + P^X_{jbt}X_{jbt} + T_{jbt} + \mathcal{E}_{jbt}$. If we denote $A^+_{jbb} = P^L_{jbt}L_{jbt} + P^X_{jbt}X_{jbt} + T_{jbt} + \mathcal{E}_{jbt}$ it is straightforward to check that we obtain the same saving rule as above if we take the first-order condition with respect to the saving rate in the following problem

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

B.2 Derivation of Optimal Portfolio Shares

In this section, we provide a detailed derivation of the optimal portfolio shares based on Koijen and Yogo (2019). We proceed by showing how the economic environment and the optimization problem of investors in our model correspond exactly to the framework in their paper, which then allows us to apply the results on the optimal portfolio shares.

In KY, there are a finite set of assets indexed by n. In our paper, we also have a finite set of N claims on firm profits in each country n. While they index investors with the subscipt i, in our framework they are indexed by their country of origin j and the year they were born b.

We have shown earlier in this appendix that the portfolio that maximizes the agents' expected value coincides with the portfolio that maximizes the agents' expected (log) value of wealth:

$$\max_{\mathbf{w}_{jbt+1}\in\Delta^N} \mathbb{E}_t \left(\log A^+_{jbt+1}\right)$$

This is the same objective as in KY. In their paper one asset is labeled the outside asset, in which the investors invest all the wealth they haven't invested elsewhere and is indexed by $n = 0$. This is just a normalization, but to follow closely their notation and their derivation, we also isolate an outside asset for each origin country j: the domestic asset in country j is the outside asset for investors located in this country. For each country j we denote the $(N-1)$-vector of portfolio weights on foreign assets with an f superscript $\mathbf{w}^f_{jbt+1}$ and the domestic one w_{jjbt+1}which is the analagous to $w_{jbt+1}(0)$ in KY:

$$\mathbf{w}_{jbt+1} = \begin{bmatrix} \mathbf{w}^f_{jbt+1} \\ w_{jjbt+1} \end{bmatrix}$$

The set of constraints for the portfolio weights are also the same: investors face a short-sale constraint on every asset

$$\begin{aligned} \mathbf{1}'\mathbf{w^f_{jbt+1}} &< 1 \\ \mathbf{w^f_{jbt+1}} &\geq \mathbf{0} \end{aligned}$$

The first constraint is the short-sale constraint for the domestic asset. Note also that in equilibrium it will be the case that $\mathbf{1}'\mathbf{w^{-j}_{jbt}} = 1$. Like in KY, and in many other papers in the literature, the short-sale constraint is an assumption.

Like in KY, returns are denoted R_{njbt+1}, their expression are given by $R_{njbt+1} = \zeta_{nbt+1}\left(1 + \tau_{njt+1} MPK_{nt+1} - \delta_{t+1}\right)$. We define their log $r_{njbt+1} = \log\left(R_{njbt+1}\right)$ and their conditional mean and covariance of log returns relative to the domestic (outside) asset:

$$\mu_{jbt+1} = \mathbb{E}_{\text{jt}}\left[\mathbf{r}^{f}_{jbt+1} - r_{jjbt+1}\mathbf{1}\right] + \frac{\sigma^2_{jbt}}{2}$$
$$\Sigma_{jbt+1} = E_{\text{jt}}\Big[\Big(\mathbf{r}^{\text{f}}_{\text{jbt+1}} - \text{r}_{\text{jjbt+1}}\mathbf{1} - \text{E}_{\text{jt}}\Big[\mathbf{r}^{\text{f}}_{\text{jbt+1}} - \text{r}_{\text{jjbt+1}}\mathbf{1}\Big]\Big)\Big(\mathbf{r}^{\text{f}}_{\text{jbt+1}} - \text{r}_{\text{jjbt+1}}\mathbf{1}\Big)\Big]$$

where σ^2_{jbt} is a vector of the diagonal elements of Σ_{jbt+1} and $r^{\text{f}}_{\text{jbt+1}}$ is the vector of foreign asset returns. Given that there is no aggregate risk in our economy (see next section for a formal proof), the only source of risk from the perspective of investors is the repatriation wedge ζ_{njbt} so the elements of the matrix $\Sigma_{jbt+1}$are a function of the elements of Σ^{ζ}_{t+1}, the variance-covariance matrix of ζ_{njbt}.

Under Assumption 1 in their paper and the parameter restrictions given in Corollary 1 and detailed in their Appendix A, we can derive the logit portfolio shares (which correspond to equations 11 and 12 in KY):

$$w_{njbt} = \frac{\delta_{njbt}}{1 + \sum_{m \neq j} \delta_{mjbt}}$$
$$w_{jjbt} = \frac{1}{1 + \sum_{m \neq j} \delta_{mjbt}}$$

We now assume that, at time t, the information set of investors in country j about country n used to forecast R_{njbt+1} is given by the following set of variables:z

$$\left[\begin{array}{ccc} \log\left(\tau_{njt+1} MPK_{nt+1}\right) & \log K_{nt+1} & \mathbf{x}_{nt} \end{array}\right]'$$

where $\mathbf{x}_{njt}$ is a vector of other observed variables of country n at date t. Here we follow KY in separating size $(\log K_{nt+1})$ from the other characteristics; in addition, we also separate the net return $\log\left(\tau_{njt+1} r_{nt+1}\right)$.

We then specify the vector of characteristics used by investor to build their portfolio, which is given by the net returns, the capital stock and other variables relative to the domestic asset:

$$\hat{\mathbf{x}}_{njt} = \left[\begin{array}{cccc} \log\left(\tau_{njt+1} MPK_{nt+1}/MPK_{jt+1}\right) & \log\left(K_{nt+1}/K_{jt+1}\right) & \mathbf{x}_{nt} - \mathbf{x}_{jt} & \log\left(\epsilon_{njt}\right) \end{array}\right]'$$

where ϵ_{njt} is a characteristic that captures investor heterogeneity across countries (it is allowed to be nj-specific), it is known to the investors but unknown to us.

Using the implied expression for δ_{njbt}:

$$\delta_{njbt} = \exp\left\{\beta_0 \log\left(K_{nt}/K_{jt}\right) + \beta_r \log\left(\tau_{njt}\, MPK_{nt}/MPK_{jt}\right) + \boldsymbol{\beta}_x' \left(\mathbf{x}_{nt-1} - \mathbf{x}_{jt-1}\right)\right\} \epsilon_{njt}$$

and setting $\epsilon_{njt} = 1$ gives the result:

$$w_{njt} \;=\; \frac{\exp\left(\boldsymbol{\beta}_x' \mathbf{x}_{nt-1}\right) \cdot \left(\tau_{njt}\, MPK_{nt}\right)^{\beta_r} \cdot K_{nt}^{\beta_0}}{\sum_{\iota=1}^{N} \exp\left(\boldsymbol{\beta}_x' \mathbf{x}_{\iota t-1}\right) \cdot \left(\tau_{\iota jt}\, MPK_{\iota t}\right)^{\beta_r} \cdot K_{\iota t}^{\beta_0}}.$$

B.3 Absence of Macroeconomic Risk

In this section, we show that the aggregate beginning of period wealth is not stochastic despite the fact individuals portfolios are due to the stochastic wedge ζ_{jbt}.

$$\begin{aligned}
\sum_{b<t}\left(\mathbf{w}_{jbt}'\mathbf{R}_{jt}\right) A_{jbt-1}^{-} &= \sum_{b<t}\sum_{j=1}^{N} w_{jbt}\zeta_{ibt}\left(1+\tau_{njt}r_{it}-\delta_t\right) A_{jbt-1}^{-} \\
&= A_{jt-1}^{-}\sum_{j=1}^{N} w_{jt}\left(1+\tau_{njt}r_{it}-\delta_t\right)\sum_{b<t}\zeta_{ibt}a_{jbt-1}^{-}
\end{aligned}$$

where we denote $a_{jbt-1}^{-} = \frac{A_{jbt-1}^{-}}{A_{jt-1}^{-}}$ the fraction of national wealth owned by cohort b and the second line uses the fact that all cohorts have the same portfolio.

We next show that for a set of shares a_{jbt-1}^{-} the sum $\sum_{b<t}\zeta_{ibt}a_{jbt-1}^{-}$ is not stochastic. Given that ζ_{ibt} is i.i.d. across cohorts we have the following

$$\begin{aligned}
Var\left(\sum_{t'\leq b<t}\zeta_{ibt}a_{jbt-1}^{-}\right) &= Var(\zeta_{ibt})\sqrt{\sum_{t'\leq b<t}\left(a_{jbt-1}^{-}\right)^2} \\
&\leq Var(\zeta_{ibt})\sqrt{\frac{1}{t-t'}}
\end{aligned}$$

Letting t' go to $-\infty$ gives $Var\left(\sum_{b<t}\zeta_{ibt}a_{jbt-1}^{-}\right) = 0$. Hence the sum $\sum_{b<t}\zeta_{ibt}a_{jbt-1}^{-}$

is almost surely equal to its expectation, $\sum_{b<t} \zeta_{ibt} a^{-}_{jbt-1} \overset{a.s}{=} 1$.

Hence we obtain

$$\sum_{b<t} \left(\mathbf{w}'_{jbt} \mathbf{R}_{jt} \right) A^{-}_{jbt-1} = A^{-}_{jt-1} \sum_{j=1}^{N} w_{jt} \left(1 + \tau_{njt} r_{it} - \delta_t \right).$$

B.4 Government Transfers

From the previous finding, we can simplify the second part of the transfers to the newly born cohort:

$$\sum_{b<t} \left(\mathbf{w}'_{jbt} \left(\mathbf{R}_{jt} - \mathbf{R}^{n}_{t} \right) \right) A^{-}_{jbt-1} = A^{-}_{jt-1} \sum_{j=1}^{N} w_{jt} \left(1 - \tau_{njt} \right) r_{it}.$$

C Event Study Validation: Alternative Estimators

In this appendix, we repeat the event study analysis of subsection 5.3 using alternative diff-in-diff estimators. Figure 5 presents estimates based on the estimator by Roth and Sant'Anna (2023), while Figure 6 presents estimates based on the estimator by Sun and Abraham (2021).

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

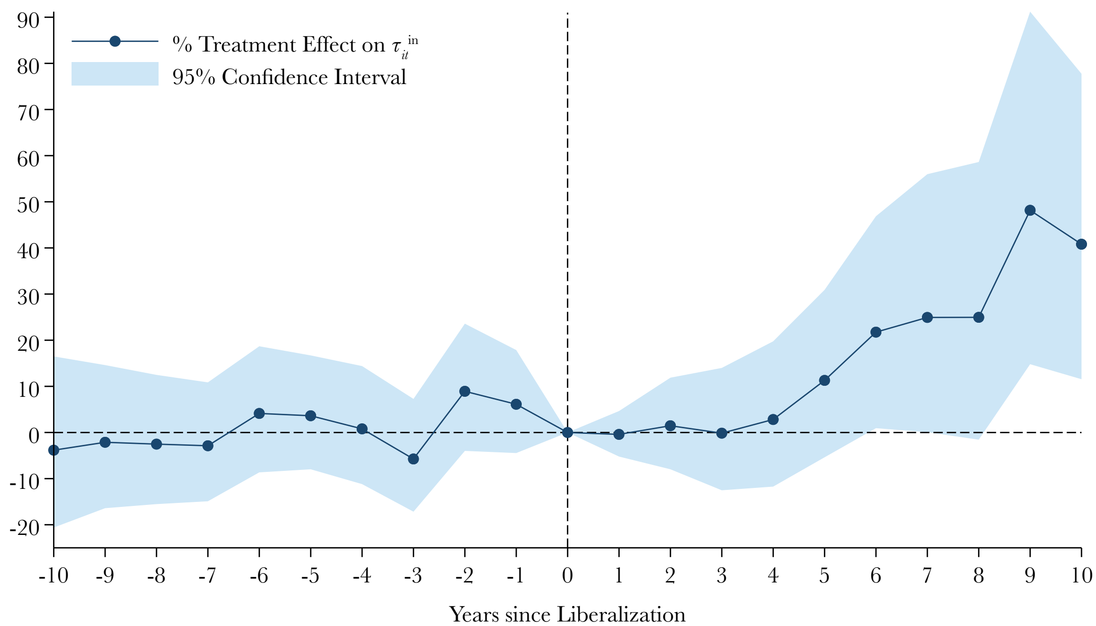
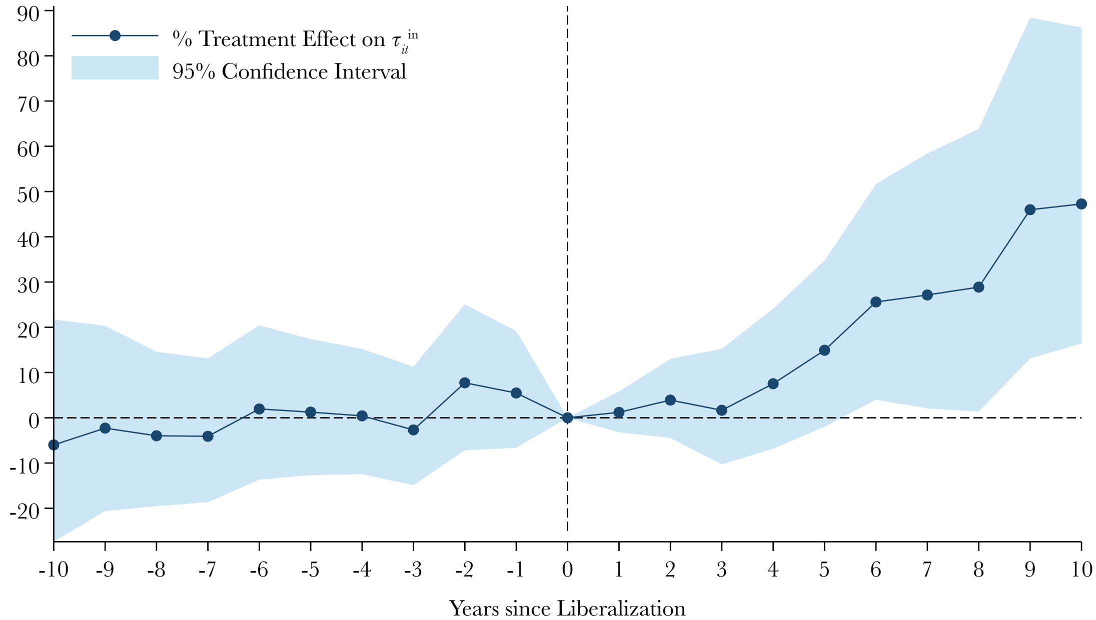


Figure 6: Event Study - EM Liberalizations and In-Wedges (Sun & Abraham estimator)



In Figures 6 and 7, we repeat the analysis in Figure 2, replacing τ_{it}^{in} with its geometric average with τ_{it}^{out}, respectively with the Callaway and Sant'Anna (2021) and the Sun and Abraham (2021) estimators (we omit the Roth and Sant'Anna (2023) estimate, which produces a significant post-treatment effect but fails to produce pre-trends consistent with the parallel trend assumption).

Figure 7: Event Study - EM Liberalizations and Average of In and Out-Wedges (CS estimator)

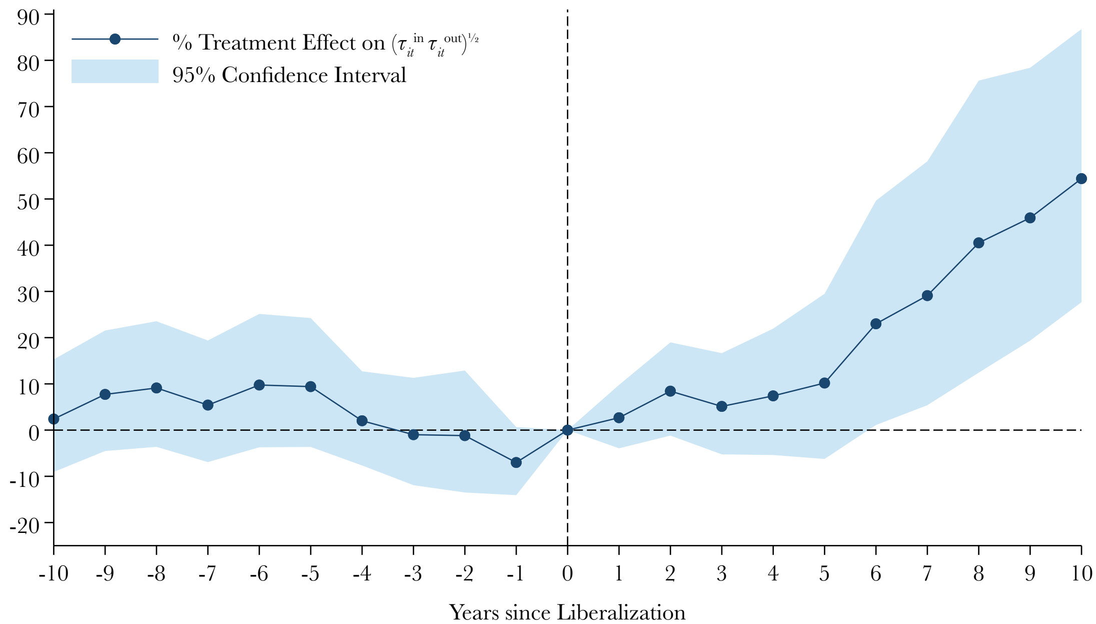
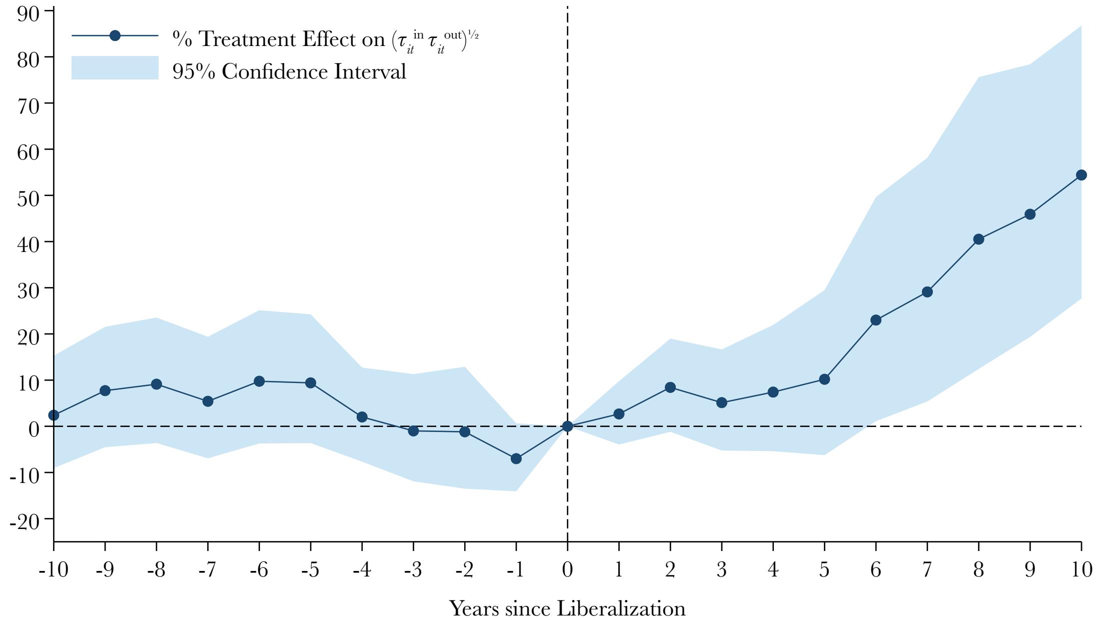


Figure 8: Event Study - EM Liberalizations and Average of In and Out-Wedges (SA estimator)



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 9: World Capital Account Openness

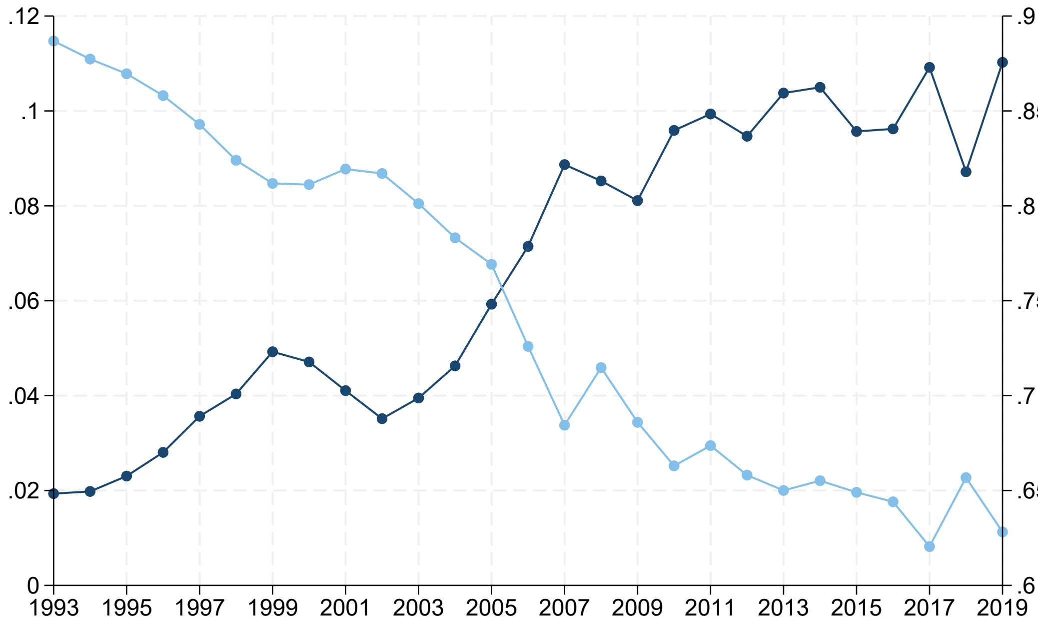


Figure 10: Revealed Capital Account Openness, High vs. Low Income Countries

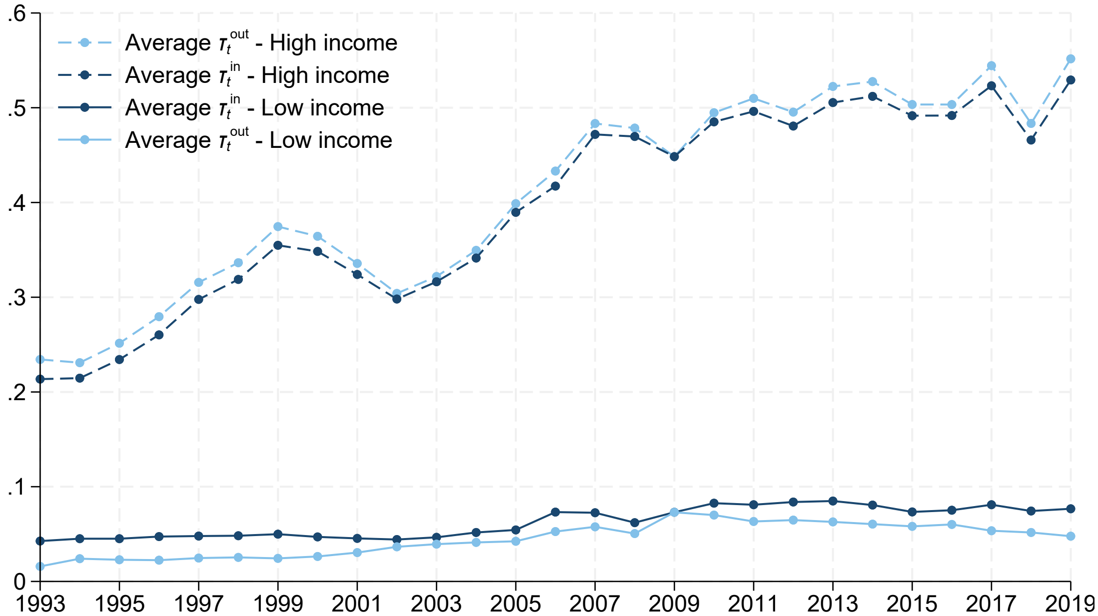


Table 5: Counterfactual Analysis (No-Globalization Scenario = 100)

Statistic	Scenario	1993	2019
World GDP	Unbalanced	100	97.62
$= \sum_{n=1}^{N} Y_{nt}$	Symmetric	100	104.25
	Convergent	100	122.90
Variance of log GDP/Capita	Unbalanced	100	109.72
$= \text{var}_{n\in \text{H}\cup\text{L}} \left[\log\left(Y_{nt}/\text{pop}_{nt}\right)\right]$	Symmetric	100	81.84
	Convergent	100	74.31
Capital/Employee - High Income C.	Unbalanced	100	108.07
$= \text{mean}_{n\in \text{H}} \left(K_{nt}/L_{nt}\right)$	Symmetric	100	83.86
	Convergent	100	56.04
Capital/Employee - Low Income C.	Unbalanced	100	93.86
$= \text{mean}_{n\in \text{L}} \left(K_{nt}/L_{nt}\right)$	Symmetric	100	111.89
	Convergent	100	162.70
Real Wage - High Income Countries	Unbalanced	100	103.57
$= \text{mean}_{n\in \text{H}} \left(P_{nt}^{L}\right)$	Symmetric	100	92.60
	Convergent	100	78.62
Real Wage - Low Income Countries	Unbalanced	100	97.10
$= \text{mean}_{n\in \text{L}} \left(P_{nt}^{L}\right)$	Symmetric	100	106.49
	Convergent	100	138.33
Return on Capital - High Income C.	Unbalanced	100	98.00
$= \text{mean}_{n\in \text{H}} \left(MPK_{nt}\right)$	Symmetric	100	115.13
	Convergent	100	153.58
Return on Capital - Low Income C.	Unbalanced	100	104.57
$= \text{mean}_{n\in \text{L}} \left(MPK_{nt}\right)$	Symmetric	100	90.90
	Convergent	100	73.84
Return on Portfolio - High Income C.	Unbalanced	100	101.86
$= \text{mean}_{j\in \text{H}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_t\right)$	Symmetric	100	108.91
	Convergent	100	145.11
Return on Portfolio - Low Income C.	Unbalanced	100	94.41
$= \text{mean}_{j\in \text{L}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_t\right)$	Symmetric	100	91.28
	Convergent	100	75.23

NOTES: "Unbalanced" refers to the equilibrium actually observed in the data. Figures are relative to the No-Globalization scenario. Summary statistics are weighted by 1995 real GDP ($\bar{Y}$). H and L denote the sets of high and low-income countries (1995 PPPGDP per capita above/below \$25,000).

E Results excluding "Sovereign Flows"

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 11: World Capital Account Openness

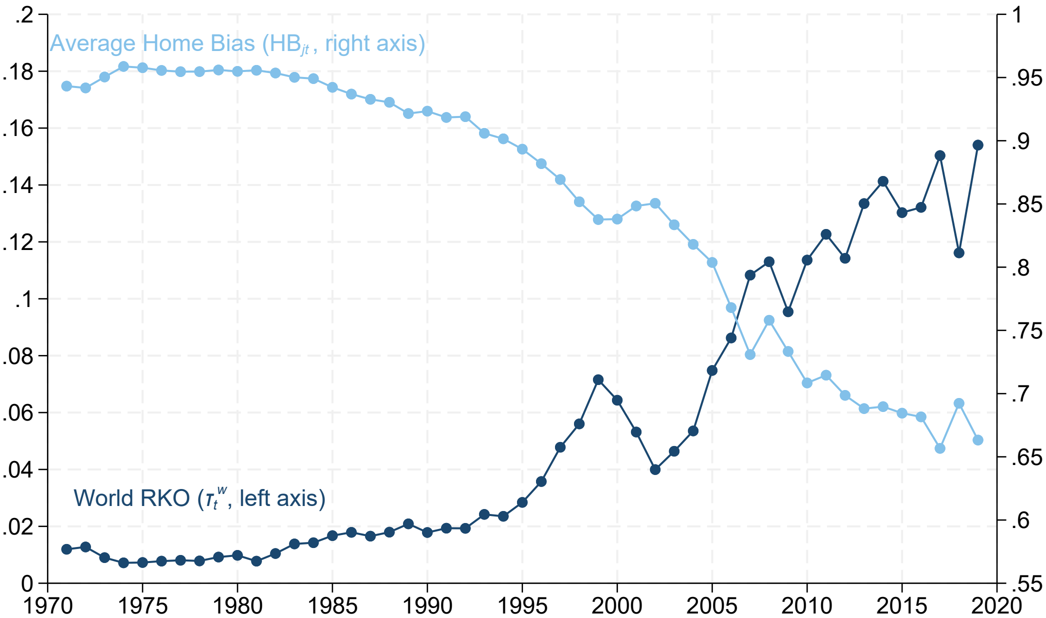


Table 6: List of Countries in the Short Panel

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	Fnji	NIC	Nicaragua	ZMB	Zambia
FRA	France	NOR	Norway		
GAB	Gabon	NZL	New Zealand		

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

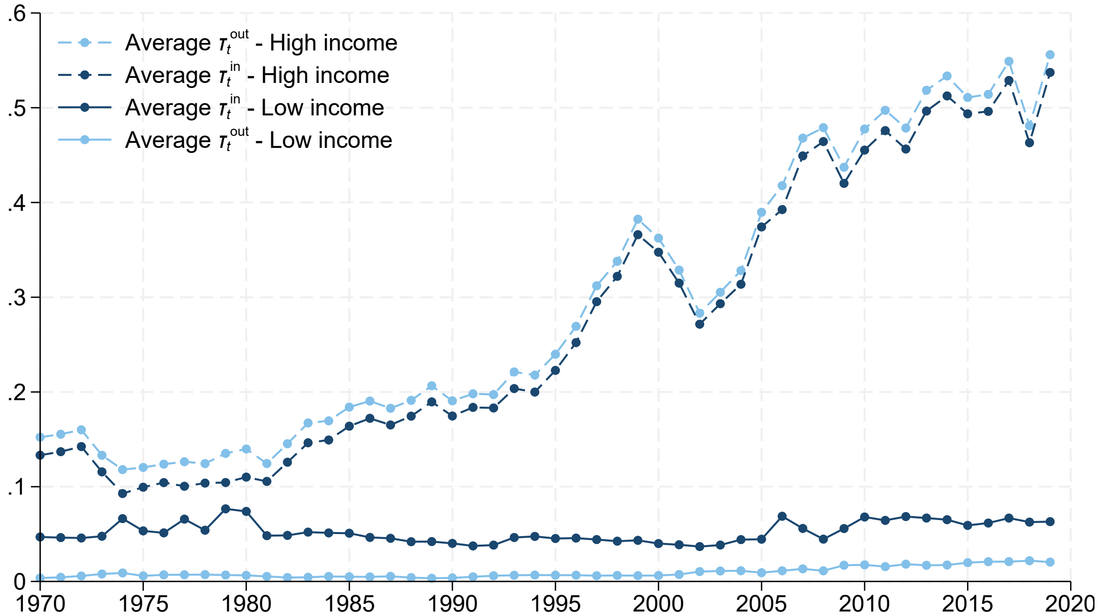


Table 7: Counterfactual Analysis (No-Globalization Scenario = 100)

Statistic	Scenario	1971	1995	2019
World GDP	Unbalanced	100	100.34	99.23
$= \sum_{n=1}^{N} Y_{nt}$	Symmetric	100	101.02	106.53
	Convergent	100	103.78	135.23
Variance of log GDP/Capita	Unbalanced	100	101.18	107.31
$= \text{var}_{n \in \text{H} \cup \text{L}} \left[\log\left(Y_{nt}/\text{pop}_{nt}\right)\right]$	Symmetric	100	97.12	69.14
	Convergent	100	96.86	71.31
Capital/Employee - High Income C.	Unbalanced	100	100.55	104.98
$= \text{mean}_{n \in \text{H}} \left(K_{nt}/L_{nt}\right)$	Symmetric	100	99.03	69.78
	Convergent	100	100.23	56.77
Capital/Employee - Low Income C.	Unbalanced	100	99.99	94.78
$= \text{mean}_{n \in \text{L}} \left(K_{nt}/L_{nt}\right)$	Symmetric	100	103.74	149.88
	Convergent	100	102.69	304.55
Real Wage - High Income Countries	Unbalanced	100	100.63	102.63
$= \text{mean}_{n \in \text{H}} \left(P_{nt}^{L}\right)$	Symmetric	100	100.10	84.52
	Convergent	100	102.04	79.46
Real Wage - Low Income Countries	Unbalanced	100	99.62	96.75
$= \text{mean}_{n \in \text{L}} \left(P_{nt}^{L}\right)$	Symmetric	100	102.63	118.71
	Convergent	100	106.48	192.05
Return on Capital - High Income C.	Unbalanced	100	87.75	92.16
$= \text{mean}_{n \in \text{H}} \left(MPK_{nt}\right)$	Symmetric	100	97.83	124.58
	Convergent	100	85.38	139.81
Return on Capital - Low Income C.	Unbalanced	100	101.52	104.42
$= \text{mean}_{n \in \text{L}} \left(MPK_{nt}\right)$	Symmetric	100	95.68	82.14
	Convergent	100	89.10	61.85
Return on Portfolio - High Income C.	Unbalanced	100	101.43	103.21
$= \text{mean}_{j \in \text{H}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_t\right)$	Symmetric	100	98.48	123.98
	Convergent	100	94.18	144.87
Return on Portfolio - Low Income C.	Unbalanced	100	97.10	92.90
$= \text{mean}_{j \in \text{L}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_t\right)$	Symmetric	100	95.67	82.05
	Convergent	100	89.00	61.95

NOTES: "Unbalanced" refers to the equilibrium actually observed in the data. Figures are relative to the No-Globalization scenario. Summary statistics are weighted by 1995 real GDP ($\bar{Y}$). H and L denote 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 13: World Capital Account Openness

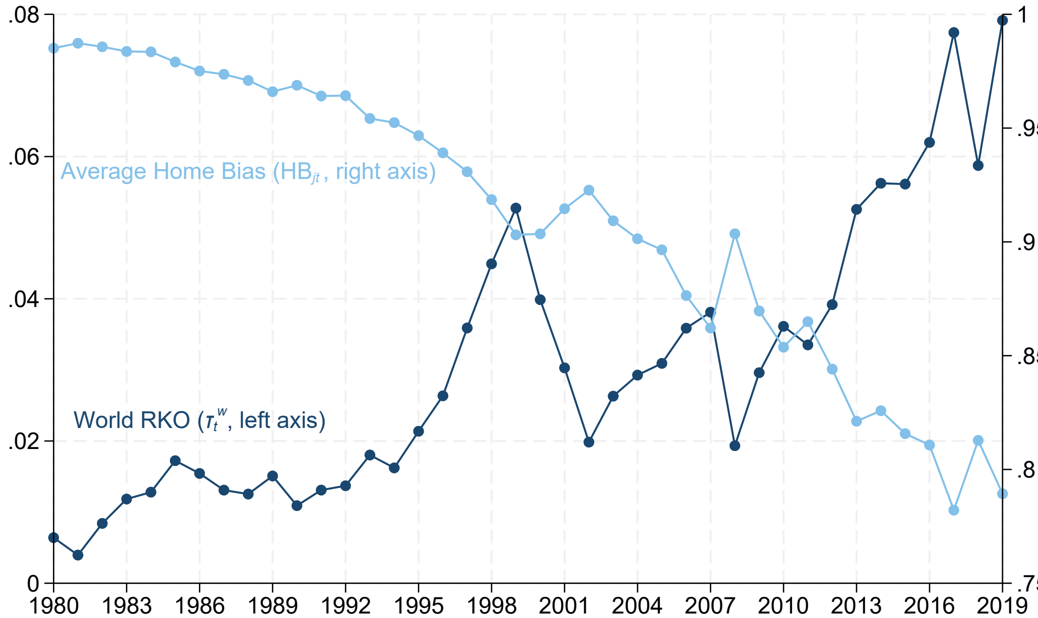


Figure 14: Revealed Capital Account Openness, High vs. Low Income Countries

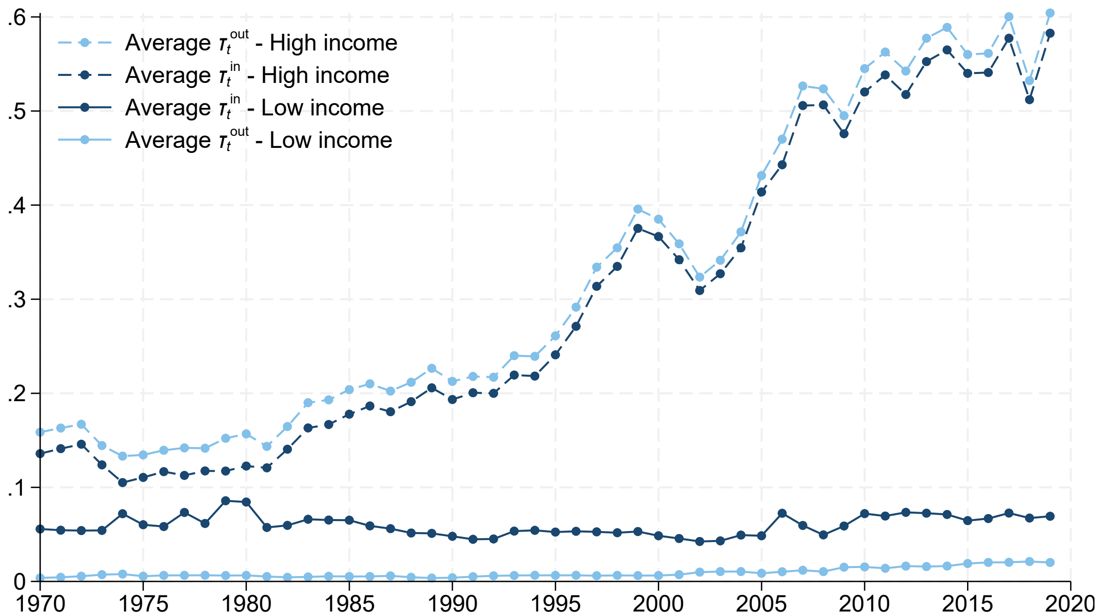


Table 8: Counterfactual Analysis (No-Globalization Scenario = 100)

Statistic	Scenario	1980	1999	2019
World GDP	Unbalanced	100	99.97	100.823
$= \sum_{n=1}^{N} Y_{nt}$	Symmetric	100	101.16	102.313
	Convergent	100	104.19	130.82
Variance of log GDP/Capita	Unbalanced	100	99.05	98.20
$= \text{var}_{n \in \text{H} \cup \text{L}} \left[\log\left(Y_{nt}/\text{pop}_{nt}\right)\right]$	Symmetric	100	93.69	76.49
	Convergent	100	92.26	78.76
Capital/Employee - High Income C.	Unbalanced	100	99.77	101.94
$= \text{mean}_{n \in \text{H}} \left(K_{nt}/L_{nt}\right)$	Symmetric	100	96.60	77.88
	Convergent	100	96.22	68.04
Capital/Employee - Low Income C.	Unbalanced	100	101.34	103.36
$= \text{mean}_{n \in \text{L}} \left(K_{nt}/L_{nt}\right)$	Symmetric	100	117.16	144.34
	Convergent	100	127.29	297.89
Real Wage - High Income Countries	Unbalanced	100	99.66	100.96
$= \text{mean}_{n \in \text{H}} \left(P^{L}_{nt}\right)$	Symmetric	100	98.25	87.76
	Convergent	100	99.78	84.80
Real Wage - Low Income Countries	Unbalanced	100	100.75	102.11
$= \text{mean}_{n \in \text{L}} \left(P^{L}_{nt}\right)$	Symmetric	100	108.30	114.10
	Convergent	100	116.15	190.41
Return on Capital - High Income C.	Unbalanced	100	101.36	99.65
$= \text{mean}_{n \in \text{H}} \left(MPK_{nt}\right)$	Symmetric	100	103.25	122.14
	Convergent	100	100.12	137.37
Return on Capital - Low Income C.	Unbalanced	100	99.47	96.65
$= \text{mean}_{n \in \text{L}} \left(MPK_{nt}\right)$	Symmetric	100	91.84	89.47
	Convergent	100	84.21	60.02
Return on Portfolio - High Income C.	Unbalanced	100	100.13	103.95
$= \text{mean}_{j \in \text{H}} \left(\mathbf{w}'_{jt}\, \mathbf{MPK}_{t}\right)$	Symmetric	100	102.75	119.57
	Convergent	100	99.87	137.18
Return on Portfolio - Low Income C.	Unbalanced	100	98.80	93.01
$= \text{mean}_{j \in \text{L}} \left(\mathbf{w}'_{jt}\, \mathbf{MPK}_{t}\right)$	Symmetric	100	91.85	89.48
	Convergent	100	84.19	60.02

NOTES: "Unbalanced" refers to the equilibrium actually observed in the data. Figures are relative to the No-Globalization scenario. Summary statistics are weighted by 1995 real GDP ($\bar{Y}$). H and L denote the sets of high and low-income countries (1995 PPPGDP per capita above/below \$25,000).

G Results with stock volatility

In this appendix we reproduce Figures 1-2 and Tables 2-3 using an alternative specification for the portfolio shares that include stock volatility as a measure of risk.

Figure 15: World Capital Account Openness

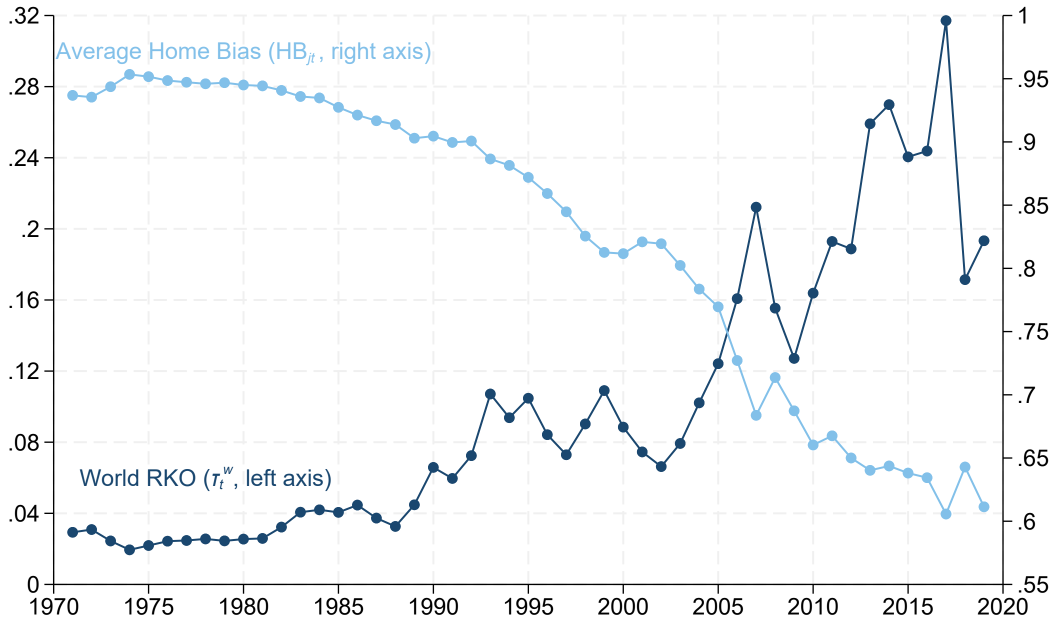


Figure 16: Revealed Capital Account Openness, High vs. Low Income Countries

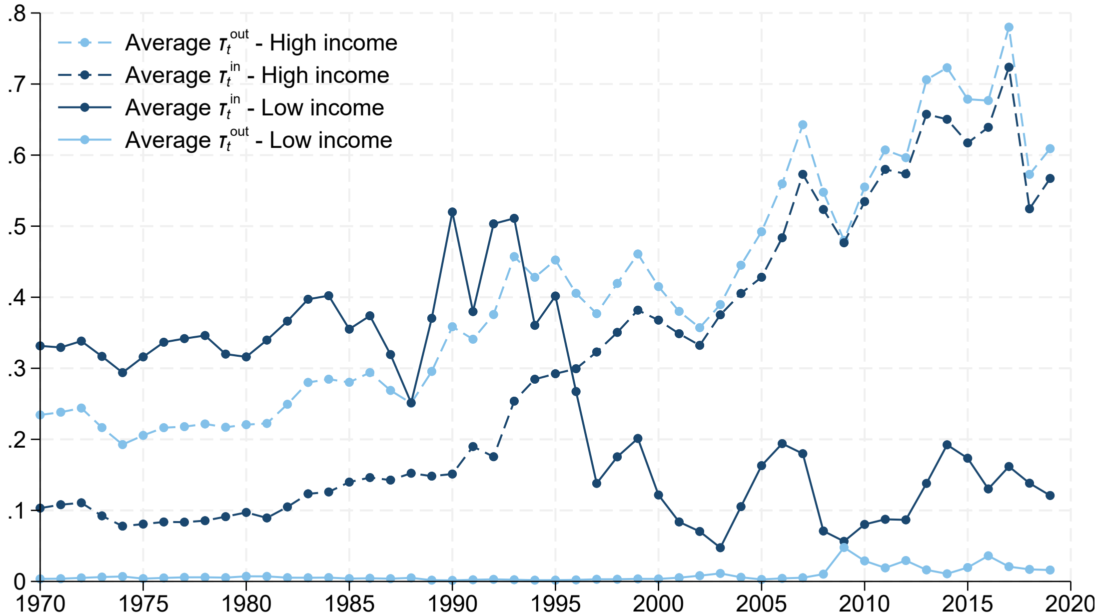


Table 9: Counterfactual Analysis (No-Globalization Scenario = 100)

Statistic	Scenario	1980	1999	2019
World GDP	Unbalanced	100	98.87	93.58
$= \sum_{n=1}^{N} Y_{nt}$	Symmetric	100	102.46	106.42
	Convergent	100	98.03	129.40
Variance of log GDP/Capita	Unbalanced	100	99.33	117.76
$= \text{var}_{n \in \text{H} \cup \text{L}} \left[\log\left(Y_{nt}/\text{pop}_{nt}\right)\right]$	Symmetric	100	101.29	70.41
	Convergent	100	142.21	115.12
Capital/Employee - High Income C.	Unbalanced	100	98.74	117.86
$= \text{mean}_{n \in \text{H}} \left(K_{nt}/L_{nt}\right)$	Symmetric	100	100.41	47.78
	Convergent	100	116.94	64.34
Capital/Employee - Low Income C.	Unbalanced	100	100.15	58.03
$= \text{mean}_{n \in \text{L}} \left(K_{nt}/L_{nt}\right)$	Symmetric	100	108.75	257.04
	Convergent	100	50.43	363.47
Real Wage - High Income Countries	Unbalanced	100	98.45	108.71
$= \text{mean}_{n \in \text{H}} \left(P_{nt}^{L}\right)$	Symmetric	100	101.65	70.40
	Convergent	100	106.4	85.06
Real Wage - Low Income Countries	Unbalanced	100	99.84	79.98
$= \text{mean}_{n \in \text{L}} \left(P_{nt}^{L}\right)$	Symmetric	100	103.46	137.36
	Convergent	100	69.96	158.19
Return on Capital - High Income C.	Unbalanced	100	77.92	65.19
$= \text{mean}_{n \in \text{H}} \left(MPK_{nt}\right)$	Symmetric	100	91.10	144.81
	Convergent	100	82.34	93.65
Return on Capital - Low Income C.	Unbalanced	100	102.88	100.76
$= \text{mean}_{n \in \text{L}} \left(MPK_{nt}\right)$	Symmetric	100	96.08	109.31
	Convergent	100	139.07	100.25
Return on Portfolio - High Income C.	Unbalanced	100	104.77	92.63
$= \text{mean}_{j \in \text{H}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_t\right)$	Symmetric	100	95.53	142.80
	Convergent	100	102.16	143.03
Return on Portfolio - Low Income C.	Unbalanced	100	100.50	108.19
$= \text{mean}_{j \in \text{L}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_t\right)$	Symmetric	100	95.02	85.86
	Convergent	100	137.03	122.54

NOTES: "Unbalanced" refers to the equilibrium actually observed in the data. Figures are relative to the No-Globalization scenario. Summary statistics are weighted by 1995 real GDP ($\bar{Y}$). H and L denote the sets of high and low-income countries (1995 PPPGDP per capita above/below \$25,000).

H Model with Capitalists and Workers

In this appendix, we show that our baseline results in Table 5 are robust to a specification of the model in which capitalists and workers are both infinitely lived but separate agents. Assume there are two types of agents, workers and capitalists, and we index these two types with $\theta = \{W, K\}$. Utility of both types of agents is given by

$$V_{jt}^{\theta} \;=\; \left(1-\sigma_{jt}\right)\log C_{jt}^{\theta} + \sigma_{jt}\cdot \mathbb{E}_t\left(V_{jt+1}^{\theta}\right)$$

Workers earn income from labor that is supplied inelastically and transfers from the government, which are equal to tax revenues and rents from natural resources. As it is common in the literature, workers are hand-to-mouth and consume their current income:

$$C_{jt}^{W} \;=\; P_{jt}^{L}L_{jt} + P_{jt}^{X}X_{jt} + T_{jt} + \mathcal{E}_{jt}$$

Capitalists own all the capital and, each period earn the returns on their portfolio

$$A_{jt+1}^{+} \;=\; \left(\mathbf{w}_{t+1}'\mathbf{R}_{t+1}\right)A_{jt}^{-}$$

and choose how much to withdraw from it and to consume

$$C_{jt}^{K} \;=\; A_{jt}^{+} - A_{jt}^{-} \;=\; \left(1-s_{jt}\right)A_{jt}^{+} \;=\; \left(1-s_{jt}\right)\left(\mathbf{w}_t'\mathbf{R}_t\right)A_{jt-1}^{-} = \left(1-s_{jt}\right)\left(\mathbf{w}_t'\mathbf{R}_t\right)s_{jt-1}A_{jt-1}^{+}$$

where s_{jt} denotes the saving rates of capitalists at time t and country j. The following table, which gives the results of the counterfactuals done in the workers-capitalists version of the model, confirms that our results are robust.

Table 10: Counterfactual Analysis (No-Globalization Scenario = 100)

Statistic	**Scenario**	1971	1995	2019
World GDP	Unbalanced	100	100.13	97.19
$= \sum_{n=1}^{N} Y_{nt}$	Symmetric	100	101.14	104.56
	Convergent	100	103.33	138.43
Variance of log GDP/Capita	Unbalanced	100	102.15	112.18
$= \text{var}_{n \in \text{H} \cup \text{L}} \left[\log\left(Y_{nt}/\text{pop}_{nt}\right)\right]$	Symmetric	100	96.66	75.38
	Convergent	100	95.85	69.01
Capital/Employee - High Income C.	Unbalanced	100	100.78	105.57
$= \text{mean}_{n \in \text{H}} \left(K_{nt}/L_{nt}\right)$	Symmetric	100	98.56	71.87
	Convergent	100	98.35	56.27
Capital/Employee - Low Income C.	Unbalanced	100	98.46	85.48
$= \text{mean}_{n \in \text{L}} \left(K_{nt}/L_{nt}\right)$	Symmetric	100	104.09	137.78
	Convergent	100	103.47	319.87
Real Wage - High Income Countries	Unbalanced	100	100.88	102.67
$= \text{mean}_{n \in \text{H}} \left(P_{nt}^{L}\right)$	Symmetric	100	100.08	85.68
	Convergent	100	101.32	79.67
Real Wage - Low Income Countries	Unbalanced	100	98.33	91.06
$= \text{mean}_{n \in \text{L}} \left(P_{nt}^{L}\right)$	Symmetric	100	102.84	113.22
	Convergent	100	106.35	195.2
Return on Capital - High Income C.	Unbalanced	100	82.24	91.24
$= \text{mean}_{n \in \text{H}} \left(MPK_{nt}\right)$	Symmetric	100	96.22	121.29
	Convergent	100	84.74	132.86
Return on Capital - Low Income C.	Unbalanced	100	103.73	111.15
$= \text{mean}_{n \in \text{L}} \left(MPK_{nt}\right)$	Symmetric	100	95.27	87.07
	Convergent	100	89.39	61.64
Return on Portfolio - High Income C.	Unbalanced	100	101.42	102.49
$= \text{mean}_{j \in \text{H}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_t\right)$	Symmetric	100	97.99	120.03
	Convergent	100	95.23	136.66
Return on Portfolio - Low Income C.	Unbalanced	100	97.64	96.76
$= \text{mean}_{j \in \text{L}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_t\right)$	Symmetric	100	95.23	86.93
	Convergent	100	89.3	61.76

NOTES: "Unbalanced" refers to the equilibrium actually observed in the data. Figures are relative to the No-Globalization scenario. Summary statistics are weighted by 1995 real GDP ($\bar{Y}$). H and L denote the sets of high and low-income countries (1995 PPPGDP per capita above/below \$25,000).

I Wedges Estimated from Bilateral Data

In this appendix, we compare the model results in the case where we use the wedges τ_{ijt} estimated based on the panel of aggregate foreign liabilities and assets and in the case where we instead use the wedges τ^{b}_{ijt} estimated from bilateral positions. Given that we can apply the second methodology only from 2015 to 2017, we cannot run the same historical counterfactuals from 1970 to 2019. What we do instead is to propose a version of the "Converging" counterfactual from 2015 to 2017, in which the bilateral wedges are equal to their estimated values in 2015, and converge to the average world RKO in 2017. The formula is given by $\log \tau^{\text{con}}_{njt} \stackrel{\text{def}}{=} \frac{2017-t}{3} \cdot \log \tau_{njt} + \frac{t-2015}{3} \cdot \log \tau^{w}_{t}$ for $n \neq j$. Table 11 shows that both sets of wedges deliver quantitatively similar results.

Table 11: Counterfactual Analysis (Unbalanced= 100)

Statistic	Estimation Method	2015	2017
World GDP	τ_{ijt}	100	120.95
$= \sum_{n=1}^{N} Y_{nt}$	τ_{ijt}^{b}	100	125.17
Variance of log GDP/Capita	τ_{ijt}	100	67.11
$= \text{var}_{n\in \text{H}\cup\text{L}} \left[\log\left(Y_{nt}/\text{pop}_{nt}\right)\right]$	τ_{ijt}^{b}	100	61.83
Capital/Employee - High Income C.	τ_{ijt}	100	64.36
$= \text{mean}_{n\in\text{H}} \left(K_{nt}/L_{nt}\right)$	τ_{ijt}^{b}	100	55.74
Capital/Employee - Low Income C.	τ_{ijt}	100	227.25
$= \text{mean}_{n\in\text{L}} \left(K_{nt}/L_{nt}\right)$	τ_{ijt}^{b}	100	242.04
Real Wage - High Income Countries	τ_{ijt}	100	83.17
$= \text{mean}_{n\in\text{H}} \left(P_{nt}^{L}\right)$	τ_{ijt}^{b}	100	80.12
Real Wage - Low Income Countries	τ_{ijt}	100	159.55
$= \text{mean}_{n\in\text{L}} \left(P_{nt}^{L}\right)$	τ_{ijt}^{b}	100	172.60
Return on Capital - High Income C.	τ_{ijt}	100	135.82
$= \text{mean}_{n\in\text{H}} \left(MPK_{nt}\right)$	τ_{ijt}^{b}	100	126.18
Return on Capital - Low Income C.	τ_{ijt}	100	64.15
$= \text{mean}_{n\in\text{L}} \left(MPK_{nt}\right)$	τ_{ijt}^{b}	100	55.91
Return on Portfolio - High Income C.	τ_{ijt}	100	147.09
$= \text{mean}_{j\in\text{H}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_{t}\right)$	τ_{ijt}^{b}	100	151.25
Return on Portfolio - Low Income C.	τ_{ijt}	100	70.21
$= \text{mean}_{j\in\text{L}} \left(\mathbf{w}_{jt}' \, \mathbf{MPK}_{t}\right)$	τ_{ijt}^{b}	100	71.14

NOTES: "τ_{ijt}" refers to the estimation approach using the panel of aggregate foreign liabilities and assets. "τ_{ijt}^{b}" refers to the estimation approach using the bilateral positions. Figures are relative to the "unbalanced" or actual equilibrium. Summary statistics are weighted by 2016 real GDP $(\bar{Y})$. H and L denote the sets of high and low-income countries (2016 PPPGDP per capita above/below median).