International Equity and Debt Flows to Emerging Market Economies: Composition, Crises, and Controls*

Chang Ma† Shang-Jin Wei‡

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Abstract

We generalize a canonical debt-only small open economy model by allowing international equity financing to study the composition of capital flows and incidence of crisis. A key result is that the composition of capital inflows depends on institutional quality. Compared with a debt-only framework, allowing equity issuance mitigates the severity of binding borrowing constraints and improves risk sharing. Although debt constraints bind more frequently, large consumption decline events become less frequent and less severe. Interestingly, optimal capital controls target both debt and equity, as portfolio choices depend on the marginal valuation of wealth, which is affected by pecuniary externalities. We also compare the welfare effects of capital controls with those of institutional reforms that enable equity issuance.

Keywords: Capital Controls; Institutional Quality
JEL Classification: F38, F41, G18

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†Corresponding author: International School of Finance (FISF), Fudan University, Shanghai 200433, China. **Email:** changma@fudan.edu.cn. **Phone:** 021-63895527.

‡Graduate School of Business, Columbia University, FISF and NBER, New York, 10027, USA. **Email:** shangjin.wei@columbia.edu. **Phone:** 212-854-9139.

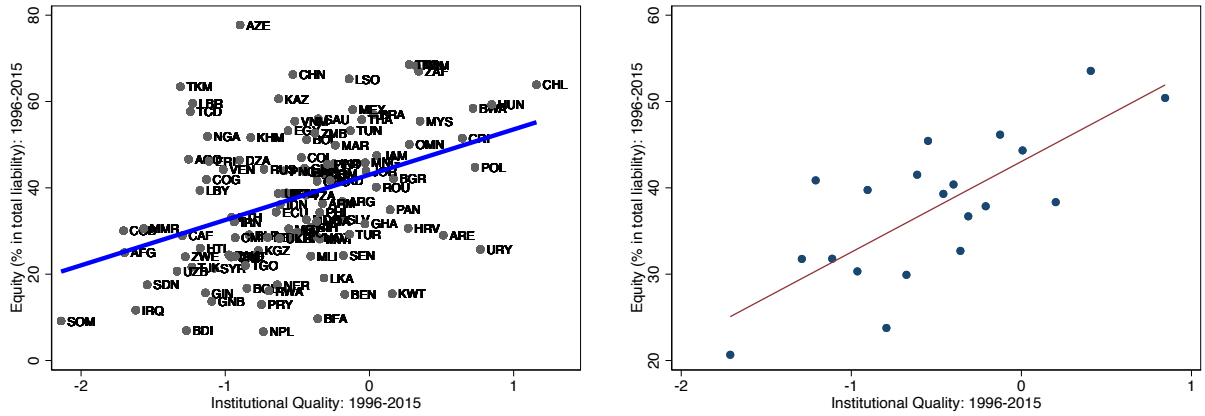
1 Introduction

Emerging market economies that rely heavily on foreign debt tend to experience more severe financial crises (see Caballero and Krishnamurthy 2003, Tong and Wei 2010 and Forbes and Warnock 2012). A large literature shows that foreign borrowing generates negative pecuniary externalities, implying that taxes or restrictions on external debt can be welfare improving (Bianchi 2011, Korinek 2018). In contrast, foreign equity financing provides superior risk sharing and, in the limiting case, would substantially attenuate these externalities. In practice, countries rely on a mix of debt and equity inflows. Recent policy discussions, including the IMF's updated Institutional View on capital flow management measures (Basu et al. 2020), emphasize the complexity of regulating different types of capital flows and the importance of structural factors such as institutional quality. Yet the literature has not examined how an endogenously determined capital flow composition affects the optimal design of capital controls.

This paper generalizes a standard debt-only small open economy model à la Bianchi (2011) by introducing equity issuance. Motivated by cross-country evidence on capital flow composition, we develop a framework in which domestic institutional quality affects the cost of issuing equity abroad and thereby shapes the structure of external liabilities. This framework generates richer predictions, allowing us to analyze how institutional reforms affect capital structure and financial stability, and how pecuniary externalities influence portfolio choices and the design of optimal capital controls when both debt and equity financing are available.

Empirically, institutional quality—such as control of corruption or judicial impartiality—is a key determinant of a country's external capital structure (see Wei 2000, Wei and Zhou 2018). Because equity does not promise a fixed payoff, its valuation depends more heavily on legal and institutional protections than debt. Debt contracts, in contrast, are less information-intensive and place fewer demands on investors (Holmstrom, 2015). Consequently, countries with weaker insti-

Figure 1 EQUITY SHARE AND INSTITUTIONAL QUALITY: RAW AND BIN SCATTER PLOTS



NOTE. The left panel shows the relationship between the equity share (percentage of total external liabilities) and domestic institutional quality from 1996 to 2015 for 113 developing countries. The right panel presents a bar scatter plot of the same relationship. The estimated slope is 10.50, with a t-statistic of 4.61. See Appendix A for data sources and variable construction, and Section 2 for additional regression results.

tutions tend to rely more on debt than equity. Figure 1 illustrates this mechanism, showing a strong positive relationship between institutional quality and the equity share of total external liabilities across emerging market economies during 1996–2015.

Guided by these facts, we build a model in which institutional quality affects the price at which domestic agents can sell equity to foreign investors, while debt issuance remains subject to a collateral borrowing constraint as in Mendoza (2010) and Bianchi (2011). Private agents optimally choose a portfolio of debt and equity. Pecuniary externalities arising from collateral constraints affect both instruments through their impact on the marginal valuation of wealth, which in turn shapes portfolio decisions (Korinek 2018). As a result, optimal policy in this environment generally involves capital controls on both debt and equity.

We study the quantitative implications of the model by matching observed features of external capital structure. We first compare our model, which allows for equity issuance, with the debt-only benchmark (Bianchi 2011). Allowing equity issuance reduces the cost of hitting the borrowing

constraint, making the constraint more likely to bind but also less severe in its consequences in terms of the decline in consumption. For example, the probability of a binding constraint rises from 7.31% to 11.91%. However, the severity of hitting the constraint also declines: the average consumption deviation falls from 13.68% to 9.72%. Hitting the constraint more often is therefore optimal, as improved risk sharing via equity reduces the precautionary motive on debt, allowing the economy to sustain higher total external liabilities. Even so, both the frequency and severity of very large fall-in-consumption events decline with equity issuance: the frequency falls from 4.31% to 4.17%, and the magnitude of consumption deviations falls from 17.71% to 16%. Overall, equity issuance mitigates the quantitative importance of the collateral debt constraint in generating crises and reduces the incidence and severity of extreme negative consumption growth events.

We also quantify the gains from moving from a debt-only economy to our economy with equity issuance. Introducing equity raises the equity share of total liabilities from 0 to 28%, which increases welfare by 0.11% of permanent consumption, quantitatively comparable to gains found in the capital controls literature. Moreover, these gains can become even larger if institutional quality improves further. For example, if institutional reforms raise the equity share to 65%, the welfare increases by 0.42% of permanent consumption, nearly four times larger. Where do these extra gains come from? We find that they arise primarily from a relaxed borrowing constraint. In transition dynamics, adding equity issuance initially boosts consumption before converging to a lower but smoother long-run path, providing both immediate and long-term benefits. Quantitatively, most of the welfare gains stem from these immediate effects.

We next examine the welfare effects of pecuniary externalities under equity issuance. As in debt-only models, the social planner behaves more cautiously than private agents by restricting external liabilities. Unlike in the debt-only economy, the planner can adjust both debt and equity issuance. In particular, the planner issues more equity than private agents when the debt constraint

binds—an *ex post* intervention that is absent in debt-only models. Consequently, the welfare gains from correcting pecuniary externalities may be smaller or larger than in debt-only economies. They may be smaller because equity issuance already mitigates constraint severity, but larger because the planner can optimally reallocate financing between debt and equity.

Our quantitative analysis finds that the welfare gains from correcting externalities are 0.11% of permanent consumption in the baseline economy, again comparable to those reported in the literature. We also compare these gains with those in the debt-only economy and find that they are slightly smaller than the 0.13% gain in the debt-only case, suggesting that equity issuance helps mitigate the welfare cost of pecuniary externalities.

We conduct a similar exercise on welfare gains from correcting externalities at different levels of institutional quality. The gains from correcting externalities are similar at all levels of institutional quality. More precisely, the welfare gains conditional on a higher level of institutions are about 0.12% of permanent consumption, slightly larger than in the baseline economy with poorer institutions, but the quantitative differences are small.

We also calculate optimal *ex ante* capital controls. In this model, taxes apply to both debt and equity, as both are affected by pecuniary externalities through the marginal valuation of wealth. Quantitatively, we find that *ex ante* taxes on equity are lower than on debt (1.64% vs. 2.95%), reflecting the superior risk-sharing properties of equity financing. Moreover, *ex ante* taxes on debt are smaller than in the debt-only economy (2.95% vs. 5.29%), consistent with the smaller welfare effects of correcting externalities under equity issuance.

Our final results compare the welfare effects of institutional reforms versus capital controls, highlighting distinct transmission channels. Institutional reforms, through equity issuance, enhance risk sharing and allow for greater external financing, while capital controls, conditional on the same level of institutional quality, restrain borrowing to limit externalities. Both mechanisms

reduce the cost of binding constraints and overall volatility, but through different channels: institutional reforms operate by improving risk sharing, whereas capital controls operate by limiting financing (a precautionary effect).

Because the economy is generally impatient, welfare gains from borrowing restrictions are moderate, whereas gains from institutional reforms can be substantial, depending on the extent of institutional improvement. These findings have important policy implications. For those countries for which it is politically feasible to reform institutions, strengthening institutional quality should be prioritized, as it delivers the largest risk-sharing benefits—especially when improvements are large—while capital controls serve as a second-order instrument, providing smaller, incremental gains by limiting borrowing and initial consumption. Of course, there may be countries for which institutional reforms are not feasible but there is some policy space to impose capital controls; they would have to manage with capital controls while living with their institutional quality. We leave the political-economy considerations of policy reforms to future research.

Literature Review. First, our paper relates to the literature on sudden-stop models with pecuniary externalities (e.g., Bianchi 2011, Benigno et al. 2013, Korinek 2018, Bianchi and Mendoza 2018, Jeanne and Korinek 2018, Ma 2020). These models typically consider only debt as a financial instrument and study the role of capital controls and macroprudential policies (see Rebucci and Ma 2020, Erten et al. 2021, Bianchi and Lorenzoni 2022 for recent surveys). Relative to this literature, we introduce equity flows, which allows us to analyze the superior risk-sharing properties of equity and how pecuniary externalities affect both debt and equity. Our approach is complementary to Bianchi and der Ghote (2024), who studies equity flows and aggregate demand externalities in the context of optimal monetary policy. Our finding that equity issuance reduces the effective cost of collateral constraints is consistent with the insight in Mendoza and Rojas (2019), who studies

the role of local-currency debt in sudden-stop models.

Second, this paper contributes to the literature on optimal policy in models with portfolio choice. For example, Bocola and Lorenzoni (2020), Gopinath and Stein (2021), Salomao and Varela (2022), Matschke (2023), Liu et al. (2024) analyze portfolio choices between local- and foreign-currency debt, while Bianchi et al. (2018), Arce et al. (2019), Ma and Matsumoto (2024) study the role of private debt and foreign exchange reserves. In contrast, we analyze portfolio choice between debt and equity. While Mendoza and Smith (2006, 2014) also consider both instruments, they do not study optimal policy. Our framework, therefore, provides a novel setting to evaluate capital control policies when equity financing is available.

Third, our paper contributes to the literature on institutional quality and international capital flows. For example, Alfaro et al. (2008) and Ju and Wei (2011) show that weak institutions reduce the volume of capital inflows, and Wei and Zhou (2018) documents that institutional quality shapes the composition of capital structure at both the country and firm levels. We provide a microfoundation in which institutional quality affects equity prices and, in equilibrium, the composition of external liabilities. Our key assumption is that institutional quality governs expropriation risk faced by foreign investors, consistent with Aguiar and Amador (2011), who emphasizes the importance of institutions for small open economies.

This paper is organized as follows. Section 2 documents stylized facts on the relationship between institutional quality and external capital structure that motivate our analysis. Section 3 presents the benchmark model. Section 4 provides the quantitative analysis. Section 5 concludes. Additional details are available in the Online Appendix.

2 Stylized Facts: Institutions and External Capital Structure

This section documents a robust empirical relationship between institutional quality and the composition of external liabilities as shown in Figure 1. Countries with stronger institutions rely more on foreign equity financing, motivating our model in which institutional quality affects the relative cost of equity and debt and thus external capital structure.

We assemble a panel of 113 developing economies for 1996–2015 from the External Wealth of Nations dataset (Lane and Milesi-Ferretti, 2007) and the Worldwide Governance Indicators (WGI). Our institutional quality measure is the simple average of six WGI indicators: control of corruption, government effectiveness, political stability, rule of law, regulatory quality, and voice and accountability.[1] These indicators capture governance features relevant for foreign investor protection and are highly correlated. See Appendix A for details.

Table 1 reports regressions of the equity share in external liabilities—defined as inward FDI plus portfolio equity liabilities divided by total external liabilities—on institutional quality. The relationship is positive, statistically significant, and economically meaningful. All variables are standardized. A one-standard-deviation increase in institutional quality is associated with 0.30 standard deviations of the equity share, equivalent to a 6.4 percentage point increase in the equity share. The result is robust to controls for GDP per capita, financial development, and trade openness. We estimate specifications with and without country fixed effects, always including year fixed effects. While the unconditional relationship weakens with country fixed effects, the conditional relationship strengthens, indicating that institutional quality is a time-varying determinant of external capital structure rather than a proxy for time-invariant country characteristics.

Overall, institutional quality strongly predicts reliance on equity-like external financing. These

[1] The results are robust to the use of different components of institutional quality measures. The corresponding results are reported in Table C3.

Table 1 EXTERNAL CAPITAL STRUCTURE AND INSTITUTIONAL QUALITY

	Equity Share (% in total liability)					
	(1)	(2)	(3)	(4)	(5)	(6)
Quality$_{t-1}$	0.30***	0.04*	0.13***	0.20**	0.26**	0.29***
	(0.02)	(0.02)	(0.03)	(0.10)	(0.11)	(0.10)
Financial Development$_{t-1}$		0.16***			-0.30***	
		(0.02)			(0.10)	
Private Credit$_{t-1}$			0.06***			-0.15**
			(0.02)			(0.07)
Log GDP per capita$_{t-1}$		0.15***	0.18***		-0.55**	-0.63**
		(0.03)	(0.03)		(0.26)	(0.25)
Trade$_{t-1}$		0.18***	0.16***		0.09	0.09
		(0.02)	(0.02)		(0.09)	(0.09)
Country FE	N	N	N	Y	Y	Y
Year FE	Y	Y	Y	Y	Y	Y
Observations	2128	1984	1961	2128	1984	1961
Adjusted R^2	0.316	0.381	0.362	0.787	0.802	0.800

NOTE. The dependent variable is equity share (portfolio equity and FDI) in total external liability. All independent variables are lagged by one year. We standardize all variables for ease of comparison. Standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

patterns motivate the model developed below, in which institutional quality determines the price of equity and the equilibrium composition of external liabilities.

3 Model

In this section, we extend a standard debt-only economy with a collateral borrowing constraint, as in Bianchi (2011), by allowing international equity financing. A trade-off between equity and debt financing occurs as institutional quality affects the cost of equity issuance. We characterize both the competitive equilibrium and the social planner's problem, and analyze optimal capital control policies on equity and debt for a given level of institutional quality.

3.1 Analytical Framework

We consider a small open economy (SOE) populated by a continuum of households. The world economy is also populated by a continuum of foreign investors who trade one-period bonds and equity shares with the SOE.

Households. Time $t \geq 0$ is discrete and has infinitely many periods. There are two goods, tradable and nontradable. The preference of households is given by

$$E_0 \left\{ \sum_{t=0}^{\infty} \beta^t u(c_t) \right\} \tag{1}$$

where $E_t(\cdot)$ is the time t expectation operator, and $\beta \in (0,1)$ is the discount factor. The period utility function $u(\cdot)$ has the constant-relative-risk-aversion (CRRA) form: $u(c_t) = \frac{c_t^{1-\gamma}}{1-\gamma}$, where $\gamma > 0$ is the coefficient of relative risk aversion. The consumption basket c_t is an Armington-type CES aggregator of tradable c_{Tt} and nontradable goods c_{Nt} given by

$$c_t = \left[\omega (c_{Tt})^{-\eta} + (1-\omega)(c_{Nt})^{-\eta} \right]^{-\frac{1}{\eta}}. \tag{2}$$

where $\omega \in (0,1)$ is the share of tradable consumption expenditure in the total consumption expenditure and $\frac{1}{1+\eta} > 0$ is the elasticity of substitution between tradable and non-tradable goods.

In each period, households receive endowments of tradable and nontradable goods, y_{Tt} and y_{Nt}. A fraction of the tradable endowment can be sold to foreign investors as dividends,

$$e_t \equiv \alpha y_{Tt}, \qquad \alpha \in [0,1], \tag{3}$$

where α is an exogenous parameter.[2] This assumption is equivalent to a Lucas tree that pays dividends $\{e_t\}_{t=0}^{\infty}$ correlated with tradable output.

Financial contracts. We consider two types of financial contracts: one-period debt denominated in units of tradables, with world gross interest rate $R > 1$; and an equity claim on the Lucas tree with dividend stream $\{e_t\}_{t=0}^{\infty}$. Normalizing the price of tradable goods to one and denoting the price of nontradable goods by p_{Nt}, the household budget constraint is given by

$$c_{Tt} + p_{Nt}c_{Nt} + Rd_t + s_t(e_t + q_t) + \frac{\kappa}{2}q_t(s_{t+1} - s_t)^2 = y_{Tt} + p_{Nt}y_{Nt} + d_{t+1} + s_{t+1}q_t \tag{4}$$

where d_{t+1} denotes debt issued at time t, $s_{t+1} \in [0,1]$ denotes the share of equity sold to foreigners, and q_t is the equity price, determined endogenously below. We introduce an adjustment cost for equity trading of the form $\frac{\kappa}{2}q_t(s_{t+1} - s_t)^2$, where $\kappa \geq 0$, to govern the degree of substitution between equity and debt financing. In the absence of this adjustment cost, agents would have a strong incentive to issue equity whenever the debt constraint binds. Consequently, the effective cost of hitting the borrowing constraint would be substantially reduced, making the constraint more likely to bind and weakening its disciplining role in the model. This mechanism is similar to that emphasized by Mendoza and Smith (2006, 2014). Introducing the adjustment cost does not alter the qualitative implications of the model but improves its quantitative performance, particularly in matching the relative volatility of equity and debt flows.

Collateral constraints. Following Bianchi (2011) and Korinek (2018), we assume that creditors impose a borrowing constraint requiring that external debt does not exceed a fraction ϕ of

[2] In the robustness section, we allow dividends to depend on nontradable output as well; the results are similar.

contemporaneous tradable and nontradable income:

$$d_{t+1} \leq \phi(y_{Tt} + p_{Nt} y_{Nt}) \tag{5}$$

This constraint plays a central role in debt-only models such as Bianchi (2011) and Korinek (2018). On the positive side, the literature uses it to model financial crises as episodes in which the constraint binds (see Mendoza 2010). On the normative side, it provides a rationale for policy intervention because it generates a pecuniary externality (see Korinek 2018 and Dávila and Korinek 2018).[3] We analyze how allowing equity issuance alters the quantitative behavior of the collateral constraint and its implications for both positive and normative outcomes.

We also assume that the equity shares s_{t+1} satisfies the following conditions

$$s_{t+1} \geq 0 \tag{6}$$

$$s_{t+1} \leq 1 \tag{7}$$

Constraint (6) captures that dividend income from the Lucas tree can only be provided by the SOE, while constraint (7) imposes a short-selling constraint on the SOE.

Institutional quality and equity payoff manipulation. We model institutional quality through its effect on incentives to manipulate equity payoffs. Equity payoffs are state-contingent and therefore more susceptible to manipulation than debt payoffs, which are state-independent. Foreign investors must collect and verify information about domestic states to assess equity returns, while domestic agents have superior information about the true income stream $\{e_t\}_{t=0}^{\infty}$. This information

[3] Ottonello et al. (2022) emphasize that the specification of the collateral constraint is critical for policy analysis. In particular, no policy intervention is warranted when the collateral constraint depends on future prices. However, for countries with nontrivial expropriation risk, it is unlikely that lenders would accept future income as collateral, so it is reasonable to define collateral over current income only.

asymmetry creates an incentive for domestic agents to misreport equity payoffs. Foreign investors cannot distinguish whether low observed dividends reflect adverse states or manipulation, and therefore discount equity payoffs in equilibrium, generating a deadweight loss. This setup corresponds to a Tirole-style moral hazard problem faced by foreign investors in a small open economy. We assume that the ability to manipulate equity payoffs depends on institutional quality: stronger institutions reduce misreporting by increasing the probability of detection, the severity of penalties, or both. Consequently, institutional quality affects equilibrium equity prices.

To formalize this mechanism, we assume that equity contracts are executed through a one-period intermediary. At the beginning of period t, the intermediary collects dividends e_t from domestic households and transfers them to foreign investors. In this process, the intermediary may underreport dividends as $(1-\bar{\kappa})e_t$, where $\bar{\kappa} \in [0,1]$. Foreign investors are aware of this incentive and may uncover the true dividend, potentially persuading local courts to punish the intermediary. If detected, the intermediary must pay a fine χe_t, with $\chi \in [\kappa, 1)$. The intermediary has an exogenous endowment w_t, assumed sufficient to cover the fine. If he avoids detection or punishment, the intermediary retains the misappropriated share $\bar{\kappa}e_t$ rather than giving it back to households. From the households' perspective, this diversion is a deadweight loss.

The expected profit of the intermediary from manipulating equity payoffs is

$$\pi_t = \max_{a_t \in \{\text{Manipulation}, \text{No Manipulation}\}} \left\{ w_t + \mathbf{1}_{a_t=\text{Manipulation}} \left[q\bar{\kappa} - (1-q)\chi \right] e_t \right\}, \tag{8}$$

where $\mathbf{1}_{a_t=\text{Manipulation}}$ is an indicator equal to one if the intermediary manipulates equity payoffs.

The intermediary's optimal decision satisfies

$$a_t^* = \begin{cases} \text{Manipulation}, & \text{if } q\bar{\kappa} - (1-q)\chi > 0, \\ \text{No Manipulation}, & \text{if } q\bar{\kappa} - (1-q)\chi \leq 0. \end{cases}$$

Define $\theta \equiv q\bar{\kappa} - (1-q)\chi$, which captures the expected fraction of payoffs diverted through manipulation. Manipulation occurs when $\theta > 0$, and its magnitude measures the strength of the incentive. We focus on $\theta \in [0,1]$, with $\theta = 0$ indicating no manipulation.

The parameter θ is a composite measure of institutional quality. A higher punishment parameter χ increases the cost of theft and reduces manipulation. The parameter $q \in [0,1]$ denotes the probability that foreign investors fail to recover their claims after misreporting; higher q reflects weaker institutional enforcement, for example due to poor accounting standards or judicial corruption. As a composite index, θ increases with q and $\bar{\kappa}$ and decreases with χ: higher θ corresponds to weaker institutions. This parameter also affects equilibrium equity prices, as it captures the expected loss faced by foreign investors in the small open economy.

Foreign investors. There is a continuum of risk-neutral foreign investors who trade in the SOE's equity shares. They discount future payoffs at the world interest rate R. From the foreign investors' perspective, equity payoff manipulation occurs when $\theta > 0$, reflecting the moral hazard problem arising from asymmetric information. The expected loss from equity investments is captured by θ. Consequently, investors discount dividend income by a fraction θ and require that the expected return on equity equals the world risk-free rate. Equity prices therefore satisfy

$$q_t = \frac{E_t\left[(1-\theta)e_{t+1} + q_{t+1}\right]}{R}. \tag{9}$$

The institutional quality parameter θ captures the overall strength of institutions. From the foreign investors' perspective, θ reflects expropriation risk, which may stem from government actions or well-connected private parties. Strong institutions restrain expropriation and increase foreign investors' willingness to provide equity financing. From the SOE's perspective, θ represents the deadweight loss associated with equity issuance, arising from intermediary misconduct and weak enforcement. This distortion can be interpreted as an iceberg cost of equity issuance for the SOE and as expropriation risk for foreign investors. In later analysis, we use θ as a broad measure of institutional quality to study its effects on equity issuance, external liability composition, and policy design. The debt-only model is nested as a special case with $\theta = 1$. In this case, equity is worthless ($q_t = 0$) and the economy optimally issues no equity, reducing the model to a standard debt-only framework as in Bianchi (2011).

3.2 Competitive Equilibrium

The competitive equilibrium in the economy is defined as an allocation $\{c_{Tt}, c_{Nt}, d_{t+1}, s_{t+1}\}_{t=0}^{\infty}$, the manipulation decision of the financial intermediaries $\{a_t\}_{t=0}^{\infty}$, the price of non-tradable goods $\{p_{Nt}\}_{t=0}^{\infty}$ and the price of SOE's equity contract $\{q_t\}_{t=0}^{\infty}$ such that: for an exogenous process of endowment $\{y_{Tt}, y_{Nt}\}_{t=0}^{\infty}$ and an initial value of $\{d_0, s_0\}$, (1) households maximize their utility (1) subject to the budget constraint (4), the collateral borrowing constraint (5) and the constraints on equity issuance (6) and (7); (2) financial intermediaries maximize their profit function (8); (3) both tradable and non-tradable good market clears; (4) the equity contract price is given by (9).

Recursive formulation. Since both the intermediaries' manipulation decision and the equity contract price are determined solely by the institutional quality parameter θ, we focus on the allocation $\{c_{Tt}, c_{Nt}, d_{t+1}, s_{t+1}\}_{t=0}^{\infty}$ in the subsequent analysis. It is convenient to rewrite the original

problem in recursive form. The state variables at time t include the endogenous variables $\{d_t, s_t\}$ and the exogenous state $\Theta_t \equiv \{y_{Tt}, y_{Nt}\}$. The optimization problem can then be written as follows, where $V^{CE}(d_t, s_t, \Theta_t)$ denotes the lifetime value function given the state variables, and the superscript "CE" indicates the competitive equilibrium allocation.

$$
\begin{aligned}
& V^{CE}(d_t, s_t, \Theta_t) = \max_{c_{Tt}, c_{Nt}, d_{t+1}, s_{t+1}} u(c_t) + \beta E_t \left[V^{CE}(d_{t+1}, s_{t+1}, \Theta_{t+1}) \right] \\
\text{s.t.} \quad & c_{Tt} + p_{Nt} c_{Nt} + R d_t + s_t(e_t + q_t) + \frac{\kappa}{2} q_t (s_{t+1} - s_t)^2 = y_{Tt} + p_{Nt} y_{Nt} + d_{t+1} + s_{t+1} q_t, (\lambda_t) \\
& d_{t+1} \leq \phi(y_{Tt} + p_{Nt} y_{Nt}), (\mu_t) \\
& s_{t+1} \geq 0, (v_t) \\
& s_{t+1} \leq 1. (u_t)
\end{aligned}
$$

The optimality conditions are given by

$$\lambda_t = u_{Tt} \tag{10}$$

$$p_{Nt} = \frac{1-\omega}{\omega} \left(\frac{c_{Tt}}{c_{Nt}} \right)^{\eta+1} \tag{11}$$

$$\lambda_t - \mu_t = \beta R E_t[\lambda_{t+1}] \tag{12}$$

$$\lambda_t q_t + v_t - u_t = \beta E_t[\lambda_{t+1}(e_{t+1} + q_{t+1})] + \kappa \Psi_t \tag{13}$$

where $u_{T,t} \equiv \frac{\partial u(c_t)}{\partial c_{Tt}}$, $\Psi_t \equiv \lambda_t q_t (s_{t+1} - s_t) - \beta E_t[\lambda_{t+1} q_{t+1}(s_{t+2} - s_{t+1})]$ and λ_t, μ_t, v_t, u_t are the Lagrangian multipliers for the budget constraint (4), the collateral borrowing constraint (5) and the constraints on equity issuance (6) and (7) respectively.

The first three optimality conditions are analogous to those in the standard debt-only model. Equation (10) implies that private agents' valuation of wealth equals their marginal utility. Equation (11) links the relative price of nontradable goods to the ratio of tradable to nontradable con-

sumption. Equation (12) is the Euler equation for debt issuance, where the collateral constraint introduces a wedge $\mu_t \geq 0$ when it binds.

The Euler equation (13) is the key new element of the model and equates the marginal benefit of equity issuance to its marginal cost. The marginal benefit consists of the external financing obtained through equity issuance, captured by $\lambda_t q_t$. The marginal cost reflects the future obligations associated with issuing equity, including the committed dividend payments and the repurchase value of equity shares, $\lambda_{t+1}(e_{t+1} + q_{t+1})$, as well as the transaction cost $\kappa\Psi_t$. In addition, the Lagrange multipliers $\{v_t, u_t\}$ capture the possibility of corner solutions in equity issuance, corresponding to cases in which the optimal equity share is either zero or one.

Allowing for equity issuance introduces a portfolio choice problem into the model. It is therefore useful to combine the Euler equations for debt and equity with the equity pricing equation in order to characterize the relative trade-off between equity and debt financing.

$$u_t - v_t = \underbrace{q_t \mu_t}_{\text{Cost of debt issuance}} \underbrace{-\beta \text{Cov}_t(\lambda_{t+1}, (1-\theta)e_{t+1} + q_{t+1})}_{\text{Diversification benefit}} - \underbrace{\theta\beta E_t[\lambda_{t+1} e_{t+1}]}_{\text{Cost of equity issuance}} - \underbrace{\kappa\Psi_t}_{\text{Transaction cost}}$$

The left-hand side summarizes the relative benefit of equity issuance versus debt issuance, $u_t - v_t$, which consists of four components. The first component is the cost of debt issuance, captured by $q_t \mu_t$. Because only debt issuance is subject to the collateral constraint, while equity issuance is not, the borrowing constraint increases the relative attractiveness of equity financing. As a result, the economy substitutes toward equity issuance, which relaxes financing pressures and encourages higher debt issuance, raising the likelihood of reaching the borrowing limit. Consequently, a model with equity issuance tends to generate a higher probability that the collateral constraint binds than an otherwise identical debt-only economy.

The second component captures the diversification benefit of equity issuance, reflected in the

negative covariance between the marginal valuation of wealth λ_{t+1} and the dividend payoff plus market value of equity $(e_{t+1} + q_{t+1})$. This represents the standard advantage of equity over debt: equity payments move with income, whereas debt payments are fixed.

The third component reflects the expected cost of equity issuance arising from weak institutional quality. Parameter θ represents the expected loss faced by foreign investors in domestic equity. Accordingly, the equity price is discounted by θ relative to expected dividends. Quantitatively, average equity issuance declines as θ increases, consistent with empirical evidence.

The final component is the transaction cost associated with equity issuance which follows Mendoza and Smith (2006, 2014). These costs primarily affect the second moments of equity issuance and vanish in the stochastic steady state ($s_t = s_{t+1} = s_{t+2}$). They serve to reduce the substitution of equity for debt, making equity issuance less responsive to external shocks. When the borrowing constraint binds, the economy cannot adjust equity issuance quickly to offset lost debt financing. This feature aligns with empirical regularities showing that equity flows are less volatile than debt flows during crises (Tong and Wei 2010).

In our quantitative exercise, we calibrate the institutional quality parameter θ to match the equity share in total liabilities, since it determines the optimal level of equity issuance. Consider a stochastic economy in which the borrowing constraint does not bind ($\mu_t = 0$) and there is no transaction cost ($\kappa = 0$). If institutional quality is very high ($\theta = 0$), the economy issues equity at the maximum level, $s^*_{t+1} = 1$, and $u_t > 0$. Conversely, if institutional quality is very low, the right-hand side of the equity Euler equation is negative, and equity issuance falls to the minimum, $s^*_{t+1} = 0$, with $v_t > 0$. Only for intermediate values of θ does equity issuance occur at an interior level. As transaction cost κ affects only second moments, we choose it to match the relative volatility of debt and equity flows, while the first moment of equity issuance depends mainly on θ.

3.3 Optimal Policy Intervention

Our model features a pecuniary externality, as in Bianchi (2011) and Korinek (2018), arising from price-dependent collateral borrowing constraints. Competitive equilibrium allocations are therefore generally suboptimal. Specifically, a vicious loop exists between aggregate spending, collateral values, and external borrowing: when the collateral constraint binds, private agents reduce spending, which lowers the price of nontradable goods, depresses collateral values, and tightens borrowing constraints further. This feedback reduces both external borrowing and aggregate spending. Importantly, private agents do not internalize the effect of their collective actions on nontradable prices and collateral values when making *ex ante* financing decisions, leading to excessive borrowing relative to the socially efficient level.

Introducing equity transforms the model into a portfolio choice framework. Because the pecuniary externality originates from the collateral constraint, which applies only to debt, it is important to examine how equity issuance affects the welfare cost of the externality and how the externality influences portfolio decisions. To study this, we introduce a social planner who internalizes the general equilibrium effects of nontradable prices on the collateral constraint. We denote the planner's allocation with the superscript "SP", and the optimization problem can then be written as follows, where $V^{SP}(d_t, s_t, \Theta_t)$ denotes the lifetime value function given the state variables.

$$
\begin{aligned}
& V^{SP}(d_t, s_t, \Theta_t) = \max_{c_{Tt}, d_{t+1}, s_{t+1}} u(c_t) + \beta E_t \left[V^{SP}(d_{t+1}, s_{t+1}, \Theta_{t+1}) \right] \\
\text{s.t.} \quad & c_{Tt} + R d_t + s_t(q_t + \alpha y_{Tt}) + \frac{\kappa}{2}(s_{t+1} - s_t)^2 q_t = y_{Tt} + d_{t+1} + s_{t+1} q_t, \left(\lambda_t^{SP} \right) \\
& d_{t+1} \leq \phi \left[y_{Tt} + \frac{1-\omega}{\omega} \left(\frac{c_{Tt}}{y_{Nt}} \right)^{\eta+1} y_{Nt} \right], \left(\mu_t^{SP} \right) \\
& s_{t+1} \geq 0, \left(v_t^{SP} \right) \\
& s_{t+1} \leq 1, \left(u_t^{SP} \right)
\end{aligned}
$$

The optimality conditions are given by

$$\lambda_t^{SP} = u_{Tt} + \mu_t^{SP}\phi\frac{1-\omega}{\omega}(1+\eta)\left(\frac{c_{Tt}}{y_{Nt}}\right)^{\eta} \tag{14}$$

$$\lambda_t^{SP} - \mu_t^{SP} = \beta R E_t\left[\lambda_{t+1}^{SP}\right] \tag{15}$$

$$\lambda_t^{SP} q_t + v_t^{SP} - u_t^{SP} = \beta E_t\left[\lambda_{t+1}^{SP}(e_{t+1}+q_{t+1})\right] + \kappa\Psi_t^{SP} \tag{16}$$

where $\Psi_t^{SP} \equiv \lambda_t^{SP} q_t(s_{t+1}-s_t) - \beta E_t\left[\lambda_{t+1}^{SP} q_{t+1}(s_{t+2}-s_{t+1})\right]$, and λ_t^{SP}, μ_t^{SP}, v_t^{SP}, and u_t^{SP} are the Lagrange multipliers associated with the budget constraint, the collateral borrowing constraint, and the two equity issuance constraints, respectively.

Equation (14) gives the social planner's valuation of wealth, which differs from the private agents' valuation in equation (10) by an additional term. This term is the standard pecuniary externality, $\mu_t^{SP}\phi\frac{1-\omega}{\omega}(1+\eta)\left(\frac{c_{Tt}}{y_{Nt}}\right)^{\eta}$, and reflects the fact that the planner values wealth more because of the general equilibrium effects of nontradable prices on collateral constraints when the constraint binds ($\mu_t^{SP} > 0$). Because the social valuation exceeds the private valuation, the competitive equilibrium exhibits an overborrowing problem, consistent with the existing literature.

Equations (15) and (16) are the Euler equations for bond and equity issuance chosen by the social planner, respectively. Compared with the Euler equations of private agents in (12) and (13), the planner's valuation of wealth differs from that of private agents, as discussed above, which alters the marginal benefits and costs of both bond and equity financing. In particular, when the constraint is not binding at time t, i.e., $\mu_t^{SP} = 0$, the economy exhibits an overborrowing (or overissuance) problem in both debt and equity. This follows from the fact that the marginal benefits are identical when the constraint is not binding, whereas the marginal costs are higher under the planner due to a higher future marginal valuation of wealth, $\lambda_t^{SP} > \lambda_t$, which increases the marginal

cost of both equity and debt issuance.[4]

Because of the pecuniary externality, the social planner and private agents choose different allocations. To implement the planner's allocation, we assume the planner has access to capital control taxes on debt and equity issuance, $\{\tau_t^d, \tau_t^s\}$, along with a lump-sum transfer $T_t = \tau_t^d d_{t+1} + q_t s_{t+1} \tau_t^s$. The budget constraint of private agents then becomes

$$c_{Tt} + p_{Nt} c_{Nt} + Rd_t + s_t(e_t + q_t) + \frac{\kappa}{2}(s_{t+1} - s_t)^2 q_t = y_{Tt} + p_{Nt} y_{Nt} + d_{t+1}\left(1 - \tau_t^d\right) + q_t s_{t+1}\left(1 - \tau_t^s\right) + T_t$$

The social planner's allocation can then be implemented by choosing

$$\tau_t^d = 1 - \frac{\lambda_t^{DP} - \beta R E_t\left[\lambda_{t+1}^{DP} - u_{Tt+1}\right]}{u_{Tt}} \tag{17}$$

$$\tau_t^s = 1 - \frac{\lambda_t^{DP} q_t - \beta E_t[(\lambda_{t+1}^{DP} - u_{Tt+1})(e_{t+1} + q_{t+1})]}{u_{Tt} q_t} + \kappa \frac{\Psi_t^{SP} - \Psi_t}{u_{Tt} q_t} \tag{18}$$

4 Quantitative Analysis

To study the quantitative impact of equity issuance, we calibrate our model and compare its implications with a debt-only economy. We also examine the welfare effects of pecuniary externalities by computing both the competitive equilibrium and the constrained-efficient allocations. The model is solved using global nonlinear methods following Cao et al. (2023), and details of the numerical procedure are provided in Appendix D.

[4] Indeed, the higher marginal valuation of wealth under the social planner also affects the transaction cost term, but this effect is quantitatively small and does not alter the overborrowing result for equity issuance when the collateral constraint does not bind in the quantitative exercise.

4.1 Calibration

Each period in the model represents one year. To facilitate comparison, we adopt the calibration parameters directly from Bianchi (2011), as reported in Table 2. Specifically, the coefficient of relative risk aversion is set to $\gamma = 2$, a standard value in the literature; the global risk-free rate ($r = R - 1$) is fixed at 4%; the share of tradable goods is $\omega = 0.31$; the elasticity of substitution $1/(1+\eta)$ is set to 0.83; the discount factor is $\beta = 0.91$; and the collateral borrowing constraint coefficient is $\phi = 0.32$. The discount factor and the collateral constraint parameter are particularly important in this class of models, as they are typically chosen to jointly match the net foreign liability-to-GDP ratio and the probability of binding borrowing constraints. As shown below, introducing equity flows changes both the level of external liabilities and the severity and frequency of binding debt constraints. We therefore do not recalibrate these two parameters and instead adopt their values from Bianchi (2011), which studies a debt-only economy, allowing for a direct comparison of model moments. The endowment process is also taken from Bianchi (2011) and is assumed to follow a first-order bivariate autoregressive process:

$$\log \begin{bmatrix} y_{Tt} \\ y_{Nt} \end{bmatrix} = \begin{bmatrix} 0.901 & 0.495 \\ -0.453 & 0.225 \end{bmatrix} \log \begin{bmatrix} y_{T,t-1} \\ y_{N,t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{Tt} \\ \varepsilon_{Nt} \end{bmatrix},$$

$$\text{where } \begin{bmatrix} \varepsilon_{Tt} \\ \varepsilon_{Nt} \end{bmatrix} \sim \mathcal{N}(0, V), \quad V = \begin{bmatrix} 0.00219 & 0.00162 \\ 0.00162 & 0.00167 \end{bmatrix}.$$

There are three parameters unique to our model, namely $\{\alpha, \theta, \kappa\}$. We choose them jointly to match three moments in the simulation. The dividend parameter $\alpha = 0.1090$ to match the average dividend payout ratio of 3.48% for Argentinian firms from 1995 to 2013 (Benavides et al. 2016). The institutional quality parameter $\theta = 0.6081$ is chosen to match the average equity share in total

Table 2 CALIBRATION AND PARAMETER VALUES

Description	Parameter Value	Target/Source
Standard parameters in debt-only model		
Gross interest rate	$R = 1.04$	Bianchi (2011)
Risk aversion	$\gamma = 2$	Standard value in DSGE-SOE
Tradable good weight	$\omega = 0.31$	Bianchi (2011)
Elasticity of substitution	$\frac{1}{1+\eta} = 0.83$	Bianchi (2011)
Discount factor	$\beta = 0.91$	Bianchi (2011)
Credit parameter	$\phi = 0.32$	Bianchi (2011)
Income process	Persistence and volatility	Bianchi (2011)
Parameters specific to our model		
Dividend parameter	$\alpha = 0.11$	Average dividend payout ratio = 3.48% (Benavides et al. 2016)
Institutional quality	$\theta = 0.61$	Equity/Net foreign liability=28%
Equity transaction cost	$\kappa = 9.75$	Relative volatility of debt to equity flows=4.52

external liabilities of 28%, corresponding to the average value for Argentina during 1980–2019, the same country used by Bianchi (2011) for calibration. The transaction cost parameter $\kappa = 9.75$ is chosen to match the relative volatility of debt flows to GDP ratio to equity flows to GDP ratio in the data from 1980 to 2019 at 4.52.

4.2 Comparing with a Debt-only Economy

The key departure of our model from Bianchi (2011) is the introduction of equity flows. We therefore seek to understand the importance of this change, which can also be interpreted as a reform of institutions that allows the economy to access equity issuance in addition to debt issuance. For this purpose, we compare our economy with a debt-only economy.

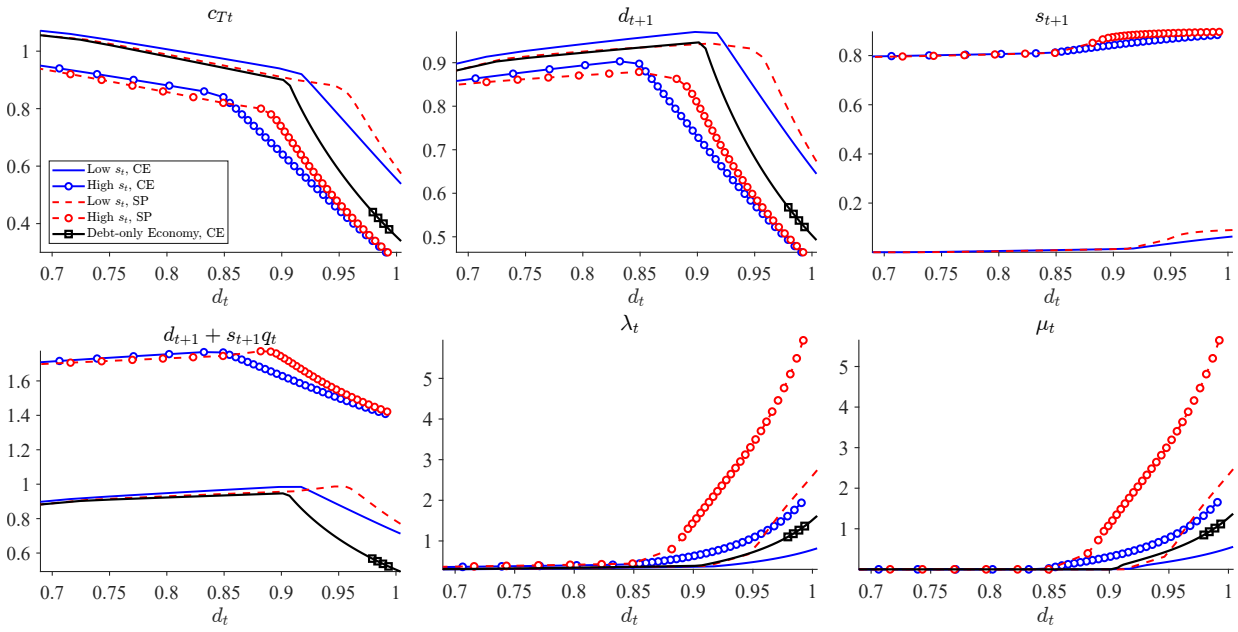
The debt-only model can be nested within our framework by setting institutional quality to $\theta = 1$. In this case, the equity price is zero and the economy optimally issues no equity. We quantitatively confirm that this economy generates allocations identical to those in Bianchi (2011). Accordingly, in the analysis below, we label the economy with $\theta = 1$ as the debt-only economy and compare it with our baseline economy, where $\theta = 0.61$ and all other parameters are held constant.

We compare policy functions and long-run simulation moments under the competitive equilibrium in both economies. The transition from $\theta = 1$ to $\theta = 0.61$ can be interpreted as an improvement in institutional quality that relaxes equity market frictions, or equivalently as a move from an economy without equity market access to one with partial access, where equity prices are discounted by institutional frictions. As a robustness check, we also consider an economy with $\theta = 0.4$, representing even stronger institutions, to evaluate the sensitivity of our results to the degree of institutional quality improvement.

Policy functions. Policy functions depend on two endogenous state variables, debt d_t and equity issuance s_t, and two exogenous income states, $\{y_{Tt}, y_{Nt}\}$. To present them clearly, we first plot policy functions by setting exogenous income two standard deviations below its mean. We then set initial equity issuance to $s_t = 0$ and present policy functions as a function of the initial debt level d_t, which facilitates a comparison with the existing literature, such as the debt-only model in Bianchi (2011), where policy functions depend on a single endogenous state variable. To illustrate the role of initial equity issuance, we also present policy functions with $s_t = 0.8$. We refer to $s_t = 0$ as low equity issuance and $s_t = 0.8$ as high equity issuance. All policy functions are shown in Figure 2.

Consistent with the literature, higher initial debt reduces tradable consumption c_{Tt}, generating a downward-sloping consumption function in both economies. The consumption function exhibits a kink at high debt levels, reflecting the binding collateral constraint, as indicated by a positive Lagrange multiplier μ_t and a higher marginal value of wealth λ_t. Relative to the debt-only economy, access to equity issuance allows the economy to sustain higher consumption at a given debt level. This is because the economy can issue more external liabilities, as reflected in higher total external liabilities, $d_{t+1} + q_t s_{t+1}$, than in the debt-only economy. Moreover, the consumption function is flatter in the baseline economy, especially when the constraint binds, indicating improved

Figure 2 POLICY FUNCTIONS



NOTE. This figure plots the policy functions $x(d_t, s_t, \theta_t)$ for $x \in \{c_{Tt}, d_{t+1}, s_{t+1}, d_{t+1} + s_{t+1}q_t, \lambda_t, \mu_t\}$, conditional on the income shocks $\{y_{Tt}, y_{Nt}\}$ being two standard deviations below their means. The policy functions are shown as functions of the initial level of debt d_t and are conditional on two initial equity share levels: a low equity share ($s_t = 0$) and a high equity share ($s_t = 0.8$). Solid blue lines represent the competitive equilibrium, while dashed red lines represent the social planner's problem. In addition, we plot the policy functions for tradable consumption, debt issuance, total liability, marginal valuation of wealth, and the Lagrangian multiplier from the debt-only economy (setting the institutional parameter $\theta = 1$) as functions of d_t, conditional on the same income shock realization and $s_t = 0$, marked by black lines with squares.

consumption smoothing relative to the debt-only economy.

Next-period debt issuance d_{t+1} displays the familiar non-monotonic relationship with initial debt. When the collateral constraint is slack, debt issuance increases with d_t; once the constraint binds, further increases in d_t require a reduction in d_{t+1}, giving rise to a "vicious loop" emphasized in the literature. Relative to the debt-only economy, the baseline economy issues more debt for any given initial debt level. As equity financing improves risk sharing and mitigates the cost of binding constraints, it reduces the precautionary motive associated with the constraint and allows the economy to sustain higher debt issuance.

Equity issuance s_{t+1} is a novel decision margin in our framework. It generally increases with

initial debt, unlike the non-monotonic debt issuance, because equity issuance is not directly subject to the collateral constraint. However, its sensitivity to initial debt depends on whether the constraint binds. When the borrowing constraint is slack, equity issuance responds weakly to initial debt because it is costly due to poor institutional quality. When the constraint binds, the economy substitutes toward equity issuance, which becomes the primary source of external financing and therefore rises more strongly as debt issuance declines.

Comparing policy functions across the baseline and debt-only economies, we find that access to equity allows the economy to obtain more financing and sustain higher consumption. Higher borrowing is not necessarily detrimental, as risk sharing improves, as seen by a flatter consumption function. Moreover, the debt threshold at which the constraint starts to bind increases in the baseline economy relative to the debt-only economy. These features imply that both the frequency and severity of big consumption decline events are mitigated by the availability of equity financing.

Although equity improves risk sharing, it also increases outstanding liabilities. Comparing low- and high-equity states, a higher initial equity position lowers consumption and raises the marginal value of wealth, reflecting a larger liability burden. It also reduces debt issuance and increases equity issuance, because the equity transaction cost depends on the initial equity position and encourages smoothing equity adjustments rather than substituting toward debt. Even with lower debt issuance, a higher initial equity position makes the collateral constraint more likely to bind, because outstanding equity liabilities increase total external liabilities and reduce collateral values through lower consumption and nontradable prices. Overall, the economy trades off improved risk sharing against higher liability burdens when choosing its external liability portfolio.

Long-run moments. We also compare the two economies by examining long-run moments. We simulate each economy for 81,000 periods, discard the first 1,000 periods, and compute moments

using the remaining 80,000 observations. All economies are simulated using the same sequence of exogenous income shocks. Results are reported in Table 3.

Column (2) reports results for the baseline economy with $\theta = 0.6$, chosen to match an equity share of 28% in total external liabilities. The model matches targeted moments well. The equity share is exactly 28%, the relative volatility of debt to equity flows is 4.51 (compared to 4.52 in the data), and the dividend payout ratio is 3.60% (versus 3.48% in the data). Other moments are broadly consistent with empirical regularities for emerging market economies. For example, the model generates a countercyclical current account-to-GDP ratio (the correlation between the current account-to-GDP ratio and GDP is -0.64), a typical feature of emerging markets.

Relative to the debt-only economy in column (1), total net foreign liabilities increase from 29% to 44% of GDP, reflecting the introduction of equity liabilities. Focusing on net foreign *debt*, the model delivers a ratio of 30%, close to the debt-only benchmark, indicating that equity issuance does not materially alter equilibrium debt levels, which remain disciplined by the collateral constraint. Equity issuance instead expands total liabilities by adding equity on top of debt. Transaction costs associated with equity issuance are small—about 3.27 basis points of GDP—suggesting that the transaction cost primarily serves to discipline equity flow volatility.

A key feature of the debt-only model in Bianchi (2011) is the use of a binding collateral constraint to characterize rare events such as financial crises. Allowing equity issuance reduces the cost of binding constraints, making constraint binding episodes more frequent but less severe. In the simulation, the frequency of binding constraints rises from 7.31% to 11.91%, while the severity of constraint episodes, measured by the average consumption deviation from its ergodic mean, declines from -13.68% to -9.72%. This is consistent with the policy functions: equity issuance effectively relaxes the borrowing constraint on debt, lowering the precautionary motive and increasing the likelihood that the constraint binds. As a result, the frequency of binding constraints

Table 3 SIMULATION RESULTS

	Competitive Equilibrium (CE)			Social Planner (SP)		
	Zero Equity (1)	Baseline (2)	More Equity (3)	Zero Equity (4)	Baseline (5)	More Equity (6)
Institutional quality parameters	1.00	0.61	0.40	1.00	0.61	0.40
Average equity price	0.00	1.07	1.64	0.00	1.07	1.64
Average dividend payout ratio	0.035	0.036	0.038	0.035	0.035	0.038
Average equity issuance	0.00	0.39	0.98	0.00	0.09	0.98
Average equity share	0.00	0.28	0.65	0.00	0.08	0.65
Relative volatility of debt to equity flows	Inf	4.51	7.49	Inf	1.41	2.18
Average equity transaction cost (in GDP, bps)	0.00	3.27	0.78	0.00	3.15	0.91
Net foreign liability (equity, in GDP)	0.00	0.14	0.56	0.00	0.03	0.56
Net foreign liability (debt, in GDP)	0.29	0.30	0.30	0.29	0.30	0.30
Net foreign liability (in GDP)	0.29	0.44	0.86	0.29	0.33	0.85
Average consumption (c_t)	0.99	0.97	0.95	0.99	0.99	0.95
std(c_t)	0.058	0.055	0.055	0.052	0.049	0.050
corr(c_t, y_{Tt})	0.89	0.89	0.90	0.92	0.92	0.92
mean(current account/GDP)	0.00	0.00	0.00	0.00	0.00	0.00
std(current account/GDP)	0.027	0.020	0.022	0.006	0.007	0.006
corr(current account/GDP, GDP)	-0.75	-0.64	-0.70	-0.03	0.32	0.00
Frequency of rare events (%)						
Event 1: large negative consumption collapse	4.31	4.17	4.26	1.92	0.87	1.96
Event 2: large capital outflows	3.72	2.91	3.06	0.06	0.02	0.07
Event 3: binding constraints	7.31	11.91	8.39	0.55	4.56	2.97
Average consumption collapse in rare events (%)						
Event 1: large negative consumption collapse	-17.71	-16.00	-16.92	-12.87	-12.69	-12.93
Event 2: large capital outflows	-18.25	-16.79	-18.12	-15.44	-16.24	-16.85
Event 3: binding constraints	-13.68	-9.72	-12.40	-11.32	-9.11	-10.08
Welfare effects (relative to column 1, %)		0.11	0.42	0.13	0.21	0.52
of which: from the first period		0.98	2.58	-0.76	0.53	2.08
of which: from the remaining periods		0.01	0.19	0.23	0.18	0.35
Welfare effects (relative to corresponding CE, %)				0.13	0.11	0.12
of which: from the first period				-0.76	-0.39	-0.56
of which: from the remaining periods				0.23	0.16	0.19
Capital control taxes (%)						
on debt (τ^d)				0.93	0.67	0.71
on equity (τ^s)				-	0.68	0.65
on debt (τ^d, *ex ante*)				5.29	2.95	2.98
on equity (τ^s, *ex ante*)				-	1.64	2.56
on debt (τ^d, *ex post*)				0.00	-47.03	-73.44
on equity (τ^s, *ex post*)				-	-19.46	-61.77

NOTE. Moments are computed from simulations of 81,000 periods. The first 1,000 periods are discarded, and the remaining 80,000 observations are used to compute ergodic moments. Columns (1)–(3) report competitive equilibrium outcomes for economies with institutional quality $\theta = 1, 0.61$, and 0.4, respectively. Columns (4)–(6) report the corresponding social planner outcomes for the same values of θ. Rare Event 1 is defined as a realization in which consumption deviates from its ergodic mean by more than two standard deviations of the ergodic consumption distribution in the benchmark economy (column 1). Rare Event 2 is defined analogously for net capital outflows. Welfare effects relative to column (1) are reported as consumption-equivalent variations, computed using the ergodic distribution generated by the benchmark economy and averaged over that distribution. Welfare decompositions report the contributions of current utility and continuation value. Welfare effects relative to the corresponding competitive equilibrium are computed by comparing competitive equilibrium and social planner outcomes conditional on the same θ.

becomes a less informative indicator of crises.

We therefore define crises using outcome-based measures: (i) large consumption collapses and (ii) large net capital outflows, both defined as deviations exceeding two standard deviations from their ergodic distributions. These measures are commonly used to characterize crises in emerging market economies. To ensure comparability, we use thresholds computed from the debt-only economy and report both the frequency and severity of these rare events in both economies. Relative to the debt-only benchmark, both the frequency and severity of rare events decline when equity issuance is allowed. Specifically, the frequency of consumption collapse events falls from 4.31% to 4.17%, and severity declines from -17.71% to -16.00%. Similar patterns arise when crises are defined using large net capital outflow events, a typical feature of sudden stops.

Comparing long-run moments across the debt-only and baseline economies, we find that the economy becomes smoother when equity issuance is allowed, as both the frequency and severity of rare events are mitigated. This is also reflected in a lower standard deviation of consumption, which declines from 0.058 to 0.055. These results indicate improved macroeconomic stability. We also observe that average consumption is lower in the baseline economy. This occurs because the economy is able to borrow more when equity is available, and higher long-run external liabilities reduce steady-state consumption.

To confirm this intuition, we conduct a transition dynamics analysis in Figure A1. We simulate the debt-only economy for 80 replications over 1,000 periods. In each simulation, at period 1 and given an initial debt level d_1, we allow the economy to access equity markets with institutional quality $\theta = 0.61$. We then study the transition from the debt-only economy to the baseline economy. Consistent with our analysis, the economy initially borrows more and increases consumption, which subsequently declines as it converges to a new steady state with higher total external liabilities. During the transition, the baseline economy begins to issue equity and substitute away from

debt, so debt liability converges to a lower level while equity liability rises. The exact composition of debt and equity in the long run depends on institutional quality and the equity price; thus, long-run debt is not necessarily higher than in the debt-only economy. However, total external liabilities are higher, allowing the economy to borrow more initially to finance consumption. Because the economy is impatient, this higher initial consumption generates welfare gains, as quantified below.

Welfare. We quantify gains of moving from the debt-only economy to the baseline economy by comparing value functions evaluated at the same initial debt level and zero equity issuance:

$$\Delta(d_t, \Theta_t) = \left(\frac{V^{\text{baseline}}(d_t, s_t = 0, \Theta_t)}{V^{\text{debt-only}}(d_t, s_t = 0, \Theta_t)} \right)^{\frac{1}{1-\gamma}} - 1. \tag{19}$$

The welfare calculation follows the capital controls literature and is therefore directly comparable to existing estimates. We find that the welfare gain from allowing equity issuance is approximately 0.11% of permanent consumption, comparable to estimates in the capital controls literature (e.g., Bianchi 2011). To decompose the sources of welfare gains, we note that the value function can be written as $V_t = u(c_t) + \beta E_t[V_{t+1}]$, which consists of contemporaneous utility and the continuation value, which primarily reflects steady-state outcomes. We compare each component of the value function across the two economies using a similar calculation method as above.

We find that welfare gains from contemporaneous consumption are equivalent to a 0.98% increase in permanent consumption, whereas gains from future utility amount to only 0.01%. Note that the overall welfare gain is not the simple sum of these components due to the nonlinear transformation used in the calculation. Nonetheless, the results clearly indicate that most gains arise from higher contemporaneous consumption. The economy also benefits from smoother future consumption, but these gains are smaller because the long-run steady-state level of consumption is lower. This finding is consistent with the transition dynamics discussed above. Overall, access to

equity raises welfare by relaxing borrowing capacity and reducing consumption volatility.

In sum, allowing equity issuance in a debt-only economy is beneficial because it lowers the cost of binding constraints. This enables the economy to borrow more and achieve better risk sharing. Although the frequency of binding constraints rises, their cost is reduced, weakening the role of the collateral constraint in characterizing financial crises in such models. Equity issuance provides an additional channel to hedge against downside risk, which reduces both the frequency and severity of rare events and smooths consumption. These improvements translate into welfare gains, with most of the benefits arising from higher initial consumption during the transition.

Furthermore, these results are not specific to the transition from a debt-only economy to our baseline economy. They also hold when moving from a debt-only economy to one with even better institutional quality ($\theta = 0.4$), as shown in columns (1) and (3) of Table 3. The only difference is that the welfare effects of the transition are larger, because better institutional quality implies a higher equity price and thus greater borrowing capacity.

4.3 Optimal Policy Analysis

We next study the effects of pecuniary externalities in our economy by comparing the competitive equilibrium (CE) with the social planner's (SP) allocation in the baseline economy. As before, we first examine policy functions and then turn to long-run simulation moments and welfare. In addition, we analyze the implied capital control taxes on both equity and debt.

Policy functions. Figure 2 also plots policy functions under the competitive equilibrium and the social planner's allocation (red dashed lines). Consistent with the literature, the planner behaves more cautiously when the collateral constraint is slack. In particular, she chooses lower tradable consumption and lower net foreign liabilities—both debt and equity—than private agents. This be-

havior reflects the planner's internalization of the pecuniary externality, which raises the marginal value of wealth. As a result, the economy is more resilient to crises under the planner's allocation, as indicated by a higher debt threshold at which the collateral constraint begins to bind.

A key difference relative to the debt-only economy is that, in our framework, the planner can adjust allocations even when the debt constraint binds. With both debt and equity as decision margins, the planner can intervene *ex post* by reallocating financing toward equity to mitigate the severity of a binding debt constraint. This margin is absent in debt-only models, where the planner cannot alter allocations once the constraint binds.

The planner's equity issuance reflects this distinction. When the constraint is slack, the social planner chooses lower equity issuance than private agents, reflecting a precautionary motive. When the constraint binds, however, the planner issues more equity, as equity becomes the only available instrument to relax the effective tightness of the borrowing constraint. This *ex post* intervention incentive is consistent with the mechanisms emphasized in Benigno et al. (2013).

Long-run moments. The planner's precautionary behavior is also evident in the long-run moments. Comparing columns (2) and (5) in Table 3, the social planner chooses a substantially lower net foreign liability–to–GDP ratio than the competitive equilibrium (0.44 vs. 0.33). Most of this reduction comes from lower equity issuance: the net equity liability–to–GDP ratio falls from 0.14 to 0.03, reflecting an *ex ante* precautionary motive. At the same time, equity is used more actively as a stabilization instrument, as reflected in the lower relative volatility of debt to equity flows under the planner (1.41 versus 4.51 in the competitive equilibrium). This pattern reflects *ex post* intervention by the planner. As a result, the economy exhibits smoother dynamics and lower macroeconomic volatility, with both the frequency and severity of rare events—including binding constraint episodes—significantly reduced. For example, the frequency of large consump-

tion collapses declines from 4.17% in the CE to 0.87% in the SP, and the severity (measured by consumption deviations) falls from -16% to -12.69%.

These findings are consistent with the macroprudential policy literature: the planner mitigates pecuniary externalities by reducing external borrowing and restraining consumption. Relative to a debt-only economy, the planner has an additional policy margin—*ex post* intervention through equity issuance—to alleviate the cost of binding constraints. However, the overall effect of allowing equity issuance on the benefits of policy intervention is theoretically ambiguous. On the one hand, equity issuance reduces the cost of binding constraints and thus attenuates the welfare impact of pecuniary externalities. On the other hand, equity provides the planner with an additional *ex post* stabilization tool, which could increase the gains from policy intervention relative to a debt-only environment. We therefore turn to a quantitative analysis of welfare gains from policy intervention and compute the implied capital control taxes.

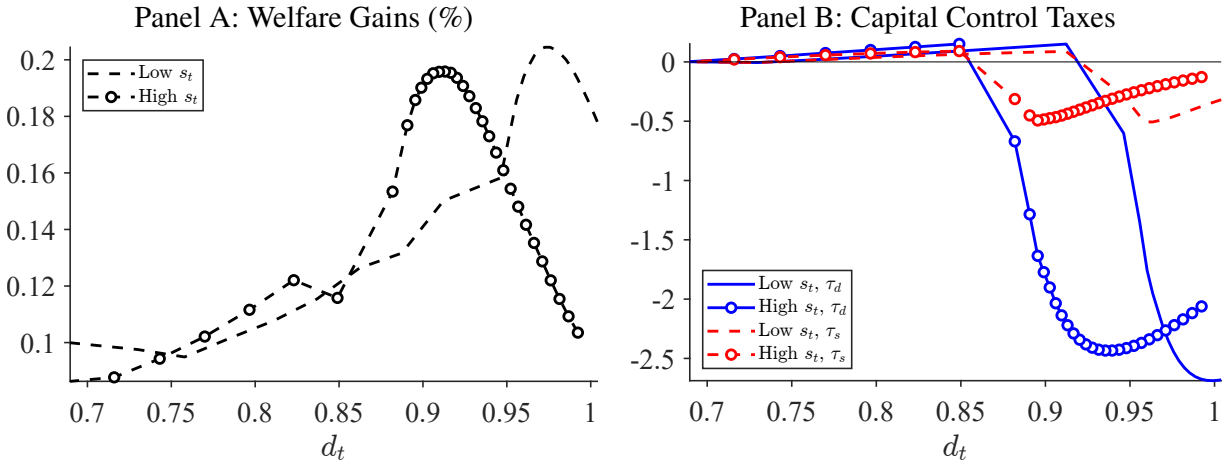
Capital controls and welfare. To quantify the welfare benefits of correcting the pecuniary externality, we compute state-contingent welfare gains achieved by the social planner. Welfare gains are measured as the percentage of permanent consumption that households would be willing to give up to live under the planner's allocation:

$$\Delta(d_t, s_t, \theta_t) = \left(\frac{V^{SP}(d_t, s_t, \theta_t)}{V^{CE}(d_t, s_t, \theta_t)} \right)^{\frac{1}{1-\gamma}} - 1. \tag{20}$$

Figure 3 reports the state-contingent gains alongside the implied capital controls taxes on debt and equity. The behavior of both is consistent with the literature. Welfare gains are small at low levels of initial debt, where the likelihood of future binding constraints—and thus the pecuniary externality—is limited. Gains increase with debt and then decline once the constraint binds.

Capital controls on both debt and equity are used to decentralize the planner's allocation. When

Figure 3 WELFARE GAINS AND CAPITAL CONTROL TAXES



NOTE. This figure shows welfare gains (equation (20)) and capital control taxes on debt and equity, τ_t^d and τ_t^s (equations (17) and (18)), conditional on income shocks $\{y_{Tt}, y_{Nt}\}$ being two standard deviations below their means. Policy functions are plotted against the initial level of debt d_t for two initial equity shares: $s_t = 0$ (low) and $s_t = 0.8$ (high). Circles indicate high–equity-share policy functions, while lines without markers correspond to low–equity-share policy functions. In panel B, solid (dashed) lines denote capital control taxes on debt (equity).

the constraint is slack, taxes are positive, reflecting an *ex ante* macroprudential motive to curb overborrowing in both instruments. When the constraint binds, taxes become negative, capturing an *ex post* intervention: the planner subsidizes debt and equity issuance to relax the constraint.

In simulations, the welfare gain from correcting the pecuniary externality in our baseline economy (column 5) is approximately 0.11% of permanent consumption, consistent with magnitudes reported in the literature. This gain is slightly smaller than in a debt-only economy (about 0.13% in column 4), reflecting that access to equity issuance already mitigates the severity of binding constraints and thus reduces the welfare impact of the pecuniary externality. Consistent with this, optimal *ex ante* capital controls on debt are smaller than in debt-only models (3.23% vs. 4.63%). Moreover, *ex ante* capital controls are larger on debt than on equity (3.23% vs. 1.71%), reflecting the superior risk-sharing properties of equity.

Comparison with gains from allowing equity issuance (institutional reforms). Starting from a debt-only economy, we consider two distinct policy approaches to improving welfare. The first approach is to allow equity issuance, moving from a debt-only economy to one with active equity markets. We interpret this change as an *institutional reform*, captured in the model by an increase in institutional quality from a low level to higher values. The second approach is to correct the pecuniary externality while holding institutional quality fixed; we refer to this as *capital controls*. We compare the welfare gains and transmission mechanisms associated with these two approaches.

Two main patterns emerge. First, the magnitudes of welfare gains are comparable, but gains from capital controls are more modest. Comparing columns 4–6, welfare gains from capital controls are around 0.11–0.13% of permanent consumption. In contrast, gains from equity issuance (institutional reform) can be substantially larger and increase with institutional quality: moving from columns 1–3, welfare gains rise to 0.42% of permanent consumption in column 3, whereas gains from capital controls remain around 0.12% (column 6).

Second, the sources of welfare gains differ. Gains from equity issuance (institutional reform) primarily arise from higher initial consumption, while gains from capital controls mainly come from improved future outcomes. This intuition is further confirmed by contrasting the transition dynamics from the competitive equilibrium to the social planner's allocation, holding institutional quality fixed, in Figure A2, with the transition dynamics from the debt-only economy to our baseline economy in Figure A1, which we analyzed earlier. Moving from the competitive equilibrium to the planner's allocation initially lowers consumption due to precautionary motives, but leads to higher long-run consumption and smoother dynamics as the planner maintains a lower net foreign liability position. In contrast, moving from a debt-only to an equity-issuance economy initially increases consumption due to higher borrowing capacity, but leads to lower long-run consumption and smoother consumption dynamics. These two transition paths reflect the distinct mechanisms

through which the two policies improve welfare.

4.4 Robustness

We obtain three key findings from the quantitative exercise. First, introducing equity into a debt-only model reduces the cost of binding the collateral borrowing constraint and improves risk sharing, thereby lowering both the frequency and severity of rare events, even though the economy is more likely to hit the constraint. Second, the welfare gains from allowing equity issuance are comparable to those from correcting pecuniary externalities. When institutional quality is sufficiently high, transitioning from a debt-only economy to one with equity issuance can generate sizable welfare gains. Third, optimal capital controls are quantitatively larger on debt than on equity.

In the online appendix, we conduct robustness checks for these results. First, we examine standard debt-only economy parameters: the collateral constraint parameter ϕ (Table C4), the discount factor β (Table C5), the gross interest rate R (Table C6), the elasticity of substitution η (Table C7), the tradable goods share ω (Table C8), and the risk aversion coefficient γ (Table C9). Across these variations, results remain consistent with our baseline findings in Table 3.

Second, we assess parameters related to equity issuance, including the equity transaction cost κ (Table C10) and the dividend payout ratio α (Table C11). A lower α reduces the equity price and the equilibrium level of equity, while a lower κ increases equity issuance in equilibrium. These changes affect quantitative predictions but do not alter the qualitative conclusions.

Finally, we consider an alternative dividend specification that depends on both tradable and non-tradable goods, given by $e_t = \alpha(y_{Tt} + p_{Nt}y_{Nt})$. We then recalibrate α to match the dividend payout ratio and re-run the simulations (Table C12). As in the baseline results, the main qualitative conclusions remain unchanged.

5 Conclusion

This paper develops a tractable framework to study how institutional quality shapes a country's external capital structure and the design of optimal capital controls. By introducing equity inflows into a standard debt-only model, we show that institutional quality affects equity prices and, consequently, the composition of external liabilities. Quantitatively, the model matches key features of external liability composition and macroeconomic moments observed in emerging markets.

Allowing equity issuance improves risk sharing and reduces the welfare costs associated with collateral borrowing constraints. Although the debt constraint binds more frequently, this outcome is optimal: access to equity financing smooths consumption, mitigates the frequency and severity of rare crises, and raises welfare by expanding external financing capacity.

Equity issuance also reshapes the design and effectiveness of capital controls. Implementing the social planner's allocation requires taxes on both debt and equity, as pecuniary externalities affect the marginal valuation of wealth for both instruments. Quantitatively, optimal *ex ante* taxes on debt are larger than those on equity.

We find that welfare gains from capital controls are moderate when equity is available, because equity issuance already mitigates the effects of pecuniary externalities. In contrast, institutional reforms that enable a debt-only economy to issue equity can generate substantially larger welfare gains when improvements in institutional quality are sufficiently large.

Overall, our results show that both strengthening institutional quality and implementing capital controls can enhance financial stability and welfare, but through distinct channels. While institutional reforms can potentially deliver larger gains than capital controls, which policy is more feasible or effective in practice remains an open question that we leave for future research.

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Internet Appendix

'International Equity and Debt Flows to Emerging Market Economies: Composition, Crises, and Controls'

(Intended for online publication only)

by C. Ma, and S. Wei

February 2026

A Data Source

Our sample covers 113 developing economies during 1996–2015, including Afghanistan, Albania, Algeria, Angola, Argentina, Armenia, Azerbaijan, Bangladesh, Belarus, Benin, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Central African Republic, Chad, Chile, China, Colombia, Congo, Costa Rica, Côte d'Ivoire, Croatia, Democratic Republic of Congo, Dominican Republic, Ecuador, Egypt, El Salvador, Eritrea, Ethiopia, Gabon, Gambia, Georgia, Ghana, Guatemala, Guinea, Guinea-Bissau, Haiti, Honduras, Hungary, India, Indonesia, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Kenya, Kuwait, Kyrgyz Republic, Laos, Lebanon, Lesotho, Liberia, Libya, Macedonia, Madagascar, Malawi, Malaysia, Mali, Mauritania, Mexico, Moldova, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Romania, Russia, Rwanda, Saudi Arabia, Senegal, Sierra Leone, Somalia, South Africa, Sri Lanka, Sudan, Syria, Tajikistan, Tanzania, Thailand, Togo, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, Uruguay, Uzbekistan, Venezuela, Vietnam, Zambia, and Zimbabwe. The summary statistics are reported in Appendix Table C1, and the variable construction is described below.

Equity (% of total liabilities) is constructed as the ratio of the sum of portfolio equity liabilities and FDI liabilities over total liabilities, based on Lane and Milesi-Ferretti (2007).

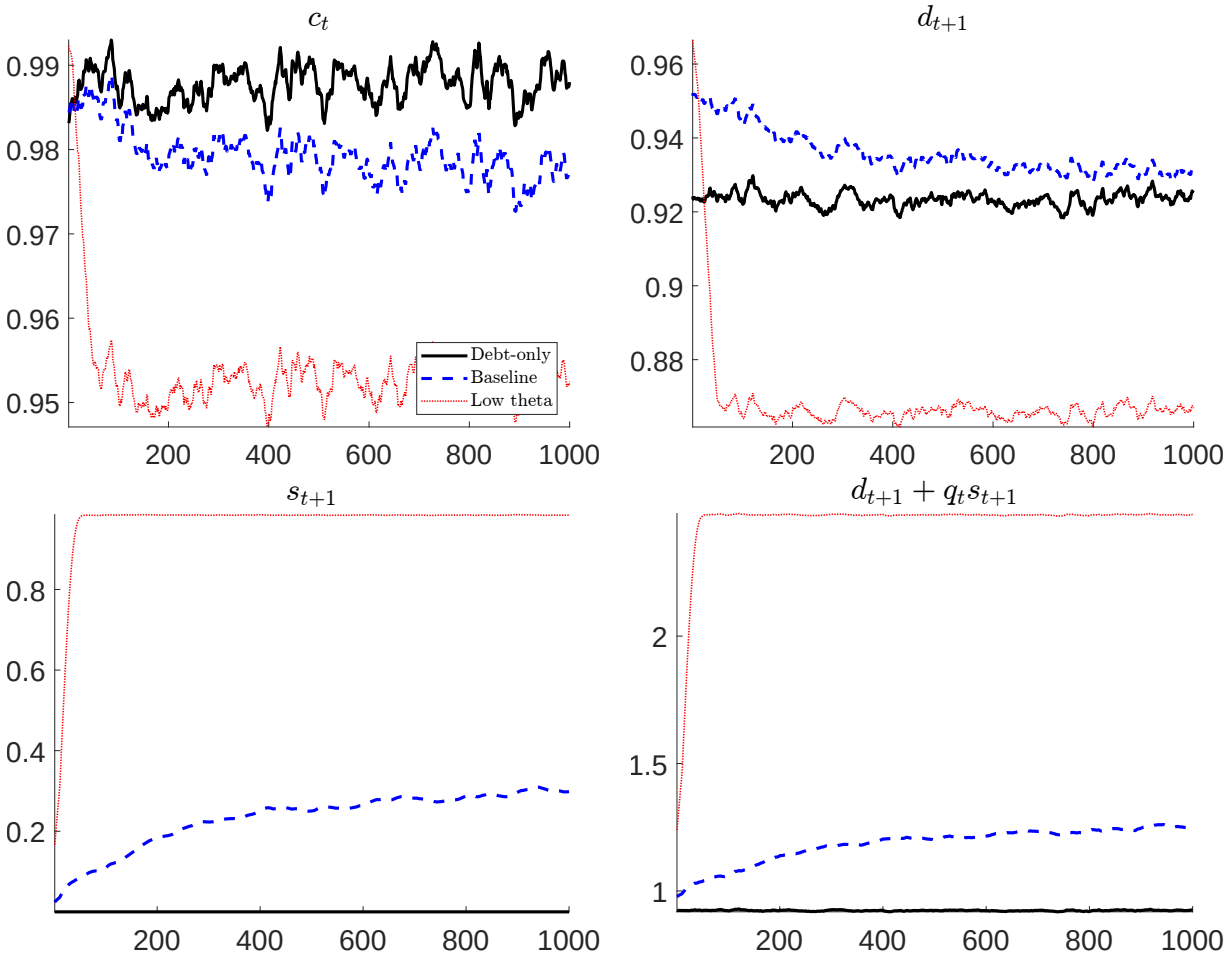
Institutional Quality is the average of the six Worldwide Governance Indicators from the World Bank Institute. The WGI database provides six measures of government institutional quality for most World Bank member countries from 1996–2017.[A1] They are Control of Corruption (CC),

[A1] For three years with missing data, i.e. 1997, 1999, and 2001, we linearly interpolate the missing data.

Government Effectiveness (GE), Political Stability, and Absence of Violence/Terrorism (PS), Rule of Law (PL), Regulatory Quality (RQ), and Voice and Accountability (VA). Each index is constructed in units of standard normal distribution, i.e. ranging from -2.5 to 2.5, where a higher value means a higher quality institution. All six measures are highly correlated with each other as shown in Table C2. Furthermore, the cross-country ranking is stable over time. Following Wei and Zhou (2018), we use the simple average of the six measures as our proxy for institutional quality.

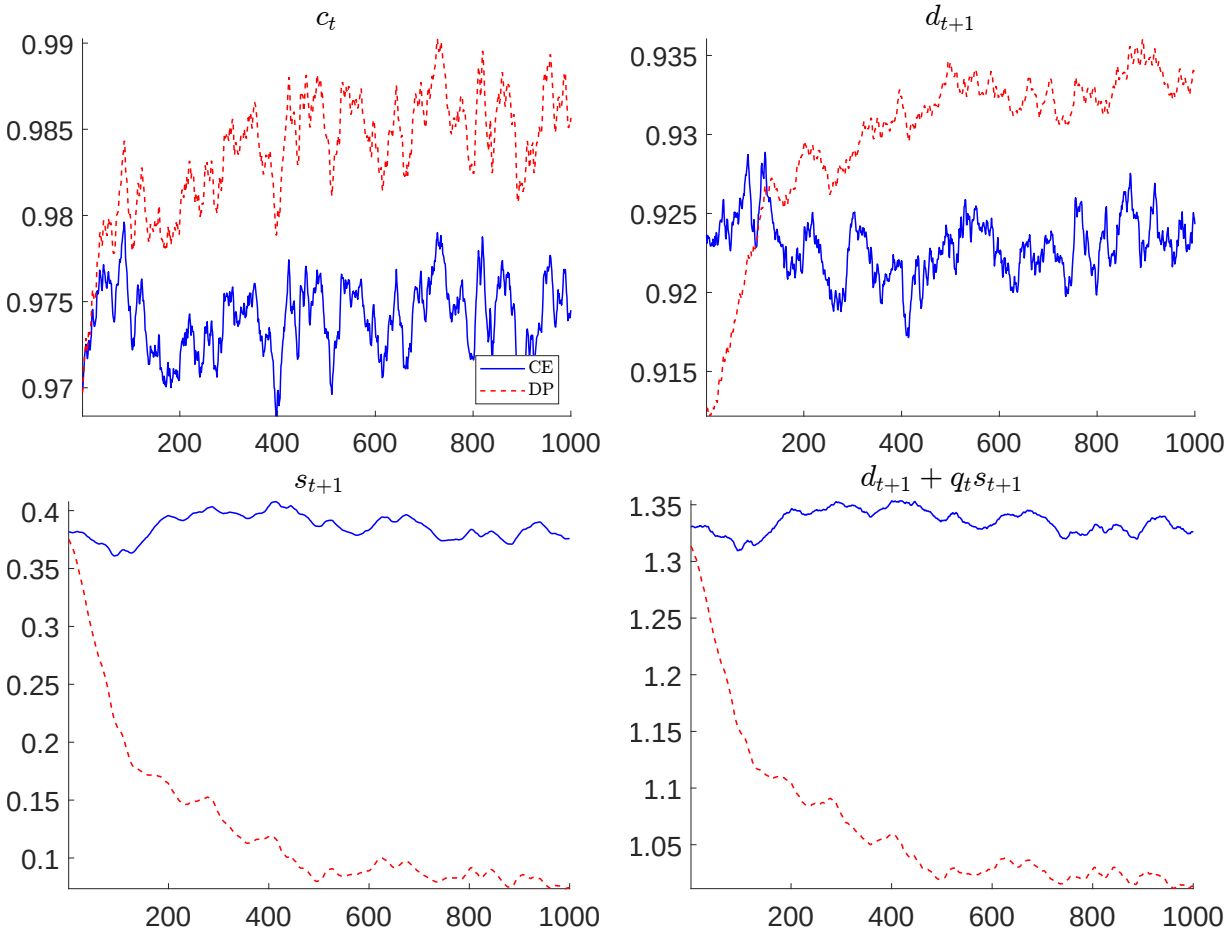
B Figures

Figure A1 TRANSITION DYNAMICS FOLLOWING THE INTRODUCTION OF EQUITY ISSUANCE



NOTE. This figure plots the transition dynamics from a debt-only economy to an economy with equity issuance. We simulate the debt-only economy for 1,000 periods and repeat the simulation 80 times. For each replication, the initial debt level d_0 is fed into the economy with equity issuance, using its policy functions to generate the transition path. The paths are then averaged across replications, and a 20-period moving average is applied to smooth the series for clarity. The figure shows results for the debt-only economy ($\theta = 1$, black solid line), the baseline economy ($\theta = 0.61$, blue dashed line), and a low-institutional-quality economy ($\theta = 0.4$, red dotted line). Panels display the dynamics of consumption, debt issuance, equity issuance, and total external liabilities.

Figure A2 TRANSITION FROM COMPETITIVE EQUILIBRIUM TO THE PLANNER ALLOCATION



NOTE. This figure plots the transition dynamics from the competitive equilibrium in the baseline economy to the allocation chosen by the social planner. We simulate the competitive equilibrium for 1,000 periods and repeat the simulation 80 times. For each replication, the initial state (d_0, s_0) is fed into the planner economy, using the planner's policy functions to generate the transition path. Paths are averaged across replications, and a 20-period moving average is applied to smooth the series for clarity. The figure shows results for the competitive equilibrium ($\theta = 0.61$, blue solid line) and the social planner economy ($\theta = 0.61$, red dashed line). Panels display the dynamics of consumption, debt issuance, equity issuance, and total external liabilities.

C Appendix Tables

Table C1 SUMMARY STATISTICS

	Observation	Mean	Std. Dev.	Min	Max
Equity (% of total liability)	2237	37.75	21.21	0.04	95.22
Institutional Quality	2260	-0.52	0.62	-2.45	1.29
Financial Development Index	2180	0.21	0.14	0.00	0.71
Log GDP per capita	2179	7.68	1.22	4.81	11.10
Private Credit (% of GDP)	2141	30.39	27.73	0.20	166.50
Trade (% of GDP)	2171	77.15	36.11	0.03	321.63

Table C2 PAIRWISE CORRELATION FOR INSTITUTIONAL QUALITY

	CC	GE	PS	RL	RQ	VA
Control of Corruption (CC)	1.00					
Government Effectiveness (GE)	0.94*	1.00				
Political Stability and Absence of Violence/Terrorism (PS)	0.75*	0.74*	1.00			
Rule of Law (PL)	0.90*	0.94*	0.74*	1.00		
Regulatory Quality (RQ)	0.96*	0.96*	0.78*	0.93*	1.00	
Voice and Accountability (VA)	0.79*	0.81*	0.68*	0.84*	0.84*	1.00

NOTE. The * shows significance at the 0.01 level.

Table C3 EXTERNAL CAPITAL STRUCTURE AND INSTITUTIONAL QUALITY: ROBUSTNESS

	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Control of Corruption						
Quality_{t-1}	0.26***	0.02	0.10***	0.17**	0.20**	0.23***
	(0.02)	(0.02)	(0.02)	(0.07)	(0.08)	(0.08)
Panel B: Government Effectiveness						
Quality_{t-1}	0.31***	0.03	0.16***	0.04	0.09	0.07
	(0.02)	(0.03)	(0.03)	(0.08)	(0.09)	(0.09)
Panel C: Political Stability, and Absence of Violence/Terrorism						
Quality_{t-1}	0.26***	0.06***	0.09***	0.03	0.07	0.06
	(0.02)	(0.02)	(0.02)	(0.06)	(0.06)	(0.06)
Panel D: Rule of Law						
Quality_{t-1}	0.29***	0.05*	0.14***	0.21**	0.28***	0.31***
	(0.02)	(0.03)	(0.03)	(0.09)	(0.09)	(0.09)
Panel E: Regulatory Quality						
Quality_{t-1}	0.28***	0.02	0.11***	0.20**	0.23**	0.25**
	(0.02)	(0.02)	(0.02)	(0.09)	(0.10)	(0.10)
Panel F: Voice and Accountability						
Quality_{t-1}	0.18***	0.01	0.05**	0.17*	0.14	0.17*
	(0.02)	(0.02)	(0.02)	(0.10)	(0.10)	(0.10)

NOTE. This table replicates the regressions in Table 1 using alternative measures of institutional quality. The dependent variable is the equity share (portfolio equity and FDI) in total external liabilities. All independent variables, except for institutional quality, are the same as in Table 1 but are omitted here to save space. Specifications (1)–(6) are also identical. All variables are standardized for ease of comparison. Standard errors are reported in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table C4 ROBUSTNESS TO THE COLLATERAL CONSTRAINT PARAMETER ($\phi = 0.2$)

	Competitive Equilibrium (CE)			Social Planner (SP)		
	Zero Equity (1)	Baseline (2)	More Equity (3)	Zero Equity (1)	Baseline (2)	More Equity (3)
Institutional quality parameters	1	0.608	0.4	1	0.608	0.4
Average equity price	0.00	1.07	1.64	0.00	1.07	1.64
Average dividend payout ratio	0.034	0.037	0.038	0.034	0.036	0.037
Average equity issuance	0.00	0.82	0.99	0.00	0.56	0.99
Average equity share	0.00	0.60	0.74	0.00	0.47	0.75
Relative volatility of debt to equity flows	Inf	2.96	5.94	Inf	1.77	3.61
Average equity transaction cost (in GDP, bps)	0.00	1.92	0.35	0.00	2.86	0.50
Net foreign liability (equity, in GDP)	0.00	0.30	0.56	0.00	0.20	0.56
Net foreign liability (debt, in GDP)	0.19	0.19	0.19	0.19	0.19	0.19
Net foreign liability (in GDP)	0.19	0.49	0.75	0.19	0.39	0.75
Average consumption (c_t)	0.99	0.96	0.96	0.99	0.97	0.96
std(c_t)	0.054	0.050	0.051	0.052	0.050	0.050
corr(c_t, y_{Tt})	0.92	0.92	0.92	0.93	0.91	0.93
mean(current account/GDP)	0.00	0.00	0.00	0.00	0.00	0.00
std(current account/GDP)	0.013	0.010	0.011	0.009	0.007	0.008
corr(current account/GDP, GDP)	-0.56	-0.29	-0.47	-0.35	0.10	-0.24
Frequency of rare events (%)						
Event 1: large negative consumption collapse	4.45	3.22	4.09	3.54	2.54	3.51
Event 2: large capital outflows	4.23	0.28	2.01	1.74	0.01	0.77
Event 3: binding constraints	26.48	34.49	30.14	8.46	14.90	11.40
Average consumption collapse in rare events (%)						
Event 1: large negative consumption collapse	-13.17	-12.45	-13.01	-12.85	-12.23	-12.63
Event 2: large capital outflows	-11.92	-12.03	-12.67	-13.18	-13.83	-13.73
Event 3: binding constraints	-6.31	-5.09	-5.81	-8.53	-5.82	-7.30
Welfare effects (relative to column 1, %)		0.04	0.34	0.01	0.05	0.35
of which: from the first period		0.50	2.06	-0.29	0.30	1.76
of which: from the remaining periods		-0.01	0.16	0.05	0.03	0.21
Welfare effects (relative to corresponding CE, %)				0.01	0.01	0.02
of which: from the first period				-0.29	-0.13	-0.17
of which: from the remaining periods				0.05	0.03	0.04
Capital control taxes (%)						
on debt (τ^d)				0.52	0.31	0.41
on equity (τ^s)					0.37	0.42
on debt (τ^d, *ex ante*)				2.92	1.34	1.60
on equity (τ^s, *ex ante*)					1.13	1.51
on debt (τ^d, *ex post*)				0.00	-5.61	-8.84
on equity (τ^s, *ex post*)					-3.94	-8.00

NOTE. Moments are computed from simulations of 81,000 periods. The first 1,000 periods are discarded, and the remaining 80,000 observations are used to compute ergodic moments. Columns (1)–(3) report competitive equilibrium outcomes for economies with institutional quality $\theta = 1, 0.61$, and 0.4, respectively. Columns (4)–(6) report the corresponding social planner outcomes for the same values of θ. Rare Event 1 is defined as a realization in which consumption deviates from its ergodic mean by more than two standard deviations of the ergodic consumption distribution in the benchmark economy (column 1). Rare Event 2 is defined analogously for net capital outflows. Welfare effects relative to column (1) are reported as consumption-equivalent variations, computed using the ergodic distribution generated by the benchmark economy and averaged over that distribution. Welfare decompositions report the contributions of current utility and continuation value. Welfare effects relative to the corresponding competitive equilibrium are computed by comparing competitive equilibrium and social planner outcomes conditional on the same θ.

Table C5 ROBUSTNESS TO THE DISCOUNT FACTOR ($\beta = 0.9$)

	Competitive Equilibrium (CE)			Social Planner (SP)		
	Zero Equity (1)	Baseline (2)	More Equity (3)	Zero Equity (1)	Baseline (2)	More Equity (3)
Institutional quality parameters	1	0.608	0.4	1	0.608	0.4
Average equity price	0.00	1.07	1.64	0.00	1.07	1.64
Average dividend payout ratio	0.035	0.038	0.038	0.035	0.038	0.038
Average equity issuance	0.00	0.94	0.99	0.00	0.90	0.98
Average equity share	0.00	0.53	0.65	0.00	0.52	0.65
Relative volatility of debt to equity flows	Inf	4.91	8.49	Inf	1.51	2.40
Average equity transaction cost (in GDP, bps)	0.00	2.86	0.70	0.00	3.25	0.82
Net foreign liability (equity, in GDP)	0.00	0.35	0.57	0.00	0.33	0.56
Net foreign liability (debt, in GDP)	0.30	0.31	0.30	0.29	0.30	0.30
Net foreign liability (in GDP)	0.30	0.66	0.87	0.29	0.63	0.86
Average consumption (c_t)	0.99	0.95	0.95	0.99	0.96	0.95
std(c_t)	0.059	0.055	0.056	0.052	0.048	0.050
corr(c_t, y_{Tt})	0.89	0.90	0.89	0.93	0.92	0.93
mean(current account/GDP)	0.00	0.00	0.00	0.00	0.00	0.00
std(current account/GDP)	0.029	0.021	0.024	0.006	0.007	0.007
corr(current account/GDP, GDP)	-0.78	-0.70	-0.74	-0.12	0.19	-0.10
Frequency of rare events (%)						
Event 1: large negative consumption collapse	4.40	4.17	4.32	1.91	1.01	1.81
Event 2: large capital outflows	3.93	2.68	3.24	0.07	0.03	0.08
Event 3: binding constraints	7.87	12.78	9.08	0.58	4.61	2.86
Average consumption collapse in rare events (%)						
Event 1: large negative consumption collapse	-18.22	-16.46	-17.44	-12.94	-13.39	-13.09
Event 2: large capital outflows	-18.55	-17.69	-18.54	-15.74	-16.85	-17.17
Event 3: binding constraints	-13.61	-9.54	-12.22	-11.69	-9.21	-9.97
Welfare effects (relative to column 1, %)		0.13	0.50	0.15	0.25	0.62
of which: from the first period		1.13	2.81	-0.82	0.62	2.26
of which: from the remaining periods		0.01	0.25	0.26	0.20	0.43
Welfare effects (relative to corresponding CE, %)				0.15	0.12	0.14
of which: from the first period				-0.82	-0.50	-0.62
of which: from the remaining periods				0.26	0.18	0.22
Capital control taxes (%)						
on debt (τ^d)				1.12	0.81	0.78
on equity (τ^s)					0.72	0.73
on debt (τ^d, *ex ante*)				5.77	3.26	3.07
on equity (τ^s, *ex ante*)					1.96	2.69
on debt (τ^d, *ex post*)				0.00	-50.10	-76.99
on equity (τ^s, *ex post*)					-24.92	-65.58

NOTE. Moments are computed from simulations of 81,000 periods. The first 1,000 periods are discarded, and the remaining 80,000 observations are used to compute ergodic moments. Columns (1)–(3) report competitive equilibrium outcomes for economies with institutional quality $\theta = 1, 0.61$, and 0.4, respectively. Columns (4)–(6) report the corresponding social planner outcomes for the same values of θ. Rare Event 1 is defined as a realization in which consumption deviates from its ergodic mean by more than two standard deviations of the ergodic consumption distribution in the benchmark economy (column 1). Rare Event 2 is defined analogously for net capital outflows. Welfare effects relative to column (1) are reported as consumption-equivalent variations, computed using the ergodic distribution generated by the benchmark economy and averaged over that distribution. Welfare decompositions report the contributions of current utility and continuation value. Welfare effects relative to the corresponding competitive equilibrium are computed by comparing competitive equilibrium and social planner outcomes conditional on the same θ.

Table C6 ROBUSTNESS TO THE INTEREST RATE ($R = 1.03$)

	Competitive Equilibrium (CE)			Social Planner (SP)		
	Zero Equity (1)	Baseline (2)	More Equity (3)	Zero Equity (1)	Baseline (2)	More Equity (3)
Institutional quality parameters	1	0.608	0.4	1	0.608	0.4
Average equity price	0.00	1.42	2.18	0.00	1.42	2.18
Average dividend payout ratio	0.034	0.038	0.038	0.034	0.038	0.038
Average equity issuance	0.00	0.97	0.99	0.00	0.96	0.98
Average equity share	0.00	0.61	0.71	0.00	0.61	0.71
Relative volatility of debt to equity flows	Inf	5.69	9.54	Inf	1.69	2.32
Average equity transaction cost (in GDP, bps)	0.00	1.85	0.45	0.00	2.11	0.75
Net foreign liability (equity, in GDP)	0.00	0.48	0.75	0.00	0.47	0.74
Net foreign liability (debt, in GDP)	0.30	0.31	0.30	0.29	0.30	0.30
Net foreign liability (in GDP)	0.30	0.79	1.05	0.29	0.77	1.04
Average consumption (c_t)	0.99	0.96	0.96	0.99	0.96	0.96
std(c_t)	0.060	0.056	0.057	0.052	0.049	0.050
corr(c_t, y_{Tt})	0.88	0.90	0.89	0.93	0.93	0.93
mean(current account/GDP)	0.00	0.00	0.00	0.00	0.00	0.00
std(current account/GDP)	0.030	0.023	0.025	0.006	0.007	0.007
corr(current account/GDP, GDP)	-0.79	-0.73	-0.75	-0.16	0.01	-0.16
Frequency of rare events (%)						
Event 1: large negative consumption collapse	4.43	4.24	4.35	1.86	1.76	1.84
Event 2: large capital outflows	4.06	2.84	3.36	0.07	0.05	0.11
Event 3: binding constraints	8.56	12.58	9.83	2.20	5.87	4.99
Average consumption collapse in rare events (%)						
Event 1: large negative consumption collapse	-18.49	-17.06	-17.68	-12.96	-13.09	-13.15
Event 2: large capital outflows	-18.66	-18.38	-18.65	-15.93	-17.07	-17.12
Event 3: binding constraints	-13.18	-9.89	-11.83	-9.66	-9.35	-10.19
Welfare effects (relative to column 1, %)		0.28	0.94	0.16	0.40	1.05
of which: from the first period		2.09	4.02	-0.84	1.53	3.53
of which: from the remaining periods		0.09	0.62	0.27	0.28	0.79
Welfare effects (relative to corresponding CE, %)				0.16	0.13	0.15
of which: from the first period				-0.84	-0.69	-0.68
of which: from the remaining periods				0.27	0.21	0.23
Capital control taxes (%)						
on debt (τ^d)				1.14	0.92	1.09
on equity (τ^s)					0.80	1.05
on debt (τ^d, *ex ante*)				6.13	4.11	4.15
on equity (τ^s, *ex ante*)					3.07	3.78
on debt (τ^d, *ex post*)				0.00	-50.38	-57.03
on equity (τ^s, *ex post*)					-35.59	-50.85

NOTE. Moments are computed from simulations of 81,000 periods. The first 1,000 periods are discarded, and the remaining 80,000 observations are used to compute ergodic moments. Columns (1)–(3) report competitive equilibrium outcomes for economies with institutional quality $\theta = 1, 0.61$, and 0.4, respectively. Columns (4)–(6) report the corresponding social planner outcomes for the same values of θ. Rare Event 1 is defined as a realization in which consumption deviates from its ergodic mean by more than two standard deviations of the ergodic consumption distribution in the benchmark economy (column 1). Rare Event 2 is defined analogously for net capital outflows. Welfare effects relative to column (1) are reported as consumption-equivalent variations, computed using the ergodic distribution generated by the benchmark economy and averaged over that distribution. Welfare decompositions report the contributions of current utility and continuation value. Welfare effects relative to the corresponding competitive equilibrium are computed by comparing competitive equilibrium and social planner outcomes conditional on the same θ.

Table C7 ROBUSTNESS TO THE ELASTICITY OF SUBSTITUTION ($\eta = 0.25$)

	Competitive Equilibrium (CE)			Social Planner (SP)		
	Zero Equity (1)	Baseline (2)	More Equity (3)	Zero Equity (1)	Baseline (2)	More Equity (3)
Institutional quality parameters	1	0.608	0.4	1	0.608	0.4
Average equity price	0.00	1.07	1.64	0.00	1.07	1.64
Average dividend payout ratio	0.035	0.036	0.038	0.035	0.035	0.038
Average equity issuance	0.00	0.33	0.98	0.00	0.07	0.98
Average equity share	0.00	0.25	0.65	0.00	0.07	0.65
Relative volatility of debt to equity flows	Inf	4.57	7.33	Inf	1.29	1.96
Average equity transaction cost (in GDP, bps)	0.00	3.40	0.84	0.00	3.06	0.83
Net foreign liability (equity, in GDP)	0.00	0.12	0.57	0.00	0.03	0.56
Net foreign liability (debt, in GDP)	0.29	0.30	0.30	0.29	0.30	0.30
Net foreign liability (in GDP)	0.29	0.42	0.87	0.29	0.32	0.86
Average consumption (c_t)	0.99	0.98	0.95	0.99	0.99	0.95
std(c_t)	0.058	0.055	0.055	0.052	0.049	0.050
corr(c_t, y_{Tt})	0.89	0.89	0.90	0.92	0.92	0.92
mean(current account/GDP)	0.00	0.00	0.00	0.00	0.00	0.00
std(current account/GDP)	0.027	0.021	0.023	0.005	0.007	0.005
corr(current account/GDP, GDP)	-0.76	-0.66	-0.71	0.02	0.38	0.07
Frequency of rare events (%)						
Event 1: large negative consumption collapse	4.30	4.15	4.21	1.91	0.88	1.91
Event 2: large capital outflows	3.67	3.01	3.04	0.03	0.02	0.03
Event 3: binding constraints	6.59	10.90	8.35	1.00	4.21	3.87
Average consumption collapse in rare events (%)						
Event 1: large negative consumption collapse	-17.77	-16.30	-17.08	-12.74	-12.34	-12.76
Event 2: large capital outflows	-18.34	-17.08	-18.31	-15.48	-16.69	-16.41
Event 3: binding constraints	-14.53	-10.25	-12.33	-8.97	-8.72	-9.31
Welfare effects (relative to column 1, %)		0.11	0.42	0.15	0.23	0.52
of which: from the first period		1.02	2.61	-0.72	0.60	2.05
of which: from the remaining periods		0.01	0.19	0.24	0.18	0.36
Welfare effects (relative to corresponding CE, %)				0.15	0.12	0.13
of which: from the first period				-0.72	-0.38	-0.60
of which: from the remaining periods				0.24	0.17	0.21
Capital control taxes (%)						
on debt (τ^d)				0.99	0.63	0.70
on equity (τ^s)					0.70	0.57
on debt (τ^d, *ex ante*)				5.47	3.00	3.48
on equity (τ^s, *ex ante*)					1.69	2.99
on debt (τ^d, *ex post*)				0.00	-53.29	-68.52
on equity (τ^s, *ex post*)					-21.88	-59.44

NOTE. Moments are computed from simulations of 81,000 periods. The first 1,000 periods are discarded, and the remaining 80,000 observations are used to compute ergodic moments. Columns (1)–(3) report competitive equilibrium outcomes for economies with institutional quality $\theta = 1, 0.61,$ and 0.4, respectively. Columns (4)–(6) report the corresponding social planner outcomes for the same values of θ. Rare Event 1 is defined as a realization in which consumption deviates from its ergodic mean by more than two standard deviations of the ergodic consumption distribution in the benchmark economy (column 1). Rare Event 2 is defined analogously for net capital outflows. Welfare effects relative to column (1) are reported as consumption-equivalent variations, computed using the ergodic distribution generated by the benchmark economy and averaged over that distribution. Welfare decompositions report the contributions of current utility and continuation value. Welfare effects relative to the corresponding competitive equilibrium are computed by comparing competitive equilibrium and social planner outcomes conditional on the same θ.

Table C8 ROBUSTNESS TO THE TRADABLE GOOD WEIGHTS ($\omega = 0.4$)

	Competitive Equilibrium (CE)			Social Planner (SP)		
	Zero Equity (1)	Baseline (2)	More Equity (3)	Zero Equity (1)	Baseline (2)	More Equity (3)
Institutional quality parameters	1	0.608	0.4	1	0.608	0.4
Average equity price	0.00	1.07	1.64	0.00	1.07	1.64
Average dividend payout ratio	0.045	0.047	0.048	0.045	0.046	0.048
Average equity issuance	0.00	0.77	0.99	0.00	0.41	0.99
Average equity share	0.00	0.53	0.70	0.00	0.34	0.70
Relative volatility of debt to equity flows	Inf	3.22	6.18	Inf	1.88	3.41
Average equity transaction cost (in GDP, bps)	0.00	2.83	0.55	0.00	4.07	0.87
Net foreign liability (equity, in GDP)	0.00	0.36	0.72	0.00	0.19	0.72
Net foreign liability (debt, in GDP)	0.31	0.31	0.31	0.30	0.31	0.31
Net foreign liability (in GDP)	0.31	0.67	1.03	0.30	0.50	1.02
Average consumption (c_t)	0.99	0.95	0.94	0.99	0.97	0.94
std(c_t)	0.056	0.051	0.052	0.052	0.049	0.049
corr(c_t, y_{Tt})	0.92	0.92	0.93	0.94	0.91	0.94
mean(current account/GDP)	0.00	0.00	0.00	0.00	0.00	0.00
std(current account/GDP)	0.019	0.015	0.017	0.013	0.010	0.011
corr(current account/GDP, GDP)	-0.56	-0.31	-0.48	-0.30	0.11	-0.21
Frequency of rare events (%)						
Event 1: large negative consumption collapse	5.28	4.31	5.09	3.49	2.57	3.38
Event 2: large capital outflows	4.35	0.61	2.71	1.46	0.02	0.89
Event 3: binding constraints	18.04	28.13	19.25	6.20	11.25	7.28
Average consumption collapse in rare events (%)						
Event 1: large negative consumption collapse	-14.80	-13.46	-14.36	-13.76	-12.94	-13.58
Event 2: large capital outflows	-14.76	-14.23	-15.21	-15.37	-13.98	-15.64
Event 3: binding constraints	-8.30	-5.96	-7.78	-10.33	-6.67	-9.91
Welfare effects (relative to column 1, %)		0.07	0.46	0.03	0.09	0.48
of which: from the first period		0.70	2.71	-0.52	0.35	2.28
of which: from the remaining periods		0.00	0.22	0.09	0.06	0.29
Welfare effects (relative to corresponding CE, %)				0.03	0.03	0.04
of which: from the first period				-0.52	-0.24	-0.33
of which: from the remaining periods				0.09	0.05	0.08
Capital control taxes (%)						
on debt (τ^d)				0.65	0.44	0.58
on equity (τ^s)					0.45	0.54
on debt (τ^d, *ex ante*)				3.13	1.67	2.19
on equity (τ^s, *ex ante*)					1.25	1.97
on debt (τ^d, *ex post*)				0.00	-9.26	-19.97
on equity (τ^s, *ex post*)					-5.89	-17.69

NOTE. Moments are computed from simulations of 81,000 periods. The first 1,000 periods are discarded, and the remaining 80,000 observations are used to compute ergodic moments. Columns (1)–(3) report competitive equilibrium outcomes for economies with institutional quality $\theta = 1, 0.61$, and 0.4, respectively. Columns (4)–(6) report the corresponding social planner outcomes for the same values of θ. Rare Event 1 is defined as a realization in which consumption deviates from its ergodic mean by more than two standard deviations of the ergodic consumption distribution in the benchmark economy (column 1). Rare Event 2 is defined analogously for net capital outflows. Welfare effects relative to column (1) are reported as consumption-equivalent variations, computed using the ergodic distribution generated by the benchmark economy and averaged over that distribution. Welfare decompositions report the contributions of current utility and continuation value. Welfare effects relative to the corresponding competitive equilibrium are computed by comparing competitive equilibrium and social planner outcomes conditional on the same θ.

Table C9 ROBUSTNESS TO THE RISK AVERSION PARAMETER ($\gamma = 3$)

	Competitive Equilibrium (CE)			Social Planner (SP)		
	Zero Equity (1)	Baseline (2)	More Equity (3)	Zero Equity (1)	Baseline (2)	More Equity (3)
Institutional quality parameters	1	0.608	0.4	1	0.608	0.4
Average equity price	0.00	1.07	1.64	0.00	1.07	1.64
Average dividend payout ratio	0.035	0.036	0.038	0.034	0.035	0.038
Average equity issuance	0.00	0.27	0.98	0.00	0.12	0.97
Average equity share	0.00	0.22	0.65	0.00	0.11	0.65
Relative volatility of debt to equity flows	Inf	3.69	5.79	Inf	1.46	2.25
Average equity transaction cost (in GDP, bps)	0.00	3.86	0.96	0.00	3.81	1.04
Net foreign liability (equity, in GDP)	0.00	0.10	0.56	0.00	0.04	0.55
Net foreign liability (debt, in GDP)	0.29	0.30	0.30	0.28	0.30	0.29
Net foreign liability (in GDP)	0.29	0.40	0.86	0.28	0.34	0.85
Average consumption (c_t)	0.99	0.98	0.95	0.99	0.98	0.95
std(c_t)	0.054	0.051	0.051	0.050	0.047	0.047
corr(c_t, y_{Tt})	0.88	0.88	0.89	0.91	0.90	0.91
mean(current account/GDP)	0.00	0.00	0.00	0.00	0.00	0.00
std(current account/GDP)	0.022	0.018	0.019	0.008	0.009	0.008
corr(current account/GDP, GDP)	-0.64	-0.50	-0.57	0.13	0.38	0.18
Frequency of rare events (%)						
Event 1: large negative consumption collapse	4.15	3.94	3.99	2.03	1.91	2.08
Event 2: large capital outflows	2.78	2.04	2.13	0.06	0.01	0.05
Event 3: binding constraints	6.02	10.11	7.77	1.17	4.11	3.28
Average consumption collapse in rare events (%)						
Event 1: large negative consumption collapse	-16.07	-14.99	-15.61	-12.69	-11.81	-12.68
Event 2: large capital outflows	-17.58	-16.63	-17.91	-14.94	-17.54	-15.89
Event 3: binding constraints	-13.49	-9.79	-11.56	-11.03	-9.16	-10.05
Welfare effects (relative to column 1, %)		0.11	0.42	0.12	0.21	0.51
of which: from the first period		0.93	2.35	-0.59	0.57	1.98
of which: from the remaining periods		0.02	0.21	0.20	0.17	0.35
Welfare effects (relative to corresponding CE, %)				0.12	0.10	0.11
of which: from the first period				-0.59	-0.34	-0.48
of which: from the remaining periods				0.20	0.15	0.17
Capital control taxes (%)						
on debt (τ^d)				0.96	0.84	1.06
on equity (τ^s)					0.64	0.93
on debt (τ^d, *ex ante*)				4.99	2.95	3.42
on equity (τ^s, *ex ante*)					1.46	2.89
on debt (τ^d, *ex post*)				0.00	-48.43	-68.29
on equity (τ^s, *ex post*)					-18.40	-57.06

NOTE. Moments are computed from simulations of 81,000 periods. The first 1,000 periods are discarded, and the remaining 80,000 observations are used to compute ergodic moments. Columns (1)–(3) report competitive equilibrium outcomes for economies with institutional quality $\theta = 1, 0.61$, and 0.4, respectively. Columns (4)–(6) report the corresponding social planner outcomes for the same values of θ. Rare Event 1 is defined as a realization in which consumption deviates from its ergodic mean by more than two standard deviations of the ergodic consumption distribution in the benchmark economy (column 1). Rare Event 2 is defined analogously for net capital outflows. Welfare effects relative to column (1) are reported as consumption-equivalent variations, computed using the ergodic distribution generated by the benchmark economy and averaged over that distribution. Welfare decompositions report the contributions of current utility and continuation value. Welfare effects relative to the corresponding competitive equilibrium are computed by comparing competitive equilibrium and social planner outcomes conditional on the same θ.

Table C10 ROBUSTNESS TO THE EQUITY TRANSACTION COST PARAMETER ($\kappa = 5$)

	Competitive Equilibrium (CE)			Social Planner (SP)		
	Zero Equity (1)	Baseline (2)	More Equity (3)	Zero Equity (1)	Baseline (2)	More Equity (3)
Institutional quality parameters	1	0.608	0.4	1	0.608	0.4
Average equity price	0.00	1.07	1.64	0.00	1.07	1.64
Average dividend payout ratio	0.035	0.037	0.038	0.035	0.036	0.038
Average equity issuance	0.00	0.63	0.98	0.00	0.35	0.96
Average equity share	0.00	0.40	0.65	0.00	0.26	0.64
Relative volatility of debt to equity flows	Inf	2.40	4.50	Inf	0.79	1.37
Average equity transaction cost (in GDP, bps)	0.00	4.59	1.18	0.00	6.05	1.69
Net foreign liability (equity, in GDP)	0.00	0.23	0.56	0.00	0.13	0.55
Net foreign liability (debt, in GDP)	0.29	0.31	0.31	0.29	0.31	0.31
Net foreign liability (in GDP)	0.29	0.54	0.86	0.29	0.44	0.85
Average consumption (c_t)	0.99	0.97	0.95	0.99	0.98	0.95
std(c_t)	0.058	0.051	0.055	0.052	0.047	0.049
corr(c_t, y_{Tt})	0.89	0.90	0.90	0.92	0.90	0.92
mean(current account/GDP)	0.00	0.00	0.00	0.00	0.00	0.00
std(current account/GDP)	0.027	0.015	0.021	0.006	0.009	0.006
corr(current account/GDP, GDP)	-0.75	-0.46	-0.68	-0.03	0.47	0.09
Frequency of rare events (%)						
Event 1: large negative consumption collapse	4.31	3.30	4.17	1.92	0.49	1.91
Event 2: large capital outflows	3.72	0.75	2.67	0.06	0.00	0.04
Event 3: binding constraints	7.31	20.58	10.01	0.55	6.89	4.96
Average consumption collapse in rare events (%)						
Event 1: large negative consumption collapse	-17.71	-14.29	-16.57	-12.87	-12.63	-12.91
Event 2: large capital outflows	-18.25	-15.75	-18.00	-15.44	NaN	-16.21
Event 3: binding constraints	-13.68	-6.56	-10.70	-11.32	-7.24	-8.98
Welfare effects (relative to column 1, %)		0.19	0.65	0.13	0.26	0.72
of which: from the first period		1.45	3.87	-0.76	1.16	3.52
of which: from the remaining periods		0.05	0.32	0.23	0.17	0.43
Welfare effects (relative to corresponding CE, %)				0.13	0.08	0.11
of which: from the first period				-0.76	-0.08	-0.63
of which: from the remaining periods				0.23	0.09	0.19
Capital control taxes (%)						
on debt (τ^d)				0.93	0.42	0.78
on equity (τ^s)					0.50	0.75
on debt (τ^d, *ex ante*)				5.29	2.13	3.02
on equity (τ^s, *ex ante*)					1.49	2.60
on debt (τ^d, *ex post*)				0.00	-22.72	-42.27
on equity (τ^s, *ex post*)					-12.88	-34.69

NOTE. Moments are computed from simulations of 81,000 periods. The first 1,000 periods are discarded, and the remaining 80,000 observations are used to compute ergodic moments. Columns (1)–(3) report competitive equilibrium outcomes for economies with institutional quality $\theta = 1, 0.61,$ and 0.4, respectively. Columns (4)–(6) report the corresponding social planner outcomes for the same values of θ. Rare Event 1 is defined as a realization in which consumption deviates from its ergodic mean by more than two standard deviations of the ergodic consumption distribution in the benchmark economy (column 1). Rare Event 2 is defined analogously for net capital outflows. Welfare effects relative to column (1) are reported as consumption-equivalent variations, computed using the ergodic distribution generated by the benchmark economy and averaged over that distribution. Welfare decompositions report the contributions of current utility and continuation value. Welfare effects relative to the corresponding competitive equilibrium are computed by comparing competitive equilibrium and social planner outcomes conditional on the same θ.

Table C11 ROBUSTNESS TO THE DIVIDEND PARAMETER ($\alpha = 0.05$)

	Competitive Equilibrium (CE)			Social Planner (SP)		
	Zero Equity (1)	Baseline (2)	More Equity (3)	Zero Equity (1)	Baseline (2)	More Equity (3)
Institutional quality parameters	1	0.608	0.4	1	0.608	0.4
Average equity price	0.00	0.49	0.75	0.00	0.49	0.75
Average dividend payout ratio	0.016	0.016	0.017	0.016	0.016	0.016
Average equity issuance	0.00	0.22	0.98	0.00	0.08	0.97
Average equity share	0.00	0.10	0.45	0.00	0.04	0.45
Relative volatility of debt to equity flows	Inf	9.86	16.05	Inf	2.66	4.11
Average equity transaction cost (in GDP, bps)	0.00	1.69	0.42	0.00	1.53	0.40
Net foreign liability (equity, in GDP)	0.00	0.04	0.25	0.00	0.01	0.24
Net foreign liability (debt, in GDP)	0.29	0.30	0.30	0.29	0.29	0.29
Net foreign liability (in GDP)	0.29	0.33	0.54	0.29	0.31	0.53
Average consumption (c_t)	0.99	0.98	0.97	0.99	0.99	0.97
std(c_t)	0.058	0.057	0.057	0.052	0.050	0.051
corr(c_t, y_{Tt})	0.89	0.89	0.89	0.92	0.92	0.92
mean(current account/GDP)	0.00	0.00	0.00	0.00	0.00	0.00
std(current account/GDP)	0.027	0.024	0.025	0.006	0.006	0.006
corr(current account/GDP, GDP)	-0.75	-0.72	-0.73	-0.03	0.19	0.01
Frequency of rare events (%)						
Event 1: large negative consumption collapse	4.31	4.31	4.31	1.92	1.88	1.93
Event 2: large capital outflows	3.72	3.52	3.43	0.06	0.03	0.06
Event 3: binding constraints	7.31	9.17	8.43	0.55	2.59	3.48
Average consumption collapse in rare events (%)						
Event 1: large negative consumption collapse	-17.71	-17.03	-17.44	-12.87	-12.49	-12.86
Event 2: large capital outflows	-18.25	-17.65	-18.35	-15.44	-16.10	-15.86
Event 3: binding constraints	-13.68	-11.80	-12.55	-11.32	-9.39	-9.63
Welfare effects (relative to column 1, %)		0.05	0.21	0.13	0.18	0.33
of which: from the first period		0.53	1.40	-0.76	-0.04	0.79
of which: from the remaining periods		0.00	0.08	0.23	0.20	0.27
Welfare effects (relative to corresponding CE, %)				0.13	0.13	0.13
of which: from the first period				-0.76	-0.61	-0.74
of which: from the remaining periods				0.23	0.20	0.22
Capital control taxes (%)						
on debt (τ^d)				0.93	0.73	0.86
on equity (τ^s)					0.65	0.76
on debt (τ^d, *ex ante*)				5.29	2.70	3.31
on equity (τ^s, *ex ante*)					1.42	2.68
on debt (τ^d, *ex post*)				0.00	-73.76	-67.12
on equity (τ^s, *ex post*)					-28.50	-52.47

NOTE. Moments are computed from simulations of 81,000 periods. The first 1,000 periods are discarded, and the remaining 80,000 observations are used to compute ergodic moments. Columns (1)–(3) report competitive equilibrium outcomes for economies with institutional quality $\theta = 1, 0.61,$ and 0.4, respectively. Columns (4)–(6) report the corresponding social planner outcomes for the same values of θ. Rare Event 1 is defined as a realization in which consumption deviates from its ergodic mean by more than two standard deviations of the ergodic consumption distribution in the benchmark economy (column 1). Rare Event 2 is defined analogously for net capital outflows. Welfare effects relative to column (1) are reported as consumption-equivalent variations, computed using the ergodic distribution generated by the benchmark economy and averaged over that distribution. Welfare decompositions report the contributions of current utility and continuation value. Welfare effects relative to the corresponding competitive equilibrium are computed by comparing competitive equilibrium and social planner outcomes conditional on the same θ.

Table C12 ROBUSTNESS TO THE DIVIDEND PROCESS ($e_t = \alpha(y_{Tt} + p_{Nt}y_{Nt})$)

	Competitive Equilibrium (CE)			Social Planner (SP)		
	Zero Equity (1)	Baseline (2)	More Equity (3)	Zero Equity (1)	Baseline (2)	More Equity (3)
Institutional quality parameters	1	0.611	0.5	1	0.611	0.5
Average equity price	0.00	1.03	1.26	0.00	1.06	1.26
Average dividend payout ratio	0.035	0.035	0.035	0.035	0.035	0.035
Average equity issuance	0.00	0.39	0.98	0.00	0.08	0.96
Average equity share	0.00	0.28	0.58	0.00	0.08	0.58
Relative volatility of debt to equity flows	Inf	4.48	6.16	Inf	1.42	2.22
Average equity transaction cost (in GDP, bps)	0.00	3.11	1.28	0.00	3.24	1.70
Net foreign liability (equity, in GDP)	0.00	0.13	0.43	0.00	0.03	0.42
Net foreign liability (debt, in GDP)	0.29	0.31	0.31	0.29	0.30	0.30
Net foreign liability (in GDP)	0.29	0.44	0.73	0.29	0.33	0.72
Average consumption (c_t)	0.99	0.97	0.96	0.99	0.99	0.96
std(c_t)	0.058	0.054	0.054	0.052	0.049	0.049
corr(c_t, y_{Tt})	0.89	0.89	0.91	0.92	0.92	0.92
mean(current account/GDP)	0.00	0.00	0.00	0.00	0.00	0.00
std(current account/GDP)	0.027	0.020	0.021	0.006	0.007	0.008
corr(current account/GDP, GDP)	-0.75	-0.62	-0.66	-0.03	0.31	-0.02
Frequency of rare events (%)						
Event 1: large negative consumption collapse	4.31	4.14	4.22	1.92	0.80	2.10
Event 2: large capital outflows	3.72	2.86	2.88	0.06	0.02	0.20
Event 3: binding constraints	7.31	14.49	11.57	0.62	4.88	4.92
Average consumption collapse in rare events (%)						
Event 1: large negative consumption collapse	-17.71	-15.54	-15.67	-12.87	-12.85	-13.07
Event 2: large capital outflows	-18.25	-16.16	-16.51	-15.45	-16.25	-16.80
Event 3: binding constraints	-13.68	-8.66	-9.99	-11.16	-8.90	-9.62
Welfare effects (relative to column 1, %)		0.11	0.22	0.13	0.22	0.31
of which: from the first period		1.00	1.81	-0.76	0.58	1.29
of which: from the remaining periods		0.01	0.05	0.23	0.18	0.21
Welfare effects (relative to corresponding CE, %)				0.13	0.09	0.08
of which: from the first period				-0.76	-0.38	-0.60
of which: from the remaining periods				0.23	0.14	0.15
Capital control taxes (%)						
on debt (τ^d)				1.00	0.72	1.14
on equity (τ^s)					0.67	0.82
on debt (τ^d, *ex ante*)				5.28	3.00	2.73
on equity (τ^s, *ex ante*)					1.66	2.04
on debt (τ^d, *ex post*)				0.00	-43.75	-29.53
on equity (τ^s, *ex post*)					-18.72	-22.81

NOTE. We recalibrate α to match the dividend payout ratio. Moments are computed from simulations of 81,000 periods. The first 1,000 periods are discarded, and the remaining 80,000 observations are used to compute ergodic moments. Columns (1)–(3) report competitive equilibrium outcomes for economies with institutional quality $\theta = 1, 0.61$, and 0.4, respectively. Columns (4)–(6) report the corresponding social planner outcomes for the same values of θ. Rare Event 1 is defined as a realization in which consumption deviates from its ergodic mean by more than two standard deviations of the ergodic consumption distribution in the benchmark economy (column 1). Rare Event 2 is defined analogously for net capital outflows. Welfare effects relative to column (1) are reported as consumption-equivalent variations, computed using the ergodic distribution generated by the benchmark economy and averaged over that distribution. Welfare decompositions report the contributions of current utility and continuation value. Welfare effects relative to the corresponding competitive equilibrium are computed by comparing competitive equilibrium and social planner outcomes conditional on the same θ.

D Numerical Solution

We solve the model using a global solution method based on time iteration on the Euler equations. The equilibrium is characterized by policy functions defined over the state variables $\{d_t, s_t, y_{Tt}, y_{Nt}\}$. Because debt d_t is unbounded, we instead transform the state space to $\{c_{Tt}, s_t, y_{Tt}, y_{Nt}\}$. This transformation is one-to-one due to the period budget constraint,

$$c_{Tt} + Rd_t + s_t(e_t + q_t) = y_{Tt} + d_{t+1} + q_t s_{t+1}. \tag{21}$$

Given the equilibrium policy functions, this constraint maps d_t one-to-one to c_{Tt}.

We construct a grid for tradable consumption, $\mathcal{G}_c = \{c^0, c^1, \ldots\}$, consisting of 61 points, and a grid for equity issuance, $\mathcal{G}_s = \{0, \ldots, 1\}$, consisting of 31 points. The exogenous processes for tradable and non-tradable income, y_{Tt} and y_{Nt}, are taken from Bianchi (2011), consisting of 16 grid points for the joint state space. We solve for the policy functions under both the competitive equilibrium and the social planner's problem using the global solution methods developed by Cao et al. (2023). The equilibrium conditions are described in Section 3.2 for the competitive equilibrium and Section 3.3 for the social planner.

For each equilibrium, we compute policy functions of the form $\tilde{x}(c_{Tt}, s_t, y_{Tt}, y_{Nt})$, where $x \in \{d_{t+1}, s_{t+1}, \lambda_t, \mu_t, u_t, v_t, p_{Nt}\}$. Given these policy functions, the budget constraint implies an associated policy function $d_t(c_{Tt}, s_t, y_{Tt}, y_{Nt})$. We then recover the original policy functions expressed in terms of debt, $x(d_t, s_t, y_{Tt}, y_{Nt})$, as well as the corresponding consumption policy $c_{Tt}(d_t, s_t, y_{Tt}, y_{Nt})$.