Insufficient or Excessive Investment Under Sovereign Default Risk*

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Abstract

Private agents do not internalize the impact of their investment decisions on the sovereign's bond prices and default risk. Therefore, a standard externality argument implies that investment is insufficient and that a subsidy can improve welfare, if financed by non-distortionary means. We contrast this logic with a countervailing force. When the sovereign is impatient relative to households, plausibly due to political economy factors, it finds laissez-faire capital accumulation excessive and might prefer instead to tax it. We embed both mechanisms in a sovereign default model with decentralized capital investment, long-term public debt, and stochastic trend growth, calibrated to salient features of the Spanish economy. We find that the impatience channel dominates quantitatively, to such an extent that laissez-faire is preferable to the government's ideal fiscal policy, based on households' welfare.

Keywords: sovereign default, capital accumulation, decentralized investment
JEL classification: E22, F34, F43

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This paper explores private capital accumulation in economies where the government implements policy under discretion and can default on outstanding public debt, in the tradition of Eaton and Gersovitz (1981). We find that, as expected from the prior work of Park (2017) and Gordon and Guerron-Quintana (2018), higher investment generally lowers default risk. In turn, this lower risk translates into higher sovereign bond prices now, more favorable borrowing terms and expanded fiscal space for the sovereign. Our analysis concerns the interplay of two mechanisms which determine the fiscal treatment of investment and its desirability.

First, as the private sector does not internalize the impact of its investment choices on public bond prices and default policies, a standard externality argument implies that an investment subsidy would improve welfare, if funded by non-distortionary means. Seoane and Yurdagul (2023) and Esquivel (2024) are two recent papers touching upon this argument. Second, governments in emerging markets and other countries at risk of default seem plagued by political economy dysfunctions, incentives that render fiscal authorities effectively more impatient than their constituents.[1] Several works highlight this feature and its role in the quantitative success of sovereign default models, including Alesina and Tabellini (1990), Chatterjee and Eyigungor (2019), Aguiar, Amador, and Fourakis (2020), Azzimonti and Mitra (2023a, 2023b), Acharya, Rajan, and Shim (2024), and Cotoc, Johri, and Sosa-Padilla (2025). We do not take a stand on the exact nature of these frictions but instead emphasize their consequences for capital accumulation. Generally, such a government finds laissez-faire private sector investment excessive, and would like to tax rather than subsidize it, to induce higher consumption immediately.[2]

We embed these two forces and evaluate their interaction in a quantitative model with private investment, random trend growth, and long-term, defaultable public debt.[3] We calibrate our model to Spain, a prototypical European periphery economy, and use it to disentangle the two forces we study, as well as evaluate the welfare implications of decentralized investment. Our model reproduces well the business cycle properties in the data, together with bond yield spread dynamics.

We compare our baseline economy, in which capital accumulation is decided by the private sector and the government is as impatient as called for by the data, to 3 coun-

1. The government being more impatient than domestic households is distinct from the finding in most quantitative work that sovereigns are more impatient than international lenders, a known driver of procyclical fiscal policy (Cuadra, Sanchez, and Sapriza 2010).

2. In the online Supplemental Material, we include suggestive cross-country evidence of the association between political frictions and the tax treatment of investment, broadly supportive of our mechanism. See Table A.4, Figure A.3, and the associated discussion in the Supplemental Material.

3. Our work abstracts from the multiplicity identified by Galli (2021), who studies a self-fulfilling austerity mechanism resulting from the interplay between fiscal policy and the market price of sovereign debt.

terfactual economies. First, we contrast with an otherwise identical economy in which the government perfectly controls investment. This isolates the externality impinging on the sovereign's bond prices and default policies. We then consider a version of our model in which the government is as patient as households, to highlight the impact of this disconnect on the tax treatment of investment in the baseline. Finally, we evaluate a scenario where the government is not impatient and has control over investment.

We find that giving the government access to an appropriately-funded subsidy on investment can indeed improve outcomes, but critically only if the government's discount factor is close enough to that of domestic households. This is not the case in the baseline calibration featuring non-trivial sovereign impatience, to such an extent that, if given the opportunity, our sovereign would want to tax investment, to induce higher consumption immediately. Such a policy worsens household welfare, by about 0.03% in consumption equivalent measure.[4] In contrast, we find much smaller, albeit positive, welfare gains from introducing the investment subsidy, of about 0.004%, if the sovereign shares its households' discount factor. Remarkably, these welfare gains and losses are almost exclusively attributable to changes in default propensity, from capital deepening and sovereign discounting, with little to no change in business cycle statistics and comovements.

Our results connect to several themes explored in the literature. With a first group of papers, we share the focus on interactions between capital accumulation and default, including Bai and Zhang (2012) on financial liberalization, Bocola (2016) on the pass-through of sovereign risk, Arellano, Bai, and Mihalache (2018), Esquivel (2024), and Deng and Liu (2024) on sectoral misallocation, Alessandria, Bai, and Deng (2020) on production with migrant flows, and Asonuma and Joo (2023) on public capital. Our paper is closest to Gordon and Guerron-Quintana (2018), including their discussion of decentralization. Also noteworthy, Park (2017) emphasizes the non-monotonic relationship between the capital stock and default incentives in a setting similar to ours, and this pattern's role in defaults during "good times."

Several papers have explored ways in which private decision-making constrains discretionary fiscal policy, for example Na et al. (2018) and Bianchi, Ottonello, and Presno (2023) on downward rigid wages and exchange rate regimes, Arellano, Bai, and Mihalache (2020) on pricing frictions and monetary policy rules, and Liu and Shen (2022) on frictional labor markets. For us, private sector capital accumulation plays this role.

Finally, our focus on decentralized physical capital investment is distinct but related to the question of decentralized international borrowing, as explored by Jeske (2006),

4. This magnitude is modest, in absolute value, but in line with standard welfare costs in economies with representative households (Otrok 2001).

Kim and Zhang (2012), and Seoane and Yurdagul (2023), among others. We maintain the standard assumption that asset markets are segmented, and that the sovereign alone can tap international markets.

1 Model

Our model focuses on the interactions between a sovereign fiscal authority, the domestic private sector, and foreign lenders. The model closest to our work is Gordon and Guerron-Quintana (2018), from which we mainly differ by adopting a random trend productivity process, informed by the evidence in Aguiar and Gopinath (2007). We discuss our agents' problems in turn and relegate the fairly standard definition of equilibria for these economies to the online Supplemental Material. We consider alternative assumptions about the ability of fiscal authorities to shape private investment behavior, as well as their degree of impatience. We start with the laissez-faire case, where the sovereign lacks fiscal instruments which impact investment directly, to then consider the polar opposite case of perfect public control over capital investment.

The private sector. The private sector consists of a representative household and a representative firm. The household owns shares in the firm and receives dividend payments. In turn, the firm's investment decisions reflect the household's marginal rate of substitution. Since there are no financial frictions between households and firms, it is convenient to think of them as a consolidated entity, the private sector.

The household maximizes its expected utility $\mathbb{E}_0 \sum_t \beta^t u(c_t)$ by choosing shareholdings a_{t+1} subject to a sequence of budget constraints $c_t + P_t a_{t+1} = w_t + (\text{div}_t + P_t)\, a_t + T_t$, where c_t is the household's consumption, P_t is the stock price, a_t are the shares held at the start of the period, div_t are dividend payments, and T_t is a lump-sum transfer received from the government (a lump-sum tax, if negative). We assume, for simplicity, that a unit of labor is supplied inelastically, so that the wage income is simply w_t.[5] With a representative agent, in equilibrium P_t is at a level such that $a_{t+1} = 1$.[6]

The firm hires labor ℓ_t and chooses investment i_t each period, to maximize the present value of dividend payments $\mathbb{E}_0 \sum_t \Lambda_t \text{div}_t$, discounted using the household's pricing kernel

5. Our results extend naturally to the typical case of Greenwood, Hercowitz, and Huffman (1988) preferences, without wealth effects on labor supply, which are widely used in studies of small open economies. We abstract from elastic labor supply in order to isolate one private sector decision margin alone, investment.

6. Note that we implicitly rule out foreign ownership of shares. We expand on our model's market segmentation aspects when discussing the sovereign's problem.

$\Lambda_t = \beta^t u'(c_t)/u'(c_0)$, subject to a sequence of constraints and laws of motion,

$$\text{div}_t = z_t k_t^{\alpha} (\Gamma_t \ell_t)^{1-\alpha} - w_t \ell_t - i_t - \Theta(k_t, k_{t+1}), \quad \text{and} \quad k_{t+1} = (1-\delta)k_t + i_t,$$

where $\Theta(k_t, k_{t+1})$ is a quadratic adjustment cost, a standard feature of small open economy models (Schmitt-Grohé and Uribe 2003). Production is constant returns to scale, subject to a stationary productivity shock z_t, and a random trend Γ_t. We assume that the stationary "cycle" shock z_t is AR(1), with

$$\log z_t = \rho_z \log z_{t-1} + \varepsilon_{z,t}, \quad \varepsilon_{z,t} \sim \text{ iid } N(0, \sigma_z^2)$$

and the trend accumulates random gross growth rate shocks, $\Gamma_t = \Gamma_{t-1} g_t$, with

$$\log g_t = (1-\rho_g) \log \mu_g + \rho_g \log g_{t-1} + \varepsilon_{g,t},\ \varepsilon_{g,t} \sim \text{ iid } N(0, \sigma_g^2).$$

Following Aguiar and Gopinath (2007), we set the adjustment cost function to $\Theta(k_t, k_{t+1}) = \frac{\theta}{2}\left(\frac{k_{t+1}}{k_t} - \mu_g\right)^2 k_t$, so that investment is costly to the extent to which the growth rate of the capital stock deviates from μ_g, the long-run average growth rate of this economy.

The fiscal authority. Financial markets are segmented. The government alone operates in international markets by trading a long-term bond, modeled as a decaying perpetuity (Hatchondo and Martinez 2009). It has the option to default on this obligation at its discretion. It uses the net proceeds from these external operations to fund a level of public spending G_t and a lump-sum transfer to the domestic households T_t, with $T_t < 0$ corresponding to lump-sum taxation. Its budget constraint is given by

$$(1 - D_t)\left[q_t(B_{t+1} - (1-\phi)B_t) - \kappa B_t\right] = G_t + T_t.$$

B_t are the outstanding bond units, B_{t+1} is the bond level chosen for the next period, and the market price of bonds is q_t. κ is the debt service payment called for by each of the B_t units of outstanding debt, while the ϕ parameter controls the maturity structure of the debt. If the sovereign chooses to default today, and sets $D_t = 1$, no debt service payments are made and the primary deficit $G_t + T_t$ must be zero.

We make the simplifying assumption that G_t is at all times proportional to the productivity trend Γ_{t-1}, rather than a choice variable for the sovereign. This frees us from having to take a stand on the social desirability of public spending levels, while broadly matching the data.

Default is followed by a spell of international financial market exclusion, which ends with probability λ. Eventually, the sovereign regains access to international markets without any outstanding debt.[7] The sovereign's choice to default causes disruptions in domestic production, captured in reduced form by a penalty function applied to the cycle component of productivity, $h(z_t)$, which proxies for the mechanisms explored by Mendoza and Yue (2012) and Arellano, Bai, and Bocola (2025), among others, of trade or banking disruptions induced by sovereign default.

We assume that the government values consumption the same as households, except possibly with a higher degree of impatience. Its objective is given by $\mathbb{E}_0 \sum_t \beta_g^t u(c_t)$, with $\beta_g \leq \beta$. This assumption captures in reduced form a long tradition of studying political economy frictions in sovereign borrowing.

International lenders. Foreign buyers of the government's bonds are competitive and risk-neutral.[8] Their opportunity cost of funds is given by a constant short-term risk-free rate r^f. These assumptions deliver the standard long-term bond pricing condition that ensures lenders break even in expectation,

$$q_t = \frac{1}{1+r^f}\mathbb{E}_t(1-D_{t+1})(\kappa + (1-\phi)q_{t+1}),$$

consistent with our assumption of full debt repudiation upon default.

With this maturity structure, the yield-to-maturity of the bond is $r_t = \frac{\kappa}{q_t} - \phi$, the spread is $r_t - r^f$, and the risk-free Macaulay duration is $\frac{1+r^f}{\phi+r^f} \approx \phi^{-1}$.

1.1 A small k, big K recursive formulation of laissez-faire

We introduce a recursive formulation of our environment via a standard "small k, big K" approach, so that firms do not internalize the impact of their individual investment decisions (k') on the aggregate capital stock next period (K') and thus allocations more broadly. To economize on notation, we group state variables into two sets: first, exogenous and stationary shocks $s = \langle z, g \rangle$, and second, the endogenous capital and debt stocks, together with the level of the trend in the previous period, $S = \langle K, B, \Gamma_{-1} \rangle$.[9]

7. We assume full repudiation of the defaulted debt. Yue (2010) and Dvorkin et al. (2021) provide reference models with haircuts and recovery, using cooperative and non-cooperative bargaining, respectively.

8. By restricting attention to the traditional case of risk-neutrality, we rule out any role for risk premia (Lizarazo 2013) or global financial shocks (Morelli, Ottonello, and Perez 2022) in driving yields in our model.

9. We reserve the details of the detrending and computation of our models for the online Supplemental Material. Detrending is enabled by the homogeneity of value and bond price functions, together with our functional form assumptions (Aguiar et al. 2016).

The value function for the private sector, the household and firm consolidated, under normal international market access for the sovereign, given that the government will have B' outstanding debt next period, satisfies

$$
\begin{aligned}
v^r(k,s,S,B') = \max_{k'} \ & u(c) + \beta \mathbb{E}_{s'|s} v(k',s',S') \\
\text{s.t. } & c + k' + \Theta(k,k') = z k^{\alpha} \Gamma^{1-\alpha} + (1-\delta)k + T(s,S,B') \\
& K' = \mathcal{K}(s,S,B'),
\end{aligned} \tag{1}
$$

where $\mathcal{K}$ is the perceived law of motion for aggregate capital. In equilibrium, a consistency condition ensures that the capital investment choice of the representative household coincides with the aggregate variable, $k' = K' = \mathcal{K}(s,S,B')$.

The value under default, in international market exclusion, is

$$
\begin{aligned}
v^d(k,s,S) = \max_{k'} \ & u(c) + \beta \mathbb{E}_{s'|s} \Big(\lambda v(k',s',S') + (1-\lambda) v^d(k',s',S') \Big) \\
\text{s.t. } & c + k' + \Theta(k,k') = h(z) k^{\alpha} \Gamma^{1-\alpha} + (1-\delta)k + T^d(s,S) \\
& K' = \mathcal{K}^d(s,S), \quad B' = 0,
\end{aligned} \tag{2}
$$

and the start-of-period value, prior to the sovereign's default decision, satisfies

$$
v(k,s,S) = \mathcal{D}(s,S) v^d(k,s,S) + (1 - \mathcal{D}(s,S)) v^r(k,s,S,\mathcal{B}(s,S)), \tag{3}
$$

where $\mathcal{D}(s,S)$ is the sovereign's equilibrium default policy and $\mathcal{B}(s,S)$ is its choice of bonds for next period. The private sector is impacted by the sovereign's choices through the levels of the transfers T and T^d, as well as the default productivity penalty h.

These private sector value functions induce policy functions under repayment and default, respectively: the consumption policies $\mathcal{C}(s,S,B')$ and $\mathcal{C}^d(s,S)$, and the capital policies $\mathcal{K}(s,S,B')$ and $\mathcal{K}^d(s,S)$. These act as further constraints on the government's choices, since the sovereign understands that, for example, following a counterfactually higher B' the resulting capital stock K' will respond as governed by the $\mathcal{K}$ policy.

The sovereign's value under repayment is

$$
\begin{aligned}
V^r(s,S) = \max_{B'} \ & u(\mathcal{C}(s,S,B')) + \beta_g \mathbb{E}_{s'|s} V(s',S') \\
\text{s.t. } & T(s,S,B') = q(s,S')(B' - (1-\phi)B) - \kappa B - G(S) \\
& K' = \mathcal{K}(s,S,B'),
\end{aligned} \tag{4}
$$

with associated bond issuance policy $\mathcal{B}(s, S)$, while the default value satisfies

$$V^d(s,S) = u(\mathcal{C}^d(s,S)) + \beta_g \mathbb{E}_{s'|s} \Big(\lambda V(s',S') + (1-\lambda)V^d(s',S')\Big) \tag{5}$$
$$\text{with } T^d(s,S) = -G(S)$$
$$K' = \mathcal{K}^d(s,S), \quad B' = 0.$$

The start of period value inclusive of the option to default is given by

$$V(s,S) = \max_{D \in \{0,1\}} D\, V^d(s,S) + (1-D)V^r(s,S) \tag{6}$$

and we encode the resulting equilibrium default policy in $\mathcal{D}(s, S)$.

Finally, the bond price schedule in recursive notation satisfies

$$q(s,S') = \frac{1}{1+r^f}\, \mathbb{E}_{s'|s}(1-\mathcal{D}(s',S'))\, \left[\kappa + (1-\phi)q(s',S'')\right] \tag{7}$$
$$\text{with } S'' = \langle \mathcal{K}(s',S',\mathcal{B}(s',S')), \mathcal{B}(s',S'), \Gamma' \rangle.$$

Due to long-term bonds, pricing reflects all future equilibrium default, borrowing, and investment policies, at all horizons.

1.2 A recursive formulation of centralized investment

We will contrast the values and policies from the previous section, under laissez-faire, to outcomes under centralized investment, where we allow the government to choose capital investment directly. We discuss in the following section how this can be decentralized using a linear investment tax or subsidy.

In the centralized case, denoted throughout by a c subscript, the value of the government under repayment is

$$V_c^r(s,S) = \max_{K',B'} u(c) + \beta_g \mathbb{E}_{s'|s} V_c(s',S') \tag{8}$$
$$\text{s.t. } c + K' + \Theta(K,K') + G(S) = zK^\alpha \Gamma^{1-\alpha} + (1-\delta)K + q_c(s,S')(B' - (1-\phi)B) - \kappa B,$$

and the resulting policies are $K' = \mathcal{K}_c(s, S)$ and $B' = \mathcal{B}_c(s, S)$. In default, the choice of capital satisfies

$$V_c^d(s,S) = \max_{K'} u(c) + \beta_g \mathbb{E}_{s'|s}\Big(\lambda V_c(s',S') + (1-\lambda)V_c^d(s',S')\Big) \tag{9}$$
$$\text{s.t. } c + K' + \Theta(K,K') + G(S) = h(z)K^\alpha\Gamma^{1-\alpha} + (1-\delta)K$$
$$B' = 0,$$

with associated policy function $K' = \mathcal{K}_c^d(s,S)$. Finally, the default decision is

$$V_c(s,S) = \max_{D\in\{0,1\}} D\, V_c^d(s,S) + (1-D)V_c^r(s,S), \tag{10}$$

and the policy is encoded in $\mathcal{D}_c(s,S)$.

The lenders' bond pricing condition is analogous to the one under the laissez-faire case, except for the fact that now the relevant policy functions are $\mathcal{D}_c$, $\mathcal{K}_c$, and $\mathcal{B}_c$, respectively:

$$q_c(s,S') = \frac{1}{1+r^f}\,\mathbb{E}_{s'|s}(1-\mathcal{D}_c(s',S'))\left[\kappa + (1-\phi)q_c(s',S'')\right] \tag{11}$$
$$\text{with } S'' = \langle \mathcal{K}_c(s',S'), \mathcal{B}_c(s',S'), \Gamma'\rangle.$$

To evaluate welfare, we compute values for the private sector too, noting that it makes no decision. For example, under market access,

$$v_c^r(s,S) = u(c) + \beta\mathbb{E}_{s'|s}v_c(s',S')$$
$$\text{where } c = zK^\alpha\Gamma^{1-\alpha} + (1-\delta)K - K' - \Theta(K,K') - G(S) + q_c(s,S')(B' - (1-\phi)B) - \kappa B$$
$$K' = \mathcal{K}_c(s,S), \quad B' = \mathcal{B}_c(s,S).$$

The online Supplemental Material includes definitions for the Markov Perfect equilibria of the laissez-faire and centralized investment economies, respectively.

1.3 A first-order condition characterization

We start our analysis by comparing the first-order optimality conditions for investment, under laissez-faire and centralized investment, to highlight the forces shaping the optimal size of the capital stock. We focus on investment when the sovereign is choosing to service the debt, although analogous conditions can be derived for default. We set $\theta = 0$ in this section alone, for ease of illustration, and revert temporarily to the more compact sequential notation.

Under laissez-faire, the first-order condition for the private sector's capital choice is

$$
\begin{aligned}
u'(c_t) = \beta \mathbb{E}_t \Bigg\{ & D_{t+1} u'(c^d_{t+1}) \left[\alpha h(z_{t+1}) \left(\frac{\Gamma_{t+1}}{K_{t+1}} \right)^{1-\alpha} + 1 - \delta \right] \\
& + (1 - D_{t+1}) u'(c^r_{t+1}) \left[\alpha z_{t+1} \left(\frac{\Gamma_{t+1}}{K_{t+1}} \right)^{1-\alpha} + 1 - \delta \right] \Bigg\}
\end{aligned}
\tag{12}
$$

while under centralized investment, when the government has perfect control over capital accumulation, the condition reads

$$
\begin{aligned}
\left[1 - \frac{\partial q_t}{\partial K_{t+1}} (B_{t+1} - (1-\phi) B_t) \right] u'(c_t) = \beta_g \mathbb{E}_t \Bigg\{ & \\
& D_{t+1} u'(c^d_{t+1}) \left[\alpha h(z_{t+1}) \left(\frac{\Gamma_{t+1}}{K_{t+1}} \right)^{1-\alpha} + 1 - \delta \right] \\
& + (1 - D_{t+1}) u'(c^r_{t+1}) \left[\alpha z_{t+1} \left(\frac{\Gamma_{t+1}}{K_{t+1}} \right)^{1-\alpha} + 1 - \delta \right] \Bigg\}
\end{aligned}
\tag{13}
$$

Two differences are salient. First, the marginal benefit of investment, on the right-hand-side, is evaluated using β_g rather than β. All else equal, future consumption is weakly less valuable today. This discourages investment. Second, the private sector does not internalize the impact of its investment on the bond price received by the sovereign today. This is reflected in the term in square brackets on the left-hand-side, scaling the marginal cost of investment.

Across the state space, the relation between capital levels and default propensity is non-monotonic (Park 2017). Still, for most of the states in the ergodic distribution, more capital means weaker incentives to default, and so the benefit of capital accumulation is underestimated by the private investment policy. This social desirability of higher capital is reflected by the $\frac{\partial q_t}{\partial K_{t+1}} > 0$ term. A more subtle implication of long-term debt is that when the government is buying back, retiring outstanding bonds in secondary markets, $B_{t+1} < (1-\phi)B_t$, the private sector could invest excessively, in that its high K_{t+1} choice supports a higher bond price, a price the sovereign now pays rather than receives.

Our quantitative analysis in the following section aims to establish which of these differences in investment behavior dominates and how the answer depends on the nature of the frictions impinging on this economy.

The decentralization tax or subsidy. We laid out two polar opposite cases: laissez-faire, under which the private sector decides on investment and the government issues bonds, and a centralized economy, where the government controls both assets. We now sketch how this centralized outcome can be implemented by means of a state-contingent subsidy to capital accumulation, mirroring the analysis of Gordon and Guerron-Quintana (2018, Appendix A.2). We introduce a subsidy τ_t on capital accumulation in the firm's problem. The definition of dividends becomes

$$\mathrm{div}_t = z_t k_t^{\alpha} \left(\Gamma_t \ell_t\right)^{1-\alpha} - w_t \ell_t + (1-\delta)k_t - (1-\tau_t)k_{t+1} - \Theta(k_t, k_{t+1}),$$

and the problems facing private sector agents are otherwise unaltered. The subsidy also enters the primary deficit expression on the right-hand-side of the government's budget constraint,

$$(1-D_t)\left[q_t(B_{t+1} - (1-\phi)B_t) - \kappa B_t\right] = G_t + T_t + \tau_t K_{t+1}.$$

The private sector's first order condition for K_{t+1} becomes

$$\begin{aligned}(1-\tau_t)u'(c_t) = \beta \mathbb{E}_t \Bigg\{ & D_{t+1} u'(c^d_{t+1}) \left[\alpha h(z_{t+1}) \left(\frac{\Gamma_{t+1}}{K_{t+1}}\right)^{1-\alpha} + 1 - \delta\right] \\ & + (1-D_{t+1}) u'(c^r_{t+1}) \left[\alpha z_{t+1} \left(\frac{\Gamma_{t+1}}{K_{t+1}}\right)^{1-\alpha} + 1 - \delta\right] \Bigg\}\end{aligned} \tag{14}$$

so that the only difference from (12) is the scaling of the marginal cost of investment on the left-hand side by the $1-\tau_t$ subsidy term. A comparison with the centralized investment condition (13) delivers a state-contingent subsidy rate which supports the centralized investment policies,

$$\tau_t = 1 - \left[1 - \frac{\partial q_t}{\partial K_{t+1}}(B_{t+1} - (1-\phi)B_t)\right] \frac{\beta}{\beta_g}. \tag{15}$$

Whether τ_t is a subsidy ($\tau_t > 0$) or a tax ($\tau_t < 0$) depends on three factors: first, the strength and sign of the investment externality, $\frac{\partial q_t}{\partial K_{t+1}}$, second, whether the sovereign is issuing or buying back bonds, $B_{t+1} \lesseqgtr (1-\phi)B_t$, and finally, the degree of sovereign impatience, $\beta_g \leq \beta$.

2 Quantitative Analysis

To evaluate our model's quantitative properties, we make further functional form assumptions. We use $u(c) = 1 - c^{-1}$ for the flow utility function, and thus employ a conventional value of 2 for the coefficient of relative risk aversion. Our default penalty follows Chatterjee and Eyigungor (2012), $h(z) = z - \max(0, \iota_0 z + \iota_1 z^2)$, with $\iota_0 < 0 < \iota_1$. The concavity of $h(z)$ is in line with the observation of Arellano (2008) that a convex penalty is key for countercyclical spreads and elevated default risk during recessions.

2.1 Calibration and model fit

We pursue a quarterly calibration of the model for the case of decentralized investment using data from Spain, a representative European periphery economy, over the 1995Q1 to 2019Q4 sample.[10] Moreover, Spain is part of a monetary union, the Euro area, which alleviates concerns about the role of monetary policy for our question. The Supplemental Material includes 2 additional calibrations of our model, aimed at establishing the robustness of our main finding: a calibration featuring high spreads, to the Argentina data moments from Gordon and Guerron-Quintana (2018), and a calibration with the same targets as our baseline except for an increased debt level, towards the levels reported by Table A.1 for Portugal and Italy.

We group parameters in two sets. First, those that can be set directly, based on estimates from the data and values common in the literature. Table 1 compiles their values and interpretation. A second set of parameters are specific to our model. They are set in order to match 7 moments in the data. Table 2 lists these parameters and the model fit.

Our productivity process features a stationary cycle component z_t and a random trend Γ_t driven by potentially persistent growth rates g_t. Estimating such a process on our short sample is challenging. We rely on the insight of Aguiar and Gopinath (2007), that the volatility of consumption reflects the relative magnitude of trend versus cycle shocks. We find that the Spanish data are best described by growth rate shocks which are uncorrelated over time, yet volatile.

The G parameter matches the average share of public spending in GDP. For the factor shares parameter α and the depreciation rate δ we rely on common values in the literature, 0.36 and 2%, respectively. The risk-free rate is 0.5% quarterly, based on a longer sample of German bond yields, a value comparable to rates in the literature, albeit somewhat

10. The online Supplemental Material reports data from five European countries, collectively and informally known as the PIIGS, often studied in relation to the European debt crisis of 2009–2010, to establish the degree to which Spain is representative for the group as a whole.

	Value	Description
Fiscal policy and international markets		
G	0.176	Mean public spending to GDP
r^f	0.005	International risk-free rate
ϕ	0.05	Macaulay duration of debt
λ	0.05	International market exclusion
κ	$\phi + r^f$	Normalization, $q^f = 1$
Production and productivity		
α	0.36	Income shares
δ	0.02	Capital depreciation
ρ_z	0.95	Persistence of cycle
ρ_g	0.0	Persistence of growth rates

Table 1: Parameters Set Externally

higher than recent levels. The Macaulay duration of the debt is 5 years, the value from Chatterjee and Eyigungor (2012), somewhat lower than the values reported by Bocola and Dovis (2019) for Italy. λ is pinned down by the average length of market exclusion following default, roughly 5 years (Tomz and Wright 2013). The debt service parameter κ is normalized to $\phi + r^f$, so that the risk-free long-term bond price is one, with the desirable property of expressing B in units of GDP.

Seven parameters allow us to target seven key moments. Nearly all parameters impact most statistics to at least some degree, but some are more influential than others, and therefore we align them in Table 2 with the moment that is most sensitive. The adjustment cost θ is set to match the volatility of investment relative to that of GDP, roughly 2.6 times more volatile. The default penalty parameters ι_0 and ι_1 drive the mean and volatility of yield spreads, in the data about 1.2% and 1.3%, respectively. As standard in growth models, the private sector discount factor β controls the capital to income ratio, equivalently the ratio of investment to GDP, about 22%. In turn, the sovereign's discount factor β_g is most important for the debt-to-GDP ratio. We find that β_g is lower than β by about 0.0012 in our quarterly calibration, a nontrivial degree of relative impatience for the fiscal authority. The volatility of shock innovations σ_z and σ_g shape the volatility of detrended GDP and the relative volatility of consumption to GDP. Overall, the model is largely successful in this moment-matching exercise, with one exception. It has difficulty in delivering the volatility of spreads, with a standard deviation of about 0.9% in the model, versus 1.3% in the data.

	Value	Target	Data	Model
β	0.9875	Investment to GDP	0.22	0.22
θ	30.0	Relative volatility of investment	2.56	2.92
σ_z	0.003	Volatility of GDP	1.72	1.92
σ_g	0.005	Relative volatility of consumption	1.12	1.31
β_g	0.9863	Debt to GDP	0.27	0.27
ι_0	-2.792	Bond yield spread	1.17	1.17
ι_1	2.871	Standard deviation of spread	1.31	0.94

Table 2: Parameters Set Internally

2.2 Findings

Table 3 compiles our results. It reports key statistics from the data, our model calibration, and model-based counterfactuals aimed at decomposing the relative contribution of the frictions we study. Our baseline model is the "Impatient ($\beta_g < \beta$)" + "Laissez-faire" case. The model exhibits weakly countercyclical spreads, an acyclical trade balance, together with business cycle volatilities and a debt-to-GDP ratio comparable to the data.

The third column of Table 3 allows us to explore the consequences of endowing the sovereign with direct control over the capital accumulation decision or, equivalently, under a richer set of fiscal instruments. This internalizes the externality induced by investment on the bond price schedule. On the other hand, all policies in this economy are shaped by the government's discount factor β_g and the private sector's β is only relevant for assessing welfare. The net result is a reduction in the average level of the capital stock, by about 4%, a higher default risk, and an increase in average spreads of about 7bps. Spread volatility increases too, by about 3bps, while other moments are mostly unaffected.

We employ a consumption equivalent measure[11] for welfare, to assess the value to the household of centralizing investment. We find that households are *worse off*, with roughly a 0.03% drop in consumption equivalent welfare. Households would strictly prefer not to delegate investment decisions to the sovereign, even though it would internalize the externality, because of the government's impatience.

The last two columns of Table 3 report results under the assumption that public decision-making mirrors the household's discount factor, $\beta_g = \beta$, e.g., the absence of political economy frictions, while keeping all other parameters unaltered. From the fourth column, we learn that eliminating the sovereign's impatience lowers spreads and default risk. The

11. We report welfare when shocks are at their mean, with debt and the capital stock at the mean of the baseline model's ergodic distribution. Results are similar elsewhere in the state space. We use the household's value function for this calculation, $c_{\text{eq}} = u^{-1}((1-\beta)v)$, and report the percent change in this implied consumption measure across models.

Moment	Data	Impatient ($\beta_g < \beta$) Laissez-faire	Impatient ($\beta_g < \beta$) Centralized	Patient ($\beta_g = \beta$) Laissez-faire	Patient ($\beta_g = \beta$) Centralized
Ratios to GDP					
Debt	0.27	0.27	0.28	0.27	0.27
Capital stock	—	2.76	2.69	2.76	2.79
Consumption	0.60	0.60	0.60	0.60	0.59
Investment	0.22	0.22	0.22	0.22	0.22
Yield spread and default (%)					
Mean spread	1.17	1.17	1.24	1.05	1.02
St dev spread	1.31	0.94	0.98	0.87	0.86
Default risk	—	1.04	1.10	0.94	0.92
Standard deviations, relative to GDP					
Consumption	1.12	1.31	1.33	1.31	1.31
Investment	2.56	2.92	2.97	2.91	2.88
Correlations with GDP					
Consumption	0.94	0.87	0.86	0.87	0.87
Investment	0.85	0.65	0.64	0.65	0.65
Trade balance	−0.06	−0.12	−0.12	−0.12	−0.12
Spread	−0.22	−0.27	−0.27	−0.27	−0.27
Household welfare (%)					
vs laissez-faire			−0.03		+0.004
vs impatient				+0.03	

Table 3: Model Statistics

NOTES: The "Data" column reports moments for Spain, 1995Q1–2019Q4. Our calibrated model corresponds to the "Impatient ($\beta_g < \beta$)" + "Laissez-faire" column. Model moments are computed based on long simulations, 10^6 periods, excluding default spells and the first 5 years following return to market. The welfare measure is described in footnote 11.

household is *better off* with such a patient sovereign, and consumption equivalent welfare increases by 0.03%. Even though both regimes suffer from the investment externality, allocations are improved due to the reduced willingness of the government to risk costly default episodes.

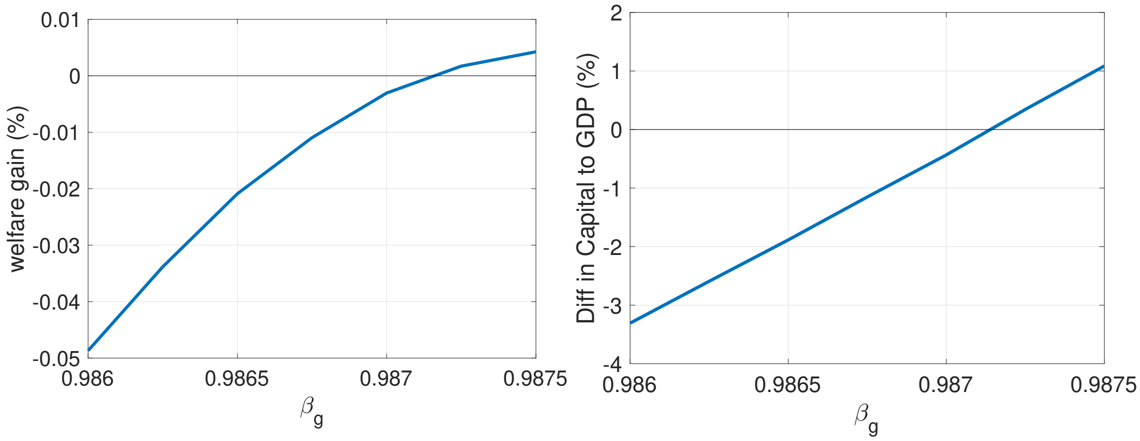
Finally, we can isolate the value of internalizing the externality by comparing the fourth and fifth columns. In both of these cases the sovereign is patient and the only difference is that in the fifth column the government controls investment directly. Capital levels are modestly higher and spreads fall on average. By internalizing the externality, fiscal policy makes households *better off*, welfare increases by 0.004%.

The role of β_g. The sovereign's impatience weighs heavily on our results. We explore how much by varying β_g while keeping β fixed. Figure A.1 plots the welfare gain from centralizing investment as a function of β_g in panel (a), and the change in the capital to GDP ratio in panel (b). With low β_g, households are robustly worse off, by up to 0.05% of their consumption equivalent measure. This reflects depressed investment and a lower capital stock. As β_g crosses a critical threshold at 0.9872, the welfare loss turns into a gain. Households thereafter are better off with centralized investment due to the desirable effects of internalizing the externality on the bond price q. In the limit, we recover the welfare gain from centralizing investment with a patient sovereign, from Table 3. We conclude that even a subtle degree of impatience can be critical for the desirability of additional fiscal instruments.

Implied taxes and subsidies. Table 4 compiles key statistics for the implied taxes or subsidies needed to align private and public incentives. We report positive values for taxes and negative values for subsidies, i.e. $-\tau$, since our baseline result features taxes rather than subsidies.

On average, an impatient sovereign would impose a 0.08% tax on investment, to stimulate immediate consumption, with some variation captured by the 0.12% standard deviation. The tax is roughly acyclical, but positively correlated with domestic absorption and negatively with the trade balance and the yield spread. In sum, the tax is higher in "good times" and lower in "bad times," when the sovereign must service the debt under elevated spreads. In contrast, the patient government ($\beta_g = \beta$) employs a modest 0.04% investment subsidy, also acyclical, to support capital accumulation and address the externality from $\frac{\partial q_t}{\partial K_{t+1}}$.

Turning to the fiscal treatment of investment during default, Table 4 documents that the tax is higher than under market access because the incentives to accumulate capital



(a) Households' welfare gain

(b) Difference in Capital-to-GDP

Figure 1: Comparison across sovereign's impatience

NOTES: Panel (a) plots the consumption equivalent welfare gain to the private sector from centralizing the investment decision, as a function of the government's discount factor β_g. Panel (b) plots the change in the average level of the capital to GDP ratio associated with centralizing investment, also as a function of β_g.

	Impatient ($\beta_g < \beta$)	Patient ($\beta_g = \beta$)
Implied tax, market access (%)		
Mean	0.08	-0.04
St dev	0.12	0.11
Implied tax, default (%)		
Mean	0.12	0.00
St dev	0.12	0.10
Implied tax, 3 years prior to default (%)		
Mean	0.07	-0.05
St dev	0.12	0.11
Correlation with tax, market access		
GDP	0.04	0.04
Consumption	0.08	0.07
Investment	0.07	0.04
Trade balance	-0.07	-0.04
Yield spread	-0.08	-0.06

Table 4: Implied Investment Tax Rates

NOTES: Positive values correspond to taxes, that is $-\tau_t$ in our model notation, while negative values denote subsidies. Implied tax rates are computed using equation (14), state by state, given equilibrium allocations.

for better borrowing conditions disappear. Interestingly, the tax is lower during the 3 years preceding defaults. This reflects the shifting priorities of the government, away from immediate consumption and towards avoiding the crisis, whenever conditions involve a high enough degree of risk.

3 Conclusions

Our results imply that the potential benefit from internalizing the investment externality via an appropriately designed and funded subsidy is outweighed by the sovereign's preference for immediate consumption. This is due to its lower discount factor, a classic proxy for political economy frictions. What is to be done? Aguiar, Amador, and Fourakis (2020) consider the gains from outright banning international market access for the sovereign and find them to be potentially large, in an endowment model. Less radically, Hatchondo, Martinez, and Roch (2022) propose fiscal rules, institutional limits on the sovereign's ability to borrow into unfavorable bond prices, by means of either a debt or spread break. Azzimonti and Mitra (2023a, 2023b) tackle political constraints and their fiscal consequences directly, in a microfounded model of legislative bargaining over tax and spending outcomes, as well as sovereign default. This broader research agenda points to a need to better understand the exact nature and causes of sovereigns' shortsightedness.

A noteworthy caveat to our findings is that our analysis has abstracted from productive roles for public debt, e.g. providing liquidity which supports domestic financial markets and production. See, for example, Woodford (1990) and Aiyagari and McGrattan (1998) in the closed economy, and Perez (2015), Sosa-Padilla (2018), and Arellano, Bai, and Bocola (2025) for the open economy case. Moreover, we also abstract from the tax smoothing benefits of issuing public debt (Lucas and Stokey 1983) but also from the forces driving a secular increase in debt in advanced economies (Yared 2019). We conjecture that a subset of these mechanisms, once incorporated into the analysis, could revert our main conclusion that public borrowing is excessive, even if $\beta_g < \beta$.

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Insufficient or Excessive Investment Under Sovereign Default Risk

— Supplemental Material —

Ilhwan Song and Gabriel Mihalache

Data Sources. Our sample consists of the PIIGS countries (Portugal, Italy, Ireland, Greece, and Spain) over the 1995Q1 to 2019Q4 period. We obtain data on debt-to-GDP, yields and spreads from the European Central Bank (ECB) and National Accounts data from Eurostat. Table A.1 compiles data moments for each country, together with the source and cross-country averages.

	Mean	Greece	Ireland	Italy	Portugal	Spain	Source
b/y	0.37	n.a.	0.34	0.38	0.51	0.27	ECB
c/y	0.58	0.68	0.38	0.60	0.65	0.60	Eurostat
i/y	0.21	0.19	0.27	0.20	0.20	0.22	Eurostat
g/y	0.18	0.21	0.15	0.19	0.18	0.18	Eurostat
spread	2.08	4.74	1.12	1.42	1.93	1.17	ECB
σ_{spread}	2.39	5.14	1.66	1.40	2.44	1.31	ECB
σ_c/σ_y	1.00	1.08	0.70	1.00	1.12	1.12	Eurostat
σ_i/σ_y	4.16	4.90	6.92	2.90	3.51	2.56	Eurostat
$\sigma_{tb/y}/\sigma_y$	2.17	1.76	3.91	1.08	2.07	2.01	Eurostat
$\rho_{y,c}$	0.80	0.89	0.46	0.80	0.90	0.94	Eurostat
$\rho_{y,i}$	0.64	0.57	0.18	0.82	0.78	0.85	Eurostat
$\rho_{y,tb/y}$	-0.06	-0.25	0.06	0.07	-0.12	-0.06	Eurostat
$\rho_{y,\text{spread}}$	-0.22	-0.52	-0.27	0.08	-0.17	-0.22	Eurostat
σ_y	2.05	2.45	3.07	1.45	1.57	1.72	Eurostat
$\sigma_{\Delta y}$	1.32	1.58	2.90	0.70	0.79	0.65	Eurostat
$\rho_{y_t,y_{t-1}}$	0.85	0.88	0.60	0.90	0.91	0.97	Eurostat
$\rho_{\Delta y_t,\Delta y_{t-1}}$	0.37	0.32	-0.21	0.51	0.42	0.82	Eurostat

Table A.1: Data Moments by Country and Average

NOTES: "spread" is the difference in yield-to-maturity between each country's bond and that of Germany, as reported by the ECB. σ denotes standard deviation, and ρ correlation. Debt to GDP data is not available for Greece. When appearing in levels, and not as ratios or log differences (Δ), variables are Hodrick and Prescott (1997) filtered with $\lambda = 1600$.

Equilibrium definition. We define the equilibria corresponding to the two regimes, with respect to the ability of the sovereign to impact private investment choices.

MPE Laissez-Faire. A recursive Markov Perfect Equilibrium of the laissez-faire economy consists of

- private sector value functions v^r, v^d, and v, and policies $\mathcal{C}$ and $\mathcal{K}$,
- government value functions V^r, V^d, and V, and policies $\mathcal{D}$ and $\mathcal{B}$, and
- the bond price schedule q,

which together satisfy the following conditions:

- given government policies, the private sector values and policies solve (1) and (2),
- given private sector policies and the bond price schedule, government values and policies solve (4) and (6),
- given policies, lenders break even and the bond price schedule (7) holds.

MPE Centralized. A recursive Markov Perfect Equilibrium of the centralized investment economy consists of

- government value functions V_c^r, V_c^d, and V_c,
- government policies $\mathcal{D}_c$, $\mathcal{B}_c$, and $\mathcal{K}_c$, and
- the bond price schedule q_c,

which together satisfy the following conditions:

- given the bond price schedule, policies and values solve (8), (9), and (10),
- given policies, lenders break even and the bond price schedule (11) holds.

Model Detrending. Our models feature a random trend, encoded in the Γ_{-1} state variables. Our detrending strategy is largely adapted from Aguiar and Gopinath (2007). We guess and verify that quantities are linear in Γ_{-1} and values are proportional to the inverse of Γ_{-1}, under our assumption of a coefficient of risk-aversion of 2. We denote by $\hat{}$ the detrended variables and values. For any quantity x (consumption, investment, etc.) we have therefore $x = \hat{x}\Gamma_{-1}$, and for any value function v we write $v = \hat{v}/\Gamma_{-1}$. The bond price function is homogeneous of degree zero in Γ_{-1}, B', and K' and can be written as a function of $\hat{B}'$ and $\hat{K}'$ directly. Finally, our functional form assumption for the investment adjustment cost Θ is consistent with this detrending strategy.

Detrending the model produces small alterations to the resource and budget constraints, as all future stock variables are scaled by the current gross growth rate shock g. For example, the resource constraint for the sovereign, under centralized investment, becomes

$$\hat{c}_t + \hat{K}_{t+1}g_t + \hat{\Theta}_t + \hat{G} = z_t(\hat{K}_t)^\alpha(g_t)^{1-\alpha} + (1-\delta)\hat{K}_t + q_{c,t}(\hat{B}_{t+1}g_t - (1-\phi)\hat{B}_t) - \kappa\hat{B}_t.$$

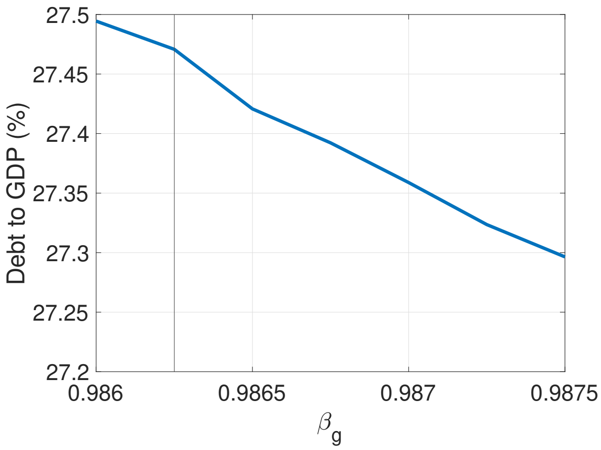
The final necessary adjustment concerns discounting. The effective discount factor in the detrended model is now β/g_t or β_g/g_t, respectively.

Numerical Solution. The computation of models with defaultable long-term debt is notoriously challenging (Chatterjee and Eyigungor 2012; Gordon and Guerron-Quintana 2018). We tackle this task in our model with capital investment by employing discrete choice methods. See Dvorkin et al. (2021) and Mihalache (2020) for early uses of these methods for default models, and Mihalache (2025) for a more pedagogical treatment.

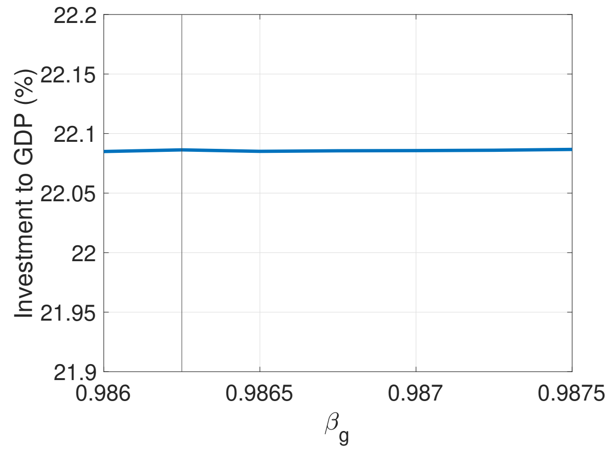
Our method involves augmenting the default ($\mathcal{D}$) and borrowing ($\mathcal{B}$) decisions with Extreme Value Type I taste shocks. We set the variance of these shocks to the smallest value consistent with convergence. The capital investment choice ($\mathcal{K}$) is not perturbed. Instead, we rely on root-finding on the private sector's first-order condition to find the preferred investment level, given any arbitrary B' borrowing level. In the centralized model, we again find the best K' for each possible B' using golden section search and linear interpolation. We solve all versions of the model using the same grids. We discretize the shock process using 13 points for z, 7 for g, 250 for B, and 150 points for K, and allow interpolation over the K dimension. We experimented with grid sizes and location, to confirm the robustness of welfare measures and business cycle statistics.

Calibrating β and β_g. In our moment matching exercise, we found that the sovereign's impatience β_g mostly impacts the debt-to-GDP ratio, while the private sector's β influences the investment-to-GDP ratio. As the sovereign becomes more patient, it is likely to borrow less, leading to a decrease in the debt-to-GDP ratio. In a laissez-faire economy, the sovereign does not have instruments to control investment decisions, so the sovereign's impatience impacts the investment-to-GDP ratio only very modestly, through equilibrium effects.

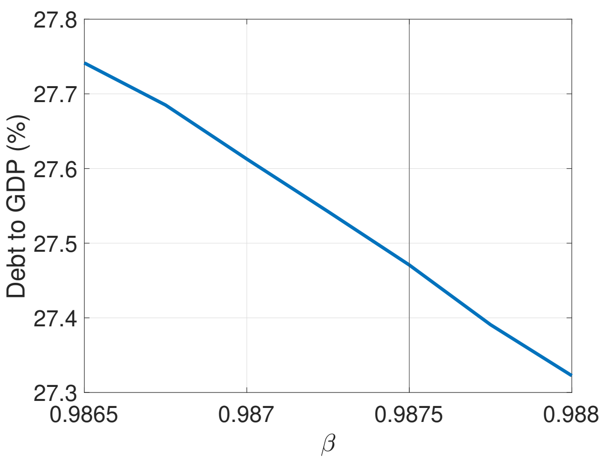
On the other hand, the private sector's impatience is mainly responsible for the allocation between investment and consumption. As the private sector becomes more patient, capital investment increases, resulting in a higher investment-to-GDP ratio. Although the private sector's impatience does not impact how much the government borrows in international financial markets, as GDP grows due to increased capital accumulation, the debt-to-GDP ratio decreases. Figures A.1 and A.2 showcase these forces, as captured by our calibration strategy.



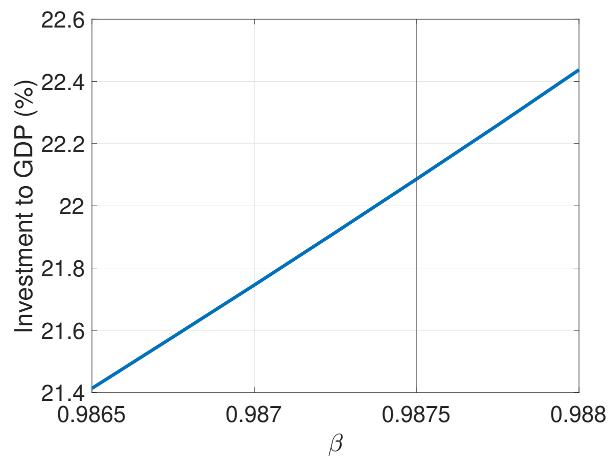
(a) Debt to GDP across β_g



(b) Investment to GDP across β_g



(c) Debt to GDP across β

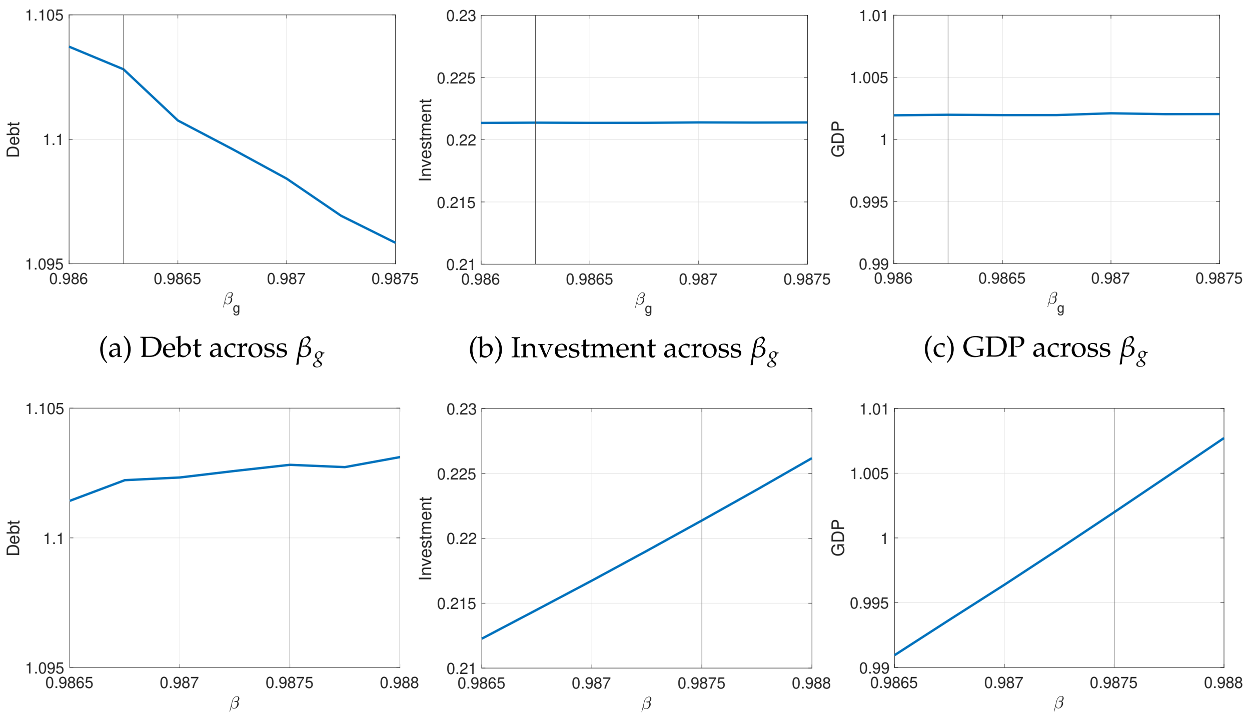


(d) Investment to GDP across β

Figure A.1: Calibrating β and β_g, Debt-to-GDP and Investment-to-GDP

NOTES: Panel (a) plots the debt to GDP (%), as a function of the government's discount factor β_g. Panel (b) plots the investment to GDP (%), also as a function of β_g. Panel (c) plots the debt to GDP (%), as a function of the private sector's discount factor β. Panel (d) plots the investment to GDP (%), also as a function of β.

Calibration for Argentina. As a robustness check, we recalibrate our model to Argentina's economic indicators, as reported by Gordon and Guerron-Quintana (2018), to explore an environment with much higher sovereign spreads and volatility. Table A.2 collects these results. Our model performs well in this moment-matching exercise. With parameters set to match Argentina's moments, we observe similar patterns to those in our baseline exercise based on the Spanish economy. In order for the model to exhibit higher



(a) Debt across β_g (b) Investment across β_g (c) GDP across β_g

(d) Debt across β (e) Investment across β (f) GDP across β

Figure A.2: Calibrating β and β_g, Levels

NOTES: Panel (a) plots the debt, as a function of the government's discount factor β_g. Panel (b) and (c) plot the investment and GDP, respectively, also as a function of β_g. (d) plots the debt, as a function of the private sector's discount factor β. Panel (e) and (f) plot the investment and GDP, respectively, also as a function of β.

default rates and a lower investment-to-GDP ratio, β_g needed to drop to 0.952, from 0.986 in the baseline, and β is now 0.984 rather than 0.988.

Employing the same consumption equivalent measure for welfare, to evaluate the benefits of centralizing investment decisions, our results imply that households are again worse off, experiencing approximately a 3.1% decline in welfare. Households prefer not to delegate investment decisions to the government, despite the potential for internalizing externalities, due to the government's impatience. As a result of the government's direct control over capital accumulation, there is a large reduction in the average level of the capital stock, by about 29%. This leads to a higher default risk and an increase in average spreads of approximately 4.4%. Additionally, spread volatility rises by about 2.4%.

Calibration for a Higher Debt Scenario. We recalibrate our model for a higher debt scenario, based on Spanish data, where the debt-to-GDP ratio ranges from 0.27 to 0.40, and compile our findings in Table A.3. With higher average debt-to-GDP, households are significantly worse off, resulting in approximately a 1.0% decline in consumption equivalent welfare compared to our baseline debt-to-GDP calibration. This decline is attributed to the fact that governments with higher debt tend to be more myopic than those with lower debt levels. β_g is now 0.98, modestly lower than in the baseline, and we keep β unchanged. Default penalty parameters are now $\iota_0 = -2.95$ and $\iota_1 = 3.05$, respectively. All other parameters are unchanged.

Evidence on Political Frictions and Investment Taxes. To motivate our interpretation of the government's lower discount factor as a proxy for political frictions, we provide suggestive empirical evidence that countries with greater political frictions also exhibit a higher effective tax burden on investment. Our model predicts that a sovereign with high political frictions (low β_g) will tax investment more, to prioritize immediate consumption. We test this prediction by examining the cross-country correlation between the Worldwide Governance Indicators (WGI) from the World Bank, which serve as an inverse proxy for political frictions, and the Effective Marginal Tax Rate (EMTR) and the Effective Average Tax Rate (EATR) from the OECD's Corporate Tax Statistics. The EMTR captures how taxes affect incentives to expand existing investments (the intensive margin), while the EATR reflects discrete investment decisions between alternative projects (the extensive margin).

Using 2023 WGI data and the OECD's 2023 Corporate Tax Statistics, we find a consistent negative correlation between institutional quality and investment tax burden, as reported in Table A.4 and Figure A.3. Since low WGI scores reflect high political frictions, these negative correlations imply that greater political frictions are associated with a higher

		Impatient ($\beta_g < \beta$)		Patient ($\beta_g = \beta$)	
Moment	Data	Laissez-faire	Centralized	Laissez-faire	Centralized
Ratios to GDP					
Debt	0.18	0.18	0.21	0.14	0.14
Capital stock	—	2.47	1.99	2.49	2.51
Consumption	0.67	0.66	0.68	0.67	0.67
Investment	0.20	0.20	0.16	0.20	0.20
Yield spread and default (%)					
Mean spread	8.15	8.08	12.51	1.61	1.54
St dev spread	4.43	5.05	7.48	1.51	1.47
Default risk	—	5.59	7.70	1.31	1.26
Standard deviations, relative to GDP					
Consumption	1.23	1.18	3.02	1.12	1.13
Investment	2.66	2.64	13.16	2.54	2.54
Correlations with GDP					
Consumption	0.93	0.95	0.48	0.96	0.96
Investment	0.85	0.50	0.11	0.57	0.56
Trade balance	−0.68	−0.03	−0.23	−0.04	−0.04
Spread	−0.79	−0.31	−0.46	−0.30	−0.30
Household welfare (%)					
vs laissez-faire			−3.11		+0.01
vs impatient				+0.61	

Table A.2: Model Statistics, Calibration to Argentina

NOTES: The "Data" column reports moments for Argentina as reported by Gordon and Guerron-Quintana (2018). The ratios of GDP components to GDP are calculated using Argentina's GDP data from 1993 to 2013. Our calibrated model corresponds to the "Impatient ($\beta_g < \beta$)" + "Laissez-faire" column. Model moments are computed based on long simulations, 10^6 periods.

Moment	Impatient ($\beta_g < \beta$)		Patient ($\beta_g = \beta$)	
	Laissez-faire	Centralized	Laissez-faire	Centralized
Ratios to GDP				
Debt	0.40	0.43	0.39	0.39
Capital stock	2.76	2.29	2.76	2.79
Consumption	0.59	0.61	0.59	0.59
Investment	0.22	0.18	0.22	0.22
Yield spread and default (%)				
Mean spread	1.12	1.45	0.61	0.59
St dev spread	0.78	0.91	0.50	0.49
Default risk	1.00	1.27	0.57	0.53
Standard deviations, relative to GDP				
Consumption	1.36	1.72	1.33	1.34
Investment	3.19	3.92	3.03	2.98
Correlations with GDP				
Consumption	0.83	0.78	0.85	0.84
Investment	0.62	0.49	0.63	0.64
Trade balance	−0.11	−0.14	−0.11	−0.11
Spread	−0.19	−0.21	−0.19	−0.19
Household welfare (%)				
vs laissez-faire		−0.99		+0.01
vs impatient			+0.22	

Table A.3: Model Statistics, High Debt Case

NOTES: Model moments are computed based on long simulations, 10^6 periods, excluding default spells and the first 5 years following return to market. The welfare measure is described in footnote 11.

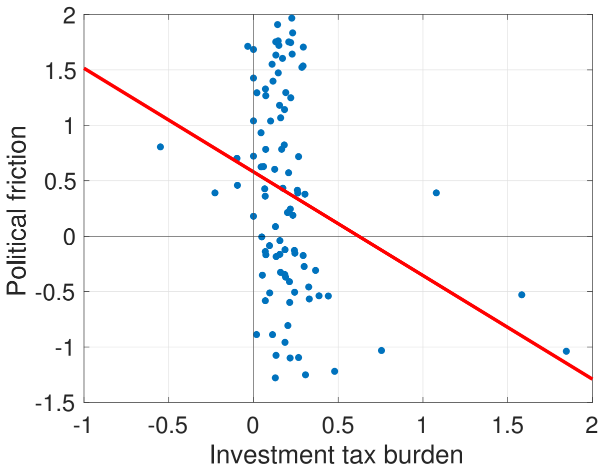
effective tax on investment. As a robustness check, the correlations remain negative after excluding the top and bottom 5% of outliers.[12] This observed association supports our core assumption that political-economy considerations, proxied by $\beta_g < \beta$, are a driver of policies that discourage long-term capital accumulation.

	Worldwide Governance Indicators						
	VA	PV	GE	RQ	RL	CC	Mean
Effective marginal tax rate	−0.19	−0.23	−0.29	−0.30	−0.29	−0.28	−0.26
Effective average tax rate	−0.19	−0.30	−0.35	−0.33	−0.32	−0.27	−0.29

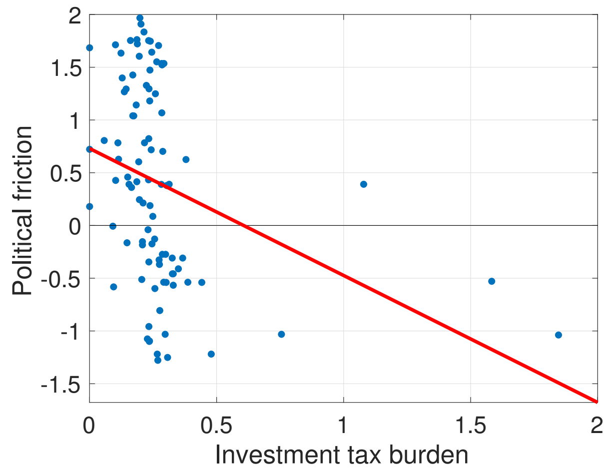
Table A.4: Correlation between Investment Tax and Political Friction

NOTES: The Worldwide Governance Indicators is a reverse measures of political frictions. The effective marginal tax rate and the effective average tax rate from OECD Corporate Tax Statistics summarize the tax treatment of investment. Each abbreviation corresponds to the following indicators: Voice and Accountability (VA), Political Stability and Absence of Violence/Terrorism (PV), Government Effectiveness (GE), Regulatory Quality (RQ), Rule of Law (RL), and Control of Corruption (CC).

12. After excluding the top and bottom 5% of countries, the correlation between EMTR and WGI is −0.15, while the correlation between EATR and WGI is −0.32.



(a) Effective marginal tax rate



(b) Effective average tax rate

Figure A.3: Investment Tax Burden and Political Friction

NOTES: Both panels display scatterplots where the horizontal axis represents the investment tax burden, and the vertical axis reflects political friction for each of the 95 countries. We use the Rule of Law from the 2023 World Bank WGI as a proxy for political friction. Higher scores on the Rule of Law indicate lower political friction, while lower scores indicate higher political friction. The red lines represent the least-squares regression line fitted to the scatterplots. Panel (a) uses the 2023 effective marginal tax rate from OECD Corporate Tax Statistics as a proxy for the investment tax burden, whereas panel (b) uses the 2023 effective average tax rate for the same purpose.