Financial Development, Growth, and the Political Economy of Shareholder Protection *

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Abstract

Given the well documented benefits of protecting outside investors, why are poor countries lagging behind in terms of their governance standards? Focusing on shareholder protection, I build a model proposing two complementary explanations. First, I show that the welfare maximizing level of shareholder protection is lower in poor countries. Improving shareholder protection not only expands public firms' risk sharing possibilities but also imposes an additional compliance burden, leading smaller firms to go private. The later effect hinders financial development the most in poor countries. Second, I show that improving shareholder protection induces a transfer of wealth from the poor to the rich, creating political opposition to investor protection reforms. These reforms become politically viable only above some threshold of economic development.

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1 Introduction

There is now a near consensus that economic and financial development are intrinsically related.[1] Investor protection, broadly defined by the extent to which laws and their enforcement protect outside investors from being expropriated by firm insiders, is a key determinant of financial development. The recent theoretical and empirical macroeconomic literature has shown that cross-country differences in the quality of investor protection can explain part of the observed dispersion in productivity and output per capita (Castro et al. (2004); Castro et al. (2009); Amaral and Quintin (2010)). Given the well documented benefits of investor rights enforcement, a natural question comes to mind: why aren't poor countries improving their governance standards?

Since the literature mentioned above takes the level of investor protection in a specific country as exogenous, it has little to say about several important related questions: What determines the level of investor protection? Is the maximum level of investor protection also the optimum level? Why don't all countries replicate the policies implemented by the most successful ones? When are the laws defining investor protection likely to be reformed? How do investor protection, financial development and economic development interact? The objective of this paper is to shed light on these questions while putting a particular emphasis on the last one. Since the tendency for poor countries to provide low levels of investor protection is particularly evident for equity holders rights (La Porta et al. (1998)), this paper focuses on shareholders protection.

According to the usual view introduced by La Porta et al. (1998), the level of investor protection a country offers is to a large extent determined by its legal origin. Broadly, these legal origins can be categorized into four family; in decreasing order of the protection they offer to shareholders, these families are: the English common-law system and the German, Scandinavian, and French civil-law traditions. Since most countries adopted their legal families centuries ago, for reasons specific to their history (La Porta et al. (1998)), investor protection is considered an exogenous variable in that paradigm.

This view, however, contrasts sharply with the fact that reforms of corporate laws do occur

[1] See Levine (2005) for a survey of the literature.

and have been particularly notable in the recent past. Moreover, Rajan and Zingales (2003) provide evidence that countries of common law origin haven't always been protecting the rights of investors so well. This evidence suggests that deficient laws can be improved by appropriate political interventions. The question is then why and when will these reforms take place? Some political economy studies have shown that imperfect investor protection can arise from the political process when some groups have vested interests in keeping its level low (Pagano and Volpin (2005); Bebchuk and Neeman (2010)). However, these studies rely on static models that are not well-suited to study the interdependence between investor protection, financial development and economic development, the main focus of this paper.

To the extent of my knowledge, the only other paper that encompasses both the macroeconomic consequences and the politico-economic determinants of investor protection is Sevcik (2012). Our two models, however, differ significantly on several aspects. Most importantly, in his paper, as well as in most the political economy papers mentioned above, strong investor protection is strictly beneficial to financial development. As a consequence, their analyses focus on the political impediments that prevent investor protection from being perfect. I believe this view to be incomplete. Most of the dissident voices raised against corporate governance reforms such as Sarbanes-Oxley are not criticizing the very idea of improving investor protection; they are instead concerned that the important costs these legislations impose on public firms overweight the benefits. In this paper, I show that modeling these costs, in itself, helps shed light on many of the questions raised earlier. Adding a political dimension to the analysis generates strategic voting behavior that magnify the consequences of these costs on financial development.

The framework is a two-sector overlapping generations model. Firms in the consumption goods sector are perfectly competitive and use capital along with labor to produce their output via a standard neoclassical technology with exogeneous and deterministic TFP growth. When young, agents with different skill levels work for the consumption goods sector. At the end of the first period of their life, they can use part of their labor income to set up capital producing firms.

These firms can freely allocate their resources between two types of projects. The first type is risk-free, whereas the second type bears some idiosyncratic risk but offers a higher rate of return on average. At an initial fixed cost, which depends on the stringency of the laws defining investor protection, entrepreneurs can make their firm public. Doing so allows them to sell equity shares to outside investors whom, as a consequence of diversification, have a higher subjective valuation of the risky projects. Because of a moral hazard problem, however, the fraction of shares that can be sold to outside investors is determined by the quality of investor protection. In that sense, investor protection endogenizes the degree of market completeness that public entrepreneurs are facing. Given its available resources, an entrepreneur may opt to keep his firm private in which case there is no fixed cost to set up a firm. Regardless of their entrepreneurial decisions, old agents can act as outside investors by purchasing equity shares issued by public firms.

Under certain conditions, the relationship between investor protection and financial development implied by this setup displays an inverted-U shape: A minimal level of investor protection being necessary to build the trust of outside investors, but an excessive regulatory burden discouraging firms to go public. This relationship is also affected by the level of entrepreneurial wealth: A wealthy entrepreneur is able to tolerate heavier compliance costs before sheltering himself from regulations by going private. In other words, the compliance burden associated with an improvement of investor protection has the potential to strangle the financial development of poor countries. Through its impact on production decision, lower financial development in turn has adverse consequences on the future economic development of these countries. These observations relate my paper to another strand of literature that studies the link between economic growth and financial development (Greenwood and Jovanovic (1990); Greenwood et al. (2010); Buera et al. (2011)).

Among these papers, Greenwood and Jovanovic (1990) is the only one to consider the joint endogenous dynamics of financial development and economic development. In their framework, as in mine, financial development promotes growth because it allows a higher rate of return to be earned on capital, and growth in turn provides the means to implement costly financial structures. A main difference between our approaches is that, in their model, the cost of financial structures is an exogeneous parameter instead of being the outcome of a political process. Endogenizing this variable makes possible the identification of the political determinants that can delay otherwise desirable financial reforms.

The level of investor protection is voted upon at every period. When choosing their preferred policy, entrepreneurs are influenced by two main factors: their wealth and their preference for financial markets completeness. Stronger investor protection, by expanding risk sharing possibilities, leads public firms to use the high productivity technology more intensively. As a result, the aggregate supply of capital goods rises and the price goes down. Poor entrepreneurs, whom compliance costs keep from going public, are affected by the quality of investor protection solely through its impact on the price of their output. As a consequence, they prefer investor protection to be at the lowest possible level and essentially vote for financial autarky. As for wealthier entrepreneurs, they prefer a higher level of investor protection because they can afford to comply with regulations and benefit from the resulting improvement in their productivity. In other words, high investor protection induces a redistribution of profits from poorer to wealthier entrepreneurs.

I next show that financial development is politically infeasible before a minimum threshold of economic development is met. Before that point, the median entrepreneur is too poor to afford going public and the economy evolves along a balanced growth path featuring financial autarky. As time passes, productivity growth in the consumption goods sector increases the wage rate and entrepreneurs are starting their venture wealthier. When the wage rate reaches a sufficiently high level, the median investor desires to go public and accordingly votes for an improvement in the quality of investor protection. At that point in time, a financial revolution occurs: For the first time, entrepreneurs are able to go public and issue shares of their firm on the stock market. This financial revolution comes along with a period of high economic growth as the production of capital goods becomes more efficient. In the following periods, this economic growth fuels the expansion of financial markets and so on. With time, financial markets develop fully and the economy goes back to its balanced growth path. Financial development has only a transient impact on economic growth.

The remainder of this paper is structured as follows. Section 2 introduces and solves the model taking the level of investor protection as given. Section 3 examines the implications of the model for an exogenously given investor protection policy. Section 4 examines the political equilibrium of investor protection. Section 5 illustrates the transition dynamics implied by the model with numerical examples and Section 6 concludes.

2 Model

2.1 The Environment

Consider a production economy with overlapping generations of two-period lived agents whose preferences over terminal consumption exhibit constant relative risk aversion. Time is denoted by t and continuously runs from zero to infinity. To be specific, the first generation of old agents lives over the time interval $(0, 1]$ and the first generation of young lives during the time interval $(0, 2]$. At the death of the initial old generation, a new generation of agents living over the time interval $(1, 3]$ is born, and so on. In the remainder of the paper, I will refer to the time interval $(i, i + 1]$ as period i. The measure of each cohort is normalized to one. The economy has two goods: a consumption good and a capital good. The consumption good is the numeraire and q_t denotes the relative price of the capital good.

Capital goods are produced over a period using consumption goods as input: At the beginning of a period, units of consumption goods are allocated to capital good producing firms. During the period, these firms can dynamically allocate resources to two linear production technologies labeled technology L and technology H. An investment $k_{L,\tau}$ in technology L yields an instantaneous return of $dk_{L,\tau} = k_{L,\tau} g_L d\tau$, while an investment $k_{H,\tau}$ in technology H yields an instantaneous return of $dk_{H,\tau} = k_{H,\tau} g_H d\tau + k_{H,\tau} \sigma d\omega_\tau$, where $g_H > g_L$. The uncertainty associated with technology H is idiosyncratic. Investment in capital producing technologies are later refer to as projects. At the end of the period, capital goods can be sold to the consumption goods sector.

Consumption goods are produced instantaneously at the very end of each period by a competitive sector via a constant return to scale Cobb-Douglas production function: $Y_t = A_t K_t^{\alpha} L_t^{1-\alpha}$, where $A_t = (1 + g_A) A_{t-1}$. At that point in time, firms in the competitive sector buy capital goods, hire workers, and produce. Capital depreciates entirely after production. In brief, the production process of capital goods is continuous, whereas the production of consumption goods occurs at discrete intervals. To improve the clarity of the notation, continuous variables have time subscript τ and discrete variables subscript t. Figure 1 depicts the timing of the model.

Individuals are born with different working skills, which translate into different endowments of labor efficiency z. These endowments are non-negative, identically and independently distributed across generations and individuals according to a cumulative distribution function G. In each cohort $\int z dG(z) = 1$ thus aggregate labor supply always equals one. An agent born at time t with skill level z works for the competitive sector when young and receives labor income zw_t in consumption goods, where w_t is the wage per efficiency unit of labor.

Once old, an agent loses his ability to provide labor, but gain the option to fund a capital producing firm using his past income. At the time they are set up, firms can either remain private or become public. The later option involves a one-time fixed costs $\phi(b_t)$ function of the stringency of the laws defining investor protection b_t. This cost stands for all the issuance and regulation compliance requirements associated with going public. I assume $\phi(\cdot)$ has the following properties:

- $\phi(0) = c \geq 0$. Firms that go public need to pay some underwriting fee $c \geq 0$ independently of the quality of investor protection.
- $\phi'(\cdot) > 0$. The cost of going public increases in the quality of investor protection.
- $\phi''(\cdot) > 0$. The marginal cost of going public increases in the quality of investor protection.

Going public grants an entrepreneur the right to issue equity shares to outside investors for the rest of his life. The sole type of equity contract available pays a liquidating dividend at each instant, so that shares have to be continuously issued. Intuitively, the benefits of issuing these contracts stem from diversification. Since well diversified outside shareholders are not exposed to the idiosyncratic risk of technology H, they have a higher subjective valuation of these projects than the entrepreneurs who initiate them. Following the same argument, there is no incentive for an entrepreneur to sell claims on type L projects since those are risk-free. For the sake of simplicity, I assume from now on that only claims on the output of technology H are sold to outside investors. Relaxing this assumption has no bearing on any of the results. Public equity is further assumed to be the only financial contract available, hence a private entrepreneur has no way to finance his venture externally.

Following the literature, I maintain that entrepreneurs are fully entrenched and keep control of their projects regardless of the share $\alpha_\tau \in [0, 1]$ they sell to outside shareholders. Investor protection is imperfect in the sense that, at any instant τ, after output o_τ has realized but before dividends are paid, an entrepreneur has the opportunity to abscond with a fraction f_τ of that output. However, a fraction $b_t \in [0, 1]$ of the stolen amount is lost in the process for a net gain of $(1 - b_t) f_\tau o_\tau$. In that context, parameter b_t is interpreted as a measure of investor protection since it determines the marginal cost of diverting output. This parameter is known at the beginning of a period and remains constant over that period. When choosing f_τ, an entrepreneur takes into account the impact stealing has on the value of his remaining $1 - \alpha_\tau$ shares of the project. His objective is

$$f_\tau \in \arg\max_{f'_\tau} (1 - b_t) f'_\tau o_\tau + (1 - \alpha_\tau)(1 - f'_\tau) o_\tau. \tag{1}$$

The first term corresponds to the net flow of stolen output. The second term corresponds to the dividend that belongs to the entrepreneur after he has stolen a fraction f'_τ of output. Outside investors are rational and, at the time they purchase equity, accurately anticipate and internalize the amount of diversion that will occur.

The remaining part of labor income that hasn't been used to fund entrepreneurial projects can be used to purchase equity stakes in public firms. When forming his portfolio, an investor can choose among shares of a vast quantity of ex-ante identical projects each subject to their own idiosyncratic risk. The law of large number and a second-order stochastic dominance argument imply that the optimal portfolio is well diversified and risk-free. In the remainder of this section, I solve the problems faced by firms and agents, and explicit the market clearing conditions.

2.2 Consumption Goods Sector

The representative firm of the consumption goods sector solves

$$\max_{K_t,L_t} A_t K_t^{\alpha} L_t^{1-\alpha} - q_t K_t - w_t L_t. \tag{2}$$

The first-order conditions for profit maximization in the consumption goods sector determine the wage rate and the price of capital. Imposing market clearing in the labor market yields

$$w_t = (1-\alpha) A K_t^{\alpha}, \tag{3}$$

$$q_t = \alpha A K_t^{\alpha-1}. \tag{4}$$

At the end of every period, old agents sell their capital output, which aggregates to K_t, and receive $q_t K_t$ for it. Young agents provide their labor to the consumption goods sector and collectively receive the wage given by (3) for it. That labor income is then used to set up the firms that are going to produce next period capital K_{t+1}.

2.3 Entrepreneur's Problem and the Decision to Go Public

Let $k_\tau = k_{L,\tau} + k_{H,\tau} + s_\tau$ denote the wealth in capital units at time τ of an entrepreneur who went private. In that expression, $k_{L,\tau}$ and $k_{H,\tau}$ are respectively the capital invested in technology L and H, and s_τ is the market value of the agent's equity portfolio, also referred to as savings. Denoting by $V_{Pri}(z)$ the indirect utility of a private entrepreneur of type z, the allocation problem reads

$$V_{Pri}(z) = \max_{k_{H,\tau},k_{L,\tau},s_\tau} E_t\left[\frac{c_{t+1}^{1-\gamma}}{1-\gamma}\right], \tag{5}$$

subject to

$$k_t = z w_t, \tag{6}$$

$$k_\tau = k_t + \int_t^\tau \left(k_{L,x}g_L + k_{H,x}g_H + s_x r_{p,x}\right)dx + \int_t^\tau k_{H,x}\sigma d\omega_x, \tag{7}$$

$$c_{t+1} = q_{t+1}k_{t+1}. \tag{8}$$

Constraint (6) states that agents who go private start their entrepreneurial career with an initial wealth equal to their past labor income. Constraint (7) is the dynamic budget constraint and states that wealth is accumulated from the returns on investment in the production technologies and on investment in an equity portfolio. Constraint (8) states that terminal consumption is given by the market value of the capital goods an entrepreneur owns at the end of his life. The solution to this problem is characterized in Proposition 1. Before stating that proposition, let's look at the problem of a public entrepreneur.

Let $k_\tau = k_{L,\tau} + (1-\alpha_\tau T_\tau)\,k_{H,\tau} + s_\tau$ denote the wealth in capital units at time τ of a public entrepreneur who issues a fraction α_τ of his equity in a type H project. In this expression, T_τ is the Tobin's Q of a type H project so that the term $\alpha_\tau T_\tau k_{H,\tau}$ corresponds to the amount the entrepreneur receives for his shares. Denoting by $V_{Pub}(z)$ the indirect utility of an agent with skill z who decides to go public, the allocation problem can be written as follows:

$$V_{Pub}(z) = \max_{k_{H,\tau},k_{L,\tau},s_\tau,\alpha_\tau,f_\tau} E_t\left[\frac{c_{t+1}^{1-\gamma}}{1-\gamma}\right], \tag{9}$$

subject to

$$k_t = zw_t - \phi(b_t), \tag{10}$$

$$k_\tau = k_t + \int_t^\tau \left(k_{L,x}g_L + k_{H,x}\left((1-b_t)f_x + (1-\alpha_x)(1-f_x)\right)g_H + s_x r_{p,x}\right)dx + \int_t^\tau (1-\alpha_x)\,k_{H,s}\sigma d\omega_x, \tag{11}$$

$$c_{j,t+1} = q_{t+1}k_{t+1}, \tag{12}$$

$$f_\tau \in \arg\max_{f'_\tau} (1-b_\tau)\,f'_\tau o_\tau + (1-\alpha_\tau)(1-f'_\tau)\,o_\tau. \tag{13}$$

Constraint (10) states that agents who go public start their entrepreneurial career with an initial wealth equal to their past labor income minus the underwriting and compliance costs. Constraint

(11) is the dynamic budget constraint and states that wealth is accumulated from the returns on investment in the production technologies, from the return on investment in an equity portfolio, and from the net flow of stolen output. Constraint (12) states that terminal consumption is equal to the market value of the capital goods owned by the entrepreneur at time $t+1$. Constraint (13) is the ex-post stealing incentive compatibility constraint.

An agent of type z will go public at the beginning of period t if and only if $V_{Pub}(z) > V_{Pri}(z)$. The following proposition provides a characterization of the optimality conditions of both problems. I interpret intuitively the results below, the proofs are relegated to the Appendix.

Proposition 1. *Under Assumptions 1-5 listed in the Appendix, the return on the optimal equity portfolio is pinned down by technology L, $r_{p,\tau} = g_L$, and the exact allocation between technology L and the equity portfolio is undetermined. At the optimum, investor protection pins down the fraction of shares sold by public entrepreneurs, $\alpha_\tau = b_t$, there is no stealing, $f_\tau = 0$, and the Tobin's Q of type H projects is given by $T_\tau = \frac{g_H}{g_L}$. Denoting by $\theta_{H,\tau} = \frac{k_{H,\tau}}{k_\tau}$ the share of wealth entrepreneurs allocate to technology H, we have that*

$$\theta_{H,\tau}^{Pri} = \frac{g_H - g_L}{\gamma\sigma^2}, \tag{14}$$

and

$$\theta_{H,\tau}^{Pub}(b_t) = \frac{g_H - g_L}{\gamma\sigma^2(1-b_t)^2}. \tag{15}$$

The capital output k_{t+1} of private and public entrepreneurs are respectively distributed according to

$$k_{t+1}^{Pri} = zw_t\tilde{R}^{Pri}, \tag{16}$$

and

$$k_{t+1}^{Pub}(b_t) = [zw_t - \phi(b_t)]\,\tilde{R}^{Pub}, \tag{17}$$

where $\tilde{R}^{Pri}$ and $\tilde{R}^{Pub}(b_t)$ are log-normally distributed with means μ given by

$$\mu^{Pri} = \exp\left\{g_L + \theta_H^{Pri}(g_H - g_L)\right\}, \tag{18}$$

$$\mu^{Pub}(b_t) = \exp\left\{g_L + \theta_H^{Pub}(b_t)(g_H - g_L)\right\}. \tag{19}$$

and standard deviations ν such that $\nu^{Pri} < \nu^{Pub}(b_t)$ (the exact expressions are given in the Appendix). Both $\mu^{Pub}(b_t)$ and $\nu^{Pub}(b_t)$ are increasing in b_t. The indirect utilities achieved under the two options are given by

$$V_{Pri}(z) = \frac{\left(q_{t+1}(b_t) z w_t \sqrt{\mu^{Pri}} e^{\frac{g_L}{2}}\right)^{1-\gamma}}{1-\gamma}, \tag{20}$$

$$V_{Pub}(z) = \frac{\left(q_{t+1}(b_t)\left[z w_t - \phi(b_t)\right] \sqrt{\mu^{Pub}(b_t)} e^{\frac{g_L}{2}}\right)^{1-\gamma}}{1-\gamma}. \tag{21}$$

Entrepreneurs are going public if and only if $V_{Pub}(z) > V_{Pri}(z)$. According to the indirect utilities above, this occurs if and only if their type z is such that $z > \bar{z}(b_t)$, where

$$\bar{z}(b_t) = \frac{\phi(b_t)}{\left(1 - \sqrt{\frac{\mu^{Pri}}{\mu^{Pub}(b_t)}}\right) w_t}. \tag{22}$$

Under the assumption that technology L is being used in equilibrium, agents can earn a risk-free return from both their savings and their investments in technology L, thus no-arbitrage imposes $r_{p,\tau} = g_L$. As a consequence, wealth is allocated indifferently between the two.

Because of idiosyncratic risk, entrepreneurs discount their own project H more heavily than outside investors do. As a consequence, public entrepreneurs want to issue as many shares as possible. They cannot, however, sell a fraction $\alpha_\tau > b_t$ of their shares because it would give them the incentive to steal everything once the output realizes. When a fraction of shares $\alpha_\tau = b_t$ is issued, equation (13) shows that $f_\tau = 0$.

Because there is no stealing, outside investors expect to earn an instantaneous dividend $g_H d\tau$ per unit of capital they own. Since the return they require is $g_L d\tau$, the price they are ready to pay for that unit is $T = \frac{g_H}{g_L}$.

For both public and private entrepreneurs, the fraction of wealth $\theta_{H,\tau}$ allocated to technology H is increasing in the spread of productivity between the two technologies $g_H - g_L$, decreasing in technology H volatility σ, and decreasing in agents risk aversion γ. Investments in technology

H appear less risky to public entrepreneurs since part of the idiosyncratic is borne by outside investors. As a consequence they allocate a higher fraction of their wealth to that technology than private entrepreneurs, $\theta_{H,\tau}^{Pub}(b_t) > \theta_{H,\tau}^{Pri}$, and that difference increases with the quality of investor protection b_t. As a consequence, public entrepreneurs use their initial resources more efficiently, $\mu^{Pub}(b_t) > \mu^{Pri}$, and that difference in productivity increases with b_t.

Compared to the capital output of private entrepreneurs, the capital output of public entrepreneurs is more volatile $\nu^{Pub}(b_t) > \nu^{Pri}$. Going public has two opposite effects on output volatility. On one hand, it allows entrepreneurs to share risk with outside investors which, keeping the allocation of wealth unchanged, decreases the volatility of output. On the other hand, going public increases the share of wealth allocated to the risky technology. The second effect dominates.

Entrepreneurs who received little labor income when young (agents endowed with a relatively low z) find the cost of going public too steep and remain private. Wealthy agents, however, find this fixed cost negligible, and go public to reap the benefits of equity issuance. Somewhere in between, there exist an entrepreneur of type $\bar{z}(b_t)$ which is indifferent between the two options. The identity (type) of that entrepreneur depends on the wage rate and the level of investor protection. Keeping everything else constant, a higher wage w_t means that more entrepreneurs can afford going public and $\bar{z}(b_t)$ is lower. The effect of an increase in the level of investor protection on $\bar{z}(b_t)$ is ambiguous. On one hand, it increases the cost of going public $\phi(b_t)$. On the other hand, it increases the benefit of going public since $\mu^{Pub}(b_t)$ goes up. As discussed in further details in Section 3, the relationship between $\bar{z}(b_t)$ and b_t is non-monotonous and depends on the functional form of $\phi(\cdot)$. In general, however, $\bar{z}(0) = \infty$ so that when investor protection is non-existent, nobody goes public. I close the model in the next subsection by stating the market clearing conditions.

2.4 Market Clearing

For notation convenience, let $C_t = \int_0^\infty c_t^z dG(z)$ denote aggregate consumption, $K_\tau^{Pri} = \int_0^{\bar{z}} k_\tau^z dG(z)$ denote aggregate capital owned by private firms, $K_\tau^{Pub} = \int_{\bar{z}}^\infty k_\tau^z dG(z)$ denote aggregate capital owned by public firms and $S_\tau = \int_0^\infty s_\tau^z dG(z)$ denote aggregate savings. The economy features four markets. A consumption good market, a capital good market, a labor market and a stock market. The respective clearing conditions are

$$Y_t = C_t + K_t^{Pri} + K_t^{Pub} + \phi\left(b_t\right)\left(1 - G\left(\bar{z}\right)\right), \tag{23}$$

$$K_t^D = K_{t-1}^{Pri}\mu^{Pri} + K_{t-1}^{Pub}\mu^{Pub}\left(b_t\right), \tag{24}$$

$$L_t = 1, \tag{25}$$

$$S_\tau = \alpha_\tau \theta_{H,\tau}^{Pub} K_\tau^{Pub} T. \tag{26}$$

The first three markets clear at the end of each period. The stock market clears continuously. The first market clearing condition says that output is either consumed by the old, invested in new ventures by the young and spent covering public firms compliance costs. The second clearing condition states that capital goods demand of the consumption sector equals the capital supplied by the private and the public sector. The third condition states that the labor demanded by the consumption sector equals the effective labor endowment of the economy. The last condition states that aggregate savings are equals to the market value of equity shares issued by public firms.

3 Investor Protection, Financial Development and Growth

The first part of this section is a comparative static exercise. Taking as given last period wage, I examine how different levels of investor protection influence the decisions of entrepreneurs during one period. In the second part, I simulate the development path an economy follows when investor protection level is set by a social planner or legislator aiming to maximize aggregate welfare. These two exercises shed light on the relationship between investor protection, financial development and economic growth. Two measures of financial development are considered: the proportion of firms going public and the extent of external financing.

The proportion of firms going public is directly related to the threshold skill $\bar{z}\left(b_t\right)$ at which an entrepreneur is indifferent between the two options. A lower value for $\bar{z}$ means that more entrepreneurs go public and represents a higher level of financial development. Totally differentiating $\bar{z}(b_t)$ with respect to b_t shows that

$$\frac{d\bar{z}(b_t)}{db_t} < 0 \iff \frac{\phi'(b_t)}{\phi(b_t)} < \frac{1}{\sqrt{\frac{\mu^{Pub}(b_t)}{\mu^{Pri}}}\left(\sqrt{\frac{\mu^{Pub}(b_t)}{\mu^{Pri}}} - 1\right)} \frac{d}{db_t}\sqrt{\mu^{Pub}(b_t)} \tag{27}$$

This expression states that a marginal increase in the quality of investor protection increases the proportion of public firms if and only if the cost of going public is not growing too rapidly. How rapidly depends on the marginal impact improving investor protection has on the productivity of public firms $\mu^{Pub}(b_t)$. When $b_t \to 0$, $\left(\sqrt{\frac{\mu^{Pub}(b_t)}{\mu^{Pri}}} - 1\right) \to 0$ and equation (27) tells us that improving investor protection always leads to more firms going public (given that $\phi'(b_t) < \infty$). For higher levels of investor protection, however, that relationship will in general depend on the functional form of $\phi(\cdot)$.

The proportion of capital externally financed is given by

$$ExtFin_\tau = \frac{\alpha_\tau \theta_{H,\tau}^{Pub} K_\tau^{Pub}}{K_\tau} \tag{28}$$

From this expression, we see that improving investor protection has two clear positive effects on external financing. It increases the fraction $\theta_{H,t}^{Pub}$ of resources allocated to technology H, and allows entrepreneurs to issue a bigger fraction α_τ of their equity. Improving investor protection, however, also has a negative impact on external financing as it decreases the resources available to the public sector K_t^{Pub} through an increase in $\phi(b_t)$. Improving investor protection also changes the threshold $\bar{z}$ at which firms go public, which has an ambiguous effect on K_τ^{Pub}. Deriving additional implications from (28)proves to be hard analytically. The numerical examples conducted below provide additional insights.

3.1 Comparative static

I solve the static problem of one generation of entrepreneurs given different investor protection policies for two different wage rates. In equilibrium, the wage rate is an increasing function of the aggregate stock of capital, so that a low wage rate represents a low level of economic development and vice versa. To conduct the numerical analysis, I assume that labor endowments are log-normally distributed, and that the cost of going public is assumed to have the following functional form $\phi(b) = c + \frac{a}{\bar{b}-b_t}$, where $\bar{b}$ is picked so that Assumptions 1-5 hold. Figure 2 illustrates the results of this exercise. The numerical values of the relevant parameters can be found below the figure.

The top graphs of Figure 2 shows that the relationship between financial development and investor protection displays an inverted-U pattern: Improving investor protection when its level is low has a positive impact on financial development as it cheaply resolves part of the moral hazard problem. At higher levels, however, the regulatory burden associated with going public discourages poorer entrepreneurs to go public and ultimately hinders financial development. At the extreme, the costs investor protection legislation becomes too important for virtually every entrepreneur to go public and the economy is back to financial autarky.

The graphs also show that higher wage rate implies more financial development: when entrepreneurs are wealthier, more of them can afford to go public and thus external finance is used more extensively. The two vertical lines in top-right graph show that the level of investor protection that maximizes the extent of external financing increases with the wage rate. Everything else being equal, a higher wage rate means that going public sinks a smaller fraction of an entrepreneur's wealth. As a consequence, agents are able to sustain higher level of investor protection before the cost of going public exceeds the benefits.

The middle left graph also shows that the productivity of the capital goods sector displays the same inverted-U relationship with investor protection.[2] Equation 15 shows that public entrepreneurs' usage of technology H increases with the quality of investor protection, improving the productivity of the capital goods sector productivity. Above a certain point, however, the proportion of public firms decreases with investor protection which impact negatively the productivity of the capital goods sector. The aggregate supply of capital is positively related to the productivity

[2]the productivity of the capital goods sector is defined as $\frac{K_{t-1}^{Pri}\mu^{Pri}+K_{t-1}^{Pub}\mu^{Pub}(b_t)}{K_{t-1}^{Pub}+K_{t-1}^{Pri}}$

of the capital goods sector, explaining the pattern displayed by the price of capital.

Finally, the bottom left graph shows that income dispersion has an inverted-U relationship with investor protection. To understand this result, recall that income inequality in the model stems from two sources: difference in effective labor endowment z and from the idiosyncrasies associated with technology H. The former source of inequality is unrelated to investor protection, whereas the later source has a direct impact on it. Improving investor protection increases the expected productivity of public entrepreneurs, creating income inequality between private and public entrepreneurs, and increases public firms' output volatility, increasing income inequality among public entrepreneurs. In brief, income inequality increases with financial development everything else being equal.

The analysis conducted so far shows that, if promoting financial development is the objective, the maximum level of investor protection is not the optimum level. Moreover, our analysis suggests that it might not be optimal for poor countries to replicate the policies of wealthier countries since the financial development of less economically developed countries is maximized at lower level of investor protection. Next section investigates this point in further details.

3.2 Numerical Example

In order to better understand the relationship between investor protection, financial development, and economic development, I now solve numerically the dynamic model developed in Section 2. I assume that the level of investor protection is chosen at the beginning of each period by a social planner or legislator whose objective is to maximize the aggregate welfare of his country.

To conduct the numerical analysis I make the following assumption on the parameters of the model. The distribution of working skills is assumed lognormally distributed with a mean of one, $G \sim \ln \mathcal{N}\left(-\frac{1}{2}, 1\right)$. The coefficient of risk aversion is $\gamma = 5$. The technological parameters of the capital producing sectors are are $g_H = 0.44$, $g_L = 0.02$, $\sigma = 1$. For the consumption goods sector, the income share of capital is set to $\alpha = 0.33$ and productivity growth per period is $g_A = 0.02$. The functional form of the cost of going public is assumed to be $\phi\left(b_t\right) = c + \frac{a}{\bar{b}-b_t}$, where $c = 0,2$

and $a = 0,02$. The parameter $\bar{b} = 0.71$ is picked such that Assumptions 1-5 holds at any point in time. Figure 3 shows the typical dynamics of capital growth, investment good price, output growth, investor protection, financial development, wage, median utility and income dispersion starting from a relatively low stock of capital.

Since the economy starts with relatively low capital endowment, the marginal product of capital is initially high, and so are capital growth and output growth. As the economy converges to its balanced growth path, capital and output growth decrease. Because capital is initially scarce, its price is initially high, but decreases as time goes on. The wage rate displays the opposite early pattern since the marginal product of labor increases with capital.

The level of investor protection that maximizes output per capita is relatively low in the early periods. Because they received low wages, many entrepreneurs would not be wealthy enough to go public if the level of investor protection was higher. Although further improving investor protection would increase the output of the remaining public firms, it would discourage too many poor entrepreneurs to go public for it to be worthwhile. In short, entrepreneurs can't afford to pay for costly financial arrangements in the early stage so financial markets are relatively underdeveloped.

As the wage rate increases, entrepreneurs get wealthier and their appetite for finance grows. As a result, the social planner increases the level of investor protection, spurring financial development. As a result, public firms of the capital goods sector become more productive, generating higher capital and output growth. Financial development generates economic growth. Partly because of that finance related growth, next period entrepreneurs are wealthier so that financial development is pushed further. Economic growth feeds back to financial development. The top left and top right graphs of Figure 3 show that this process is, for a period of time, self-reinforcing as the rate of economic growth keeps increasing. Once financial markets are nearly fully developed, however, economic growth cannot be further sustained by the development of finance and capital growth and output growth revert back to their steady state values.

Lastly, the model has rich implications for the evolution of income inequality over time. At the initial phase, where financial autarky prevails, all entrepreneurs own their firms privately and the risk free technology L is used extensively. As a consequence, income inequality is relatively low. With financial development, more entrepreneurs are going public and more resources are invested in the volatile technology H. This creates two sources of income inequality. The first is associated with the difference in expected capital output between public and private entrepreneurs. The second is associated with the fact that public entrepreneur's capital output is more volatile. In the periods following the financial revolution, investor protection continues to increase, widening the productivity gap between private and public entrepreneurs and increasing the volatility of public firms output. As a consequence, income inequality rises for a while. At some point, however, most entrepreneurs are public, and the difference in productivity between public and private entrepreneurs does not contribute as much to income inequality anymore. Income inequality then decreases and, when financial market are fully developed, stabilizes at a higher level than the financial autarky level due to the more extensive use of technology H.

The main point of Figure 3 is to highlight that the optimal level of investor protection depends on the development stage of an economy. Firms operating in poor countries can't afford costly financial arrangement, so that stringent regulations repel them from participating in financial markets. In that sense, the degree of economic development is a crucial determinant of both the optimal quality of investor protection and the optimal level of financial development. In turn, financial development improves the productivity of the capital goods sector, with positive ramification to economic development.

This section assumed that investor protection was selected by a social planner aiming to maximize aggregate welfare. The laws that define investor protection, however, are the outcome of the political process, and nothing guarantees that the social planner's preferred policy is also politically feasible. Section 4 studies jointly the political and economical factors that influence the policy. Section 5 repeats the same numerical exercise realized in this section with the difference that investor protection is determined at the issue of a vote. Adding a political dimension to the analysis allows the model to explain why corporate governance reforms are not occurring in underdeveloped countries.

4 Political Equilibrium

Agents vote in each period for the level of investor protection b_t they want to see implemented. Voting occurs after labor income is realized, but before new capital producing firms are setup. The policy is selected by the simple majority rule in a pairwise vote. When casting their vote, agents are fully rational and endogenize the impact of the policy on state variables and prices. Old agents have no stakes in the current policy as their consumption plans have been predetermined by previous period wage and level of investor protection. As a consequence, I assume that young agents, who are about to become entrepreneurs, are the only ones to participate in the poll.

Each agent vote for the policy that maximizes his expected utility from terminal consumption. Deriving explicitly the indirect utility functions in my dynamic model is difficult. The policy impacts the supply of capital in a complex way by influencing the type, productivity and quantity of firms going public, making analytic solutions intractable. Fortunately, I am able to establish that policy preferences are ordered according to voters' types, with lower types z preferring lower levels of investor protection, even without the explicit derivation of indirect utilities. Under his optimal policy b_t^o, the indirect utility of an agent who received an effective labor endowment z is given by

$$U(z) = \max \left\{ \max_{b_t} V_{Pri}(z), \max_{b_t} V_{Pub}(z) \right\} \tag{29}$$

where $\max_{b_t} V_{Pri}(z)$ and $\max_{b_t} V_{Pub}(z)$ refer to the indirect utilities (20) and (21) stated in Proposition 1. The following proposition states the properties of problem (29). The proof is in the Appendix.

Proposition 2. *Under the Assumptions 1-5, there exists a threshold $\hat{z}(w_t)$ below which the solution to (29) is given by $\max_{b_t} V_{Pri}(z)$ and above which that solution is given by $\max_{b_t} V_{Pub}(z)$. That threshold $\hat{z}(w_t)$ is decreasing in the wage rate. Additionally, voter's preferred policy is weakly increasing in z, with the policy preferred by types $z < \hat{z}(w_t)$ being $b_t^o = 0$.*

Intuitively, entrepreneurs of type $z < \hat{z}(w_t)$ are not wealthy enough to find optimal to pay the cost of going public for any level of investor protection. Equation 20 shows that private entrepreneurs are affected by investor protection only through the impact it has on the price of capital goods. Under our usual assumptions, setting investor protection to zero minimizes the aggregate output of capital goods and thus maximizes the price. Essentially, firms that are going public are more productive than their private counterpart as they rely more heavily on technology H. This creates an upward pressure on the aggregate supply of capital goods, depressing its price. Private entrepreneurs, aiming to minimize the impact of public firms, vote for the policy that void the incentives to go public: $b_t^o = 0$.

Equation 21 shows that entrepreneurs of skill $z > \hat{z}(w_t)$ are concerned about the impact investor protection has on their productivity $\mu^{Pub}(b_t)$ and on the cost of going public $\phi(b_t)$ in addition to its impact on the price of capital goods. For them, improving investor protection means more shares issued to outside investors but a higher cost of going public. Wealthier agents find the fixed cost of going public relatively easier to absorb and thus prefer higher level of investor protection because it allows them to issue a bigger fraction of their equity stake.

Everything else kept constant, a higher wage rate yesterday increases entrepreneurial wealth today. Some of the lower type agents that would not have been wealthy enough to go public at a lower wage can now afford it, and $\hat{z}$ decreases.

Given the voter's preferences, results by Roberts (1977) and Gans and Smart (1996)guarantee that the policy preferred by the median voter cannot be beaten by any other feasible policy in a pair-wise vote under simple majority rule. The median voter ability is identified by the level of ability z_M that satisfies $G(z_M) = \frac{1}{2}$. These last results combined with the properties of the political equilibrium listed in Proposition 2 establish the importance of the wealth level of the median entrepreneur in the determination the level of investor protection: If the median entrepreneur is too poor to benefit from going public, $z_M < \hat{z}(w_t)$, the investor protection is set to its lowest possible level. The reason being that a poor entrepreneurs protect themselves from the competition of wealthier entrepreneurs by choosing a policy that inhibits financial development.

Equation 3 shows that the wage level is positively associated with the level of aggregate capital. Accordingly, the model predicts that poor countries are the ones facing the most political opposition to corporate governance reforms (since they have a higher $\hat{z}(w_t)$). That opposition prevents financial markets to develop with negative ramifications to the productivity of the capital goods sector. Completing the circle, an inefficient production of capital goods today means a lower aggregate level of capital tomorrow.

Only when economic development reaches the threshold level where the median entrepreneur prefers to go public, $z_M > \hat{z}(w_t)$, that a corporate governance reform becomes politically viable. At this point, the median entrepreneur prefers for the first time a positive level of investor protection. This change in policy triggers financial development since all entrepreneurs that are at least as wealthy as the median entrepreneur now go public.

The above discussion exposed the main determinants of political outcomes: the elasticity of the price of investment goods with respect to the level of investor protection, the aggregate wealth of the industrial sector, and the preference for market completeness of the median voter. I next parametrize the model and solve it numerically in order to examine the interdependence between the dynamics of the political equilibrium and the dynamics of macroeconomic aggregates.

5 Numerical Example of the Political Equilibrium

In this section, I repeat the numerical exercise of section 3 using the same parameters, with the difference that the investor protection policy is chosen according to the political equilibrium described in the previous section. In Figure 3, the full red line reproduces the numerical results of Section 3, and the dashed blue line depicts the results coming from the political equilibrium.

A first striking feature of the political equilibrium development path is that it can be broadly separated into two phases, which are delimited by a dashed vertical lines in each of the graphs. At the beginning of the first phase, the stock of capital is below its balanced growth path level, thus capital and output growth are initially high. In the subsequent periods, all variables converge to their balanced growth path values. Compared to our optimal output per capita rule, the convergence to the steady state is faster when politics determine investor protection: With the maximum welfare rule, financial development generates economic growth along the transition, slowing down the convergence to the steady state. With politics, this process does not occur during the first phase because, as a consequence of the low wage rate, the median entrepreneur is not wealthy enough to go public. Investor protection then gets voided by the political process for the reasons discussed above, and financial autarky prevails during the first phase of development.

With time, the exogenous productivity growth in the consumption goods sector pushes the wage rate up. At the point in time indicated by the vertical lines, the median entrepreneur is, for the first time, wealthy enough $(z_M > \hat{z}(w_t))$ to go public. As a consequence, his preference for investor protection shifts abruptly upward. This shift in policy leads a fraction of firms to start issuing public equity, triggering financial development. In other words, the model shows that a minimum level of economic development is necessary to make financial development politically viable.

Because public firms make use of the high productivity technology to a larger extent than private firms, the supply of capital goods increases. This sudden capital inflow generates a spike in both capital and output growth. In other words, financial development in turn generates economic development. Partly because of the growth generated by the financial revolution, the median entrepreneur of the next period is wealthier and desire an even higher level of investor protection, furthering financial development. Economic development feeds back again on financial development. As time passes, investor protection improves until it reaches its imposed maximum level $\bar{b}$. Following the growth burst caused by the financial revolution, the economy slowly reverts back to its balanced growth path. In this model, the level of financial development has no effect long run economic growth. It is the growth of finance that has a transitory effect on economic growth.

6 Conclusion

Given the well documented benefits of protecting outside investors, why aren't all countries adopting the governance standard of the most successful ones? This paper first makes the argument that improving investor protection imposes additional costs on public firms so that replicating the costly financial arrangement observed in developed countries might hurt the financial development of poor countries with negative ramification future economic development. However, the model also suggests the political process through which investor protection laws are voted might take too long to implement otherwise beneficiary investor protection reforms.

7 Figures

Figure 1: Life Cycle Timing

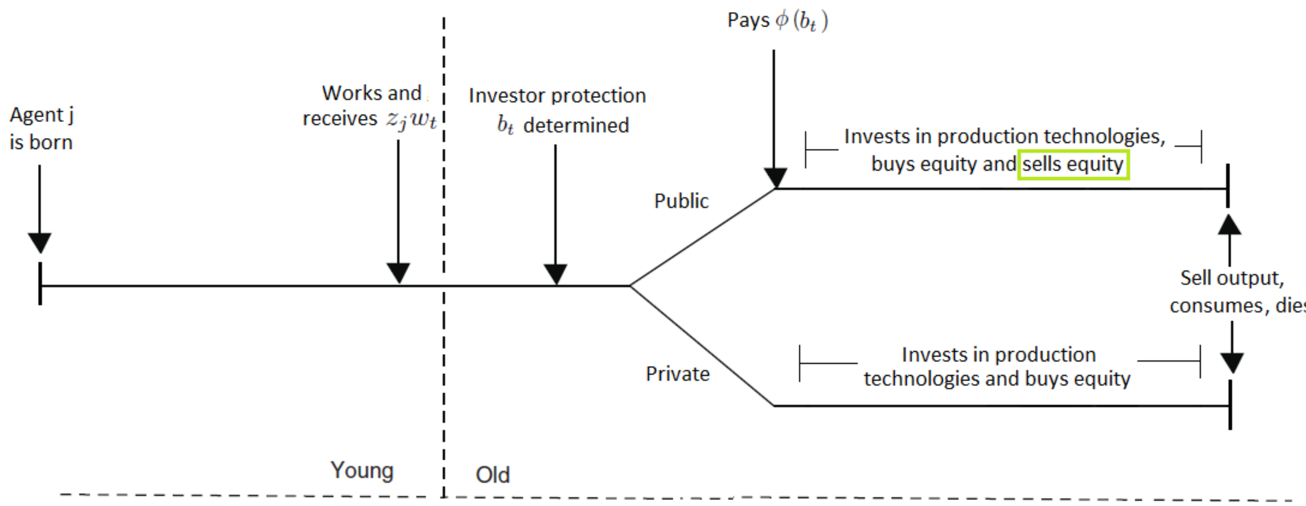
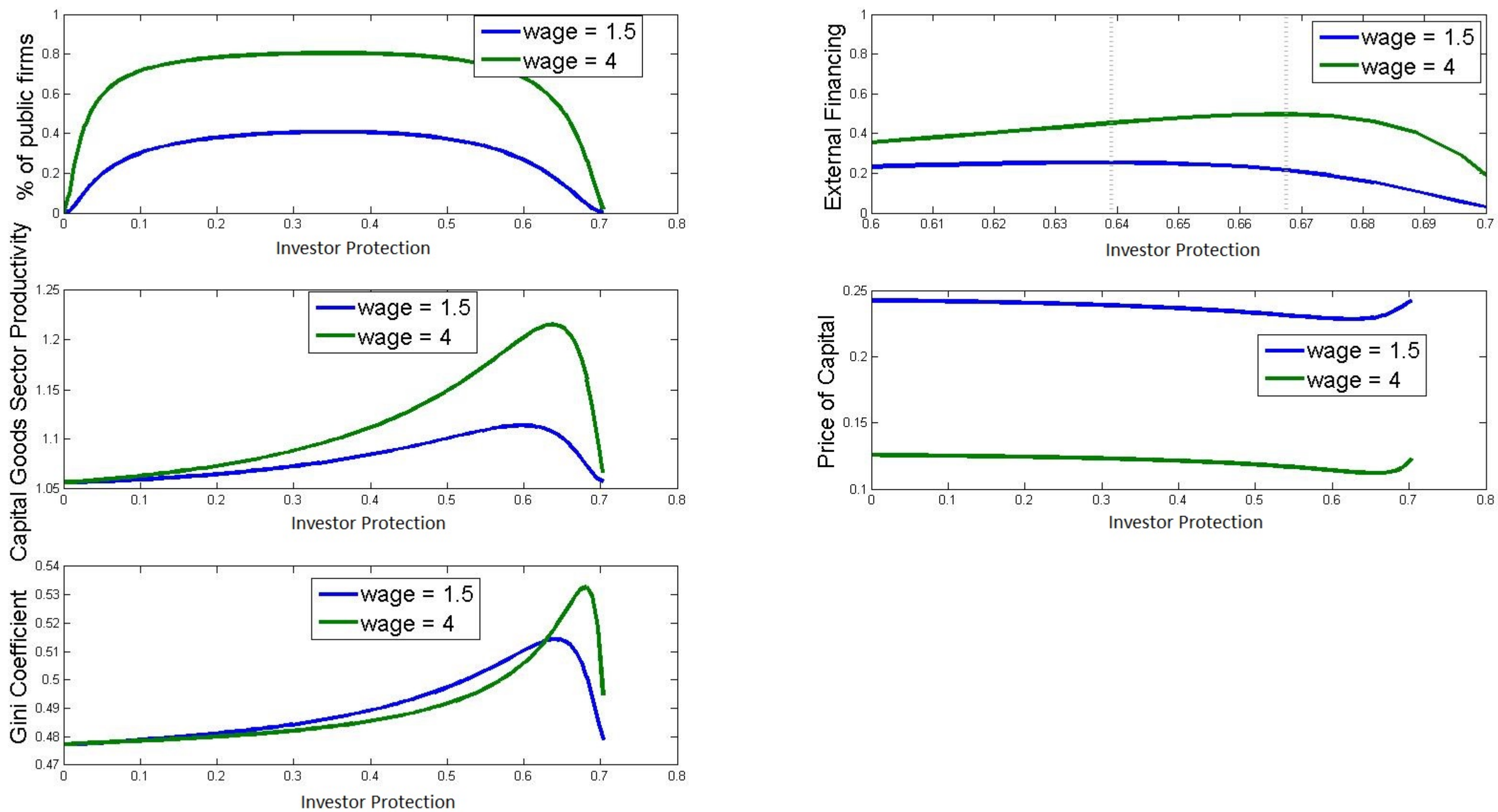


Figure 2: Comparative Static



The parameters used to produce this graph are: $g_H = 0.44$, $g_L = 0.02$, $G \sim \ln \mathcal{N}\left(-\frac{1}{2}, 1\right)$, $\gamma = 5$, $\sigma = 1$, $\phi\left(b_t\right) = c + \frac{a}{\bar{b} - b_t}$, where $c = 0,2$ and $a = 0,02$, $\alpha = 0.33$, the parameter $\bar{b} = 0.71$ is picked such that Assumptions 1-5 hold.

Figure 3: Transition Dynamics Maximum Welfare

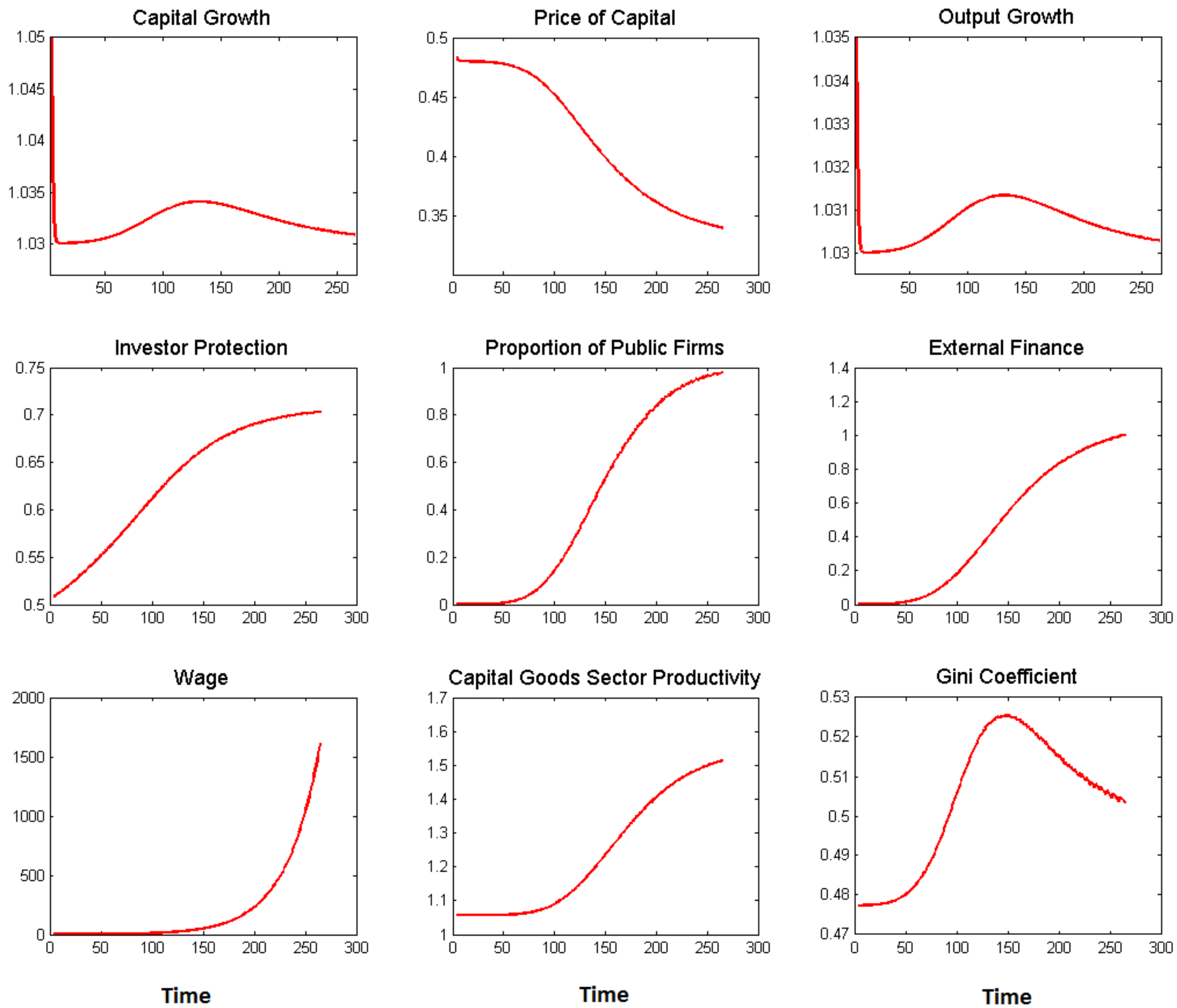
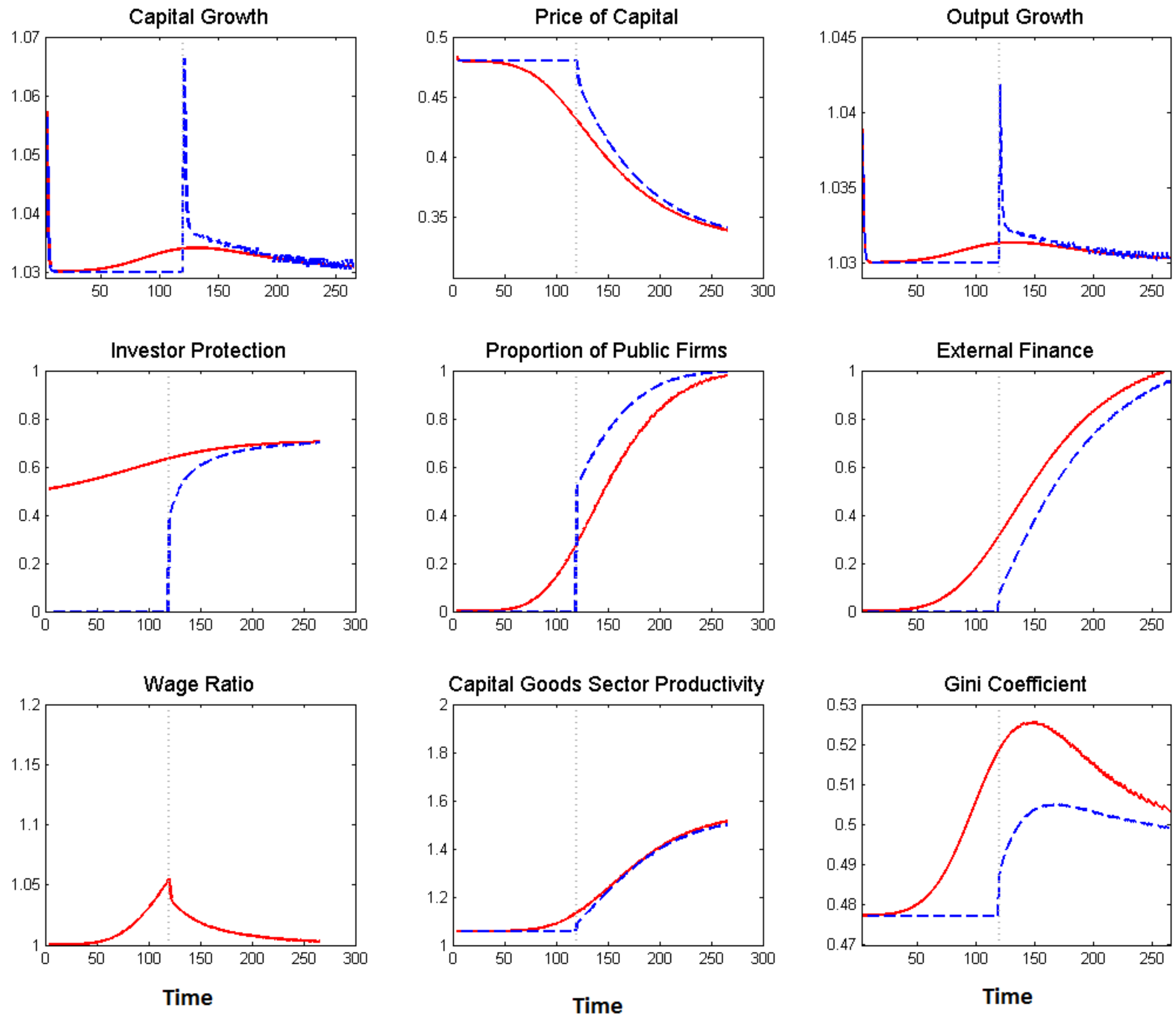


Figure 4: Transition Dynamics Political Equilibrium



A Appendix

This Appendix contains the proofs for the propositions in the main text. Throughout I make use of the following assumptions:

Assumption 1. *supp* $(g(z)) = [0, \infty)$

Assumption 2. $b_t \in [0, 1]$

Assumption 3. $0 \leq \theta_{H,\tau}, \theta_{L,\tau}$

Assumption 4. $\alpha_\tau \theta_{H,\tau}^{Pub} K_\tau^{Pub} T < \left(1 - \theta_{H,\tau}^{Pri}\right) K_\tau^{Pri} + \left(1 - \theta_{H,\tau}^{Pub}\right) K_\tau^{Pub}$

Assumption 5. $\frac{\partial q(b_t)}{\partial b_t} \sqrt{\mu_t^{Pub}(b_t)} > 0$

Assumption 1 states that effective labor endowments z are strictly positive and that the support of its density function $g(z)$ is not bounded. This ensure that terminal consumption is always positive and simplify some of the proofs. Assumption 2 ensures that agency costs exist and lie within the economically interesting and relevant region. Assumption 3 states that the production technologies cannot be shorted. Assumption 4 ensures that the stock market clearing condition holds and that technology L is used in equilibrium. Assumption 5 states that entrepreneurs find better investor protection desirable when there is no cost to improve it.

Proof of Proposition 1. Let's first look at the problem faced by a private entrepreneur. Substituting 6 in 7 and 8 in 5 and defining $\theta_{H,\tau}^{Pri} = k_{H,\tau}/k_\tau$, $\theta_{L,\tau}^{Pri} = k_{L,\tau}/k_\tau$, problem 5 can be rewritten the following way

$$V_{Pri}(z) = \max_{\theta_{L,\tau}^{Pri}, \theta_{H,\tau}^{Pri}} E_t \left[\frac{k_{t+1}^{1-\gamma}}{1-\gamma} \right] \tag{A.1}$$

s.t.

$$k_\tau = z w_t + \int_t^\tau k_s \left(r_{f,s} + \theta_{H,s}^{Pri} (g_H - r_{f,s}) + \theta_{L,s}^{Pri} (g_L - r_{f,s}) \right) ds + \int_t^\tau k_s \theta_{H,s}^{Pri} \sigma d\omega_s \tag{A.2}$$

The associated HJB equation is

$$0 = J_t(k_t, t) + \max_{\theta_{H,t}^{Pri}, \theta_{L,t}^{Pri}} \left[\frac{1}{2} J_{kk}(k_t, t) k_t^2 \left(\theta_{H,t}^{Pri}\right)^2 \sigma^2 + J_k(k_t, t) k_t \left(r_{f,s} + \theta_{H,t}^{Pri} (g_H - r_{f,t}) + \theta_{L,t}^{Pri} (g_L - r_{f,t}) \right) \right] \tag{A.3}$$

The FOC w.r.t. $\theta_{L,t}^{Pri}$ yields

$$g_L = r_{f,t} \tag{A.4}$$

Since both technology L and the market portfolio are risk-free, they must provide the same return. Hence the productivity of technology L pins down the risk-free rate. Substituting A.5 in the HJB yields

$$0 = J_t\left(k_t, t\right) + \max_{\theta_{H,t}^{Pri}} \left[\frac{1}{2} J_{kk}\left(k_t, t\right) k_t^2 \left(\theta_{H,t}^{Pri}\right)^2 \sigma^2 + J_k\left(k_t, t\right) k_t \left(g_L + \theta_{H,t}^{Pri}\left(g_H - g_L\right)\right)\right] \tag{A.5}$$

The FOC w.r.t. $\theta_{H,\tau}^{Pri}$ yields

$$\theta_{H,\tau}^{Pri} = -\frac{g_H - g_L}{\sigma^2} \frac{J_k\left(k_\tau, \tau\right)}{k_\tau J_{kk}\left(k_\tau, \tau\right)} \tag{A.6}$$

The right guess for the value function being

$$J\left(k_\tau, \tau\right) = e^{\gamma(t+1-\tau)} \frac{k_\tau^{1-\gamma}}{1-\gamma}, \tag{A.7}$$

we find

$$\theta_{H,\tau}^{Pri} = \frac{g_H - g_L}{\gamma\sigma^2} \tag{A.8}$$

Substituting our expression for $\theta_{H,\tau}$ back into the budget constraint shows that

$$k_\tau = zw_t + \int_t^\tau k_s \left(g_L + \frac{\left(g_H - g_L\right)^2}{\gamma\sigma^2}\right) ds + \int_t^\tau k_s \frac{g_H - g_L}{\gamma\sigma} d\omega_s \tag{A.9}$$

Hence the wealth process of the agent follows a geometric Brownian motion and terminal wealth is distributed according to

$$k_{t+1} = zw_t \tilde{R}^{Pri} \tag{A.10}$$

where $\tilde{R}^{Pri}$ is lognormally distributed with mean μ^{Pri} and variance ν^{Pri} given by

$$\mu^{Pri} = \exp\left\{g_L + \theta_H^{Pri}\left(g_H - g_L\right)\right\} \tag{A.11}$$

$$\nu^{Pri} = \left(\exp\left\{\left(\frac{g_H - g_L}{\gamma\sigma}\right)^2\right\} - 1\right) \exp\left\{2\left(g_L + \theta_H^{Pri}\left(g_H - g_L\right)\right)\right\} \tag{A.12}$$

Substituting

$$V_{Pri}(z) = \frac{\left(q_{t+1} z w_t \sqrt{\mu^{Pri}} e^{\frac{g_L}{2}}\right)^{1-\gamma}}{1-\gamma} \tag{A.13}$$

Let's now look at the problem of a public entrepreneur. We established that, because of diversification, outside investors require the risk-free rate of return g_L on their equity stakes. As a consequence, the market value $V(f_\tau)$ of a project of size $k_{H,\tau}$ must satisfy

$$(1 - f_\tau) k_{H,\tau} g_H dt = V(f_\tau) g_L dt. \tag{A.14}$$

This equation states that the expected dividend available for distribution to outside investors $(1 - f_\tau) k_{H,\tau} g_H dt$ must equal the amount outside investors require on their investment $V(f_\tau) g_L dt$. The Tobin's Q of a project can then be written as

$$T(f_\tau) = \frac{V(f_\tau)}{k_{H,\tau}} = \frac{(1 - f_\tau) g_H}{g_L} \tag{A.15}$$

Solving for f_τ in the incentive compatibility constraint 13 gives

$$f_\tau := \begin{cases} 1 & \text{if } \alpha_\tau > b_t \\ 0 & \text{if } \alpha_\tau \leq b_t \end{cases} \tag{A.16}$$

Taken together, equations A.15 and A.16 imply the following. An entrepreneur will never issue a fraction $\alpha_\tau > b_t$ of his equity since he wouldn't receive anything back for his shares, and neither will he issue a fraction $\alpha_\tau < b_t$ since the market value of the project is above its replacement cost $T(0) = \frac{g_H}{g_L} > 1$. As a consequence, the level of investor protection directly pins down the equity share that is sold to outside investor, $\alpha_\tau = b_t$, there is no stealing at the optimum, $f_\tau = 0$, and the Tobin's Q of a project of type H is given by $T_\tau = \frac{g_H}{g_L}$. As it was the case for the private entrepreneur's problem, the allocation of wealth between technology L and savings is undetermined. Let $\theta_{H,\tau}^{Pub} = \frac{k_{H,\tau}}{k_\tau}$ denote the share of wealth public entrepreneurs allocate to technology H. Substituting our expressions for α_τ, f_τ, and T_τ, problem 9 can be rewritten

$$V_{Pub}(z, b_t) = \max_{\theta_{H,\tau}^{Pub}} E_t \left[\frac{k_{t+1}^{1-\gamma}}{1-\gamma}\right] \tag{A.17}$$

s.t.

$$k_\tau = zw_t - \phi\left(b_t\right) + \int_t^\tau k_s\left(g_L + \theta_{H,\tau}^{Pub}\left(g_H - g_L\right)\right)dt + \int_t^\tau k_s \theta_{H,\tau}^{Pub}\left(1-\alpha_s\right)\sigma d\omega_s \tag{A.18}$$

This problem almost identical to problem 5 we studied in Proposition 1, the only two differences being the diffusion parameter, now $(1-b_s)\,\sigma_s$, and the initial level of wealth, now $zw_t - \phi\left(b_t\right)$. Following the same steps as in Proposition 1, we find the optimal allocation to technology H is

$$\theta_{H,\tau}^{Pub} = \frac{g_H - g_L}{\gamma\sigma^2\left(1-b_t\right)^2}. \tag{A.19}$$

Substituting this expression in the budget constraint shows that the amount of capital an entrepreneur has to sell at the end of his life k_{t+1} is distributed according to

$$k_{t+1} = \left[zw_t - \phi\left(b_t\right)\right]\tilde{R}^{Pub} \tag{A.20}$$

where $\tilde{R}^{Pub}$ is log-normally distributed with mean mu^{Pub} and variance nu^{Pub}

$$\mu^{Pub} = \exp\left\{g_L + \theta_H^{Pub}\left(g_H - g_L\right)\right\} \tag{A.21}$$

$$\nu^{Pub} = \left(\exp\left\{\left(\frac{g_H - g_L}{\gamma\sigma\left(1-b_t\right)}\right)^2\right\} - 1\right)\exp\left\{2\left(g_L + \theta_H^{Pub}\left(g_H - g_L\right)\right)\right\} \tag{A.22}$$

The indirect utility is given by

$$V_{Pub}\left(z\right) = \frac{\left(q_{t+1}\left[zw_t - \phi\left(b_t\right)\right]\sqrt{\mu^{Pub}}e^{\frac{g_L}{2}}\right)^{1-\gamma}}{1-\gamma} \tag{A.23}$$

Using the expressions we found for the indirect utilities, we can now determine the expression of the skill threshold at which entrepreneurs go public. By definition we have $V_{Pub}\left(\bar{z}\left(b_t\right)\right) = V_{Pri}\left(\bar{z}\left(b_t\right)\right)$. Solving for $\bar{z}\left(b_t\right)$ yields

$$\bar{z}\left(b_t\right) = \frac{\phi\left(b\right)}{\left(1 - \sqrt{\frac{\mu_{Pri}}{\mu_{Pub}}}\right)w_t}. \tag{A.24}$$

□

Before proving Proposition 3, let's establish a few preliminary results

Preliminary Result 1. *By going public, entrepreneurs of type $z > \bar{z}(b_t)$ increase their expected output:* $\forall b \in (0,1]$

$$z > \bar{z}(b_t) \Longrightarrow (zw_t - \phi(b_t))\,\mu^{Pub} > zw_t\mu^{Pri} \tag{A.25}$$

Proof. It suffices to show that the proposition holds at $z = \bar{z}(b_t)$ as we know that $\mu^{Pub} > \mu Pri$. Define $0 < \epsilon = \frac{\phi(b_t)}{\bar{z}w_t} < 1$. By definition, we know that $V_{Pub}(\bar{z}) = V_{Pri}(\bar{z})$, thus

$$[\bar{z}w_t - \phi(b_t)]\, e^{g_L + \frac{1}{2\gamma}\left(\frac{g_H - g_L}{\sigma(1-b_t)}\right)^2} = \bar{z}w_t e^{g_L + \frac{1}{2\gamma}\left(\frac{g_H - g_L}{\sigma}\right)^2} \tag{A.26}$$

After manipulations, this equation becomes

$$(1-\epsilon)\,[\bar{z}w_t - \phi(b_t)]\,\mu^{Pub} = \bar{z}w_t\mu^{Pri} \tag{A.27}$$

and thus

$$[\bar{z}w_t - \phi(b_t)]\,\mu^{Pub} > \bar{z}w_t\mu^{Pri} \tag{A.28}$$

□

Corollary 1. *Everything else kept constant, the price of capital goods q_t is maximized when $b_t = 0$*

Proof. Equation 4 shows that the price of capital goods is decreasing in the aggregate supply of capital. Preliminary Result 1 implies that aggregate supply of capital is minimized when all entrepreneurs go private, and we know from 22 that $\bar{z}(0) = \infty$ so that everyone goes private when investor protection is non existent. □

Preliminary Result 2. *A public entrepreneur preferred b_t is increasing in his effective labor endowment z.*

Proof. Applying theorem 1 of Milgrom (1994), the solution to $\max_{b_t} V_{Public}(zw_t, b_t)$ is monotone non-decreasing in z if and only if V_{Public} satisfies the Spence-Mirrlees condition that the agent's marginal rates of substitution between b_t and q_{t+1} are monotone non-decreasing in z. In our context, marginal rates of substitution are given by

$$MRS(z) = \frac{\frac{\partial V_{Public}(z)}{\partial b_t}}{\frac{\partial V_{Public}(z)}{\partial q_{t+1}}} = q'_{t+1}(b_t) + \frac{1}{\gamma}\left(\frac{g_H - g_L}{\sigma}\right)^2 \left(\frac{1}{1-b}\right)^3 q_t - \frac{\phi'(b_t)}{z_j w_t - \phi(b_t)} q_t \tag{A.29}$$

Taking the partial derivative with respect to z yields

$$\frac{\partial MRS\left(z\right)}{\partial z}=\frac{\phi'\left(b_t\right)w_t q_t}{\left[z_j w_t-\phi\left(b_t\right)\right]^2}>0 \tag{A.30}$$

□

Proof of Proposition 2. Equation 20 shows that the only impact investor protection has on private entrepreneurs is through the price of capital goods. Hence by Corollary 1, we know that entrepreneurs who find optimal to go private, those with $z<\hat{z}$, prefer the minimal level $b_t=0$. Preliminary Result 2 that the preference for b_t of entrepreneur who find optimal to go public, those with $z>\hat{z}$, is increasing in b_t. We can then conclude that agent's preference for investor protection is weakly increasing in their type z.

When $0<z<\frac{\phi(0)}{w_t}$, going public is not feasible and entrepreneurs are forced to go private. In that case, we know from Proposition 2 that the level of investor protection they vote for is $b_t=0$. It now suffice to show that for any arbitrary policy $b_t>0$, there exist a threshold $\hat{z}\left(b_t\right)$ such that for all $z>\hat{z}\left(b_t\right)$:

$$\frac{\left(q_{t+1}\left(b_t\right)\left[zw_t-\phi\left(b_t\right)\right]\sqrt{\mu^{Pub}}e^{\frac{g_L}{2}}\right)^{1-\gamma}}{1-\gamma}>\frac{\left(q_{t+1}\left(0\right)zw_t\sqrt{\mu^{Pri}}e^{\frac{g_L}{2}}\right)^{1-\gamma}}{1-\gamma} \tag{A.31}$$

Such a threshold will always exist given that

$$q_{t+1}\left(b_t\right)\sqrt{\mu^{Pub}}>q_{t+1}\left(0\right)\sqrt{\mu^{Pri}} \tag{A.32}$$

Assumption 5 ensures that this inequality holds. □

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