Can Market Failure Cause Political Failure?

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August 6, 2012

Abstract

We study how inefficiencies of market failure may be further amplified by political choices made by interest groups created in the inefficient market. We take an occupational choice framework, where agents are endowed heterogeneously with wealth and talent. In our model, market failure due to unobservability of talent endogenously creates a class structure that affects voting on institutional reform. In contrast to the world without market failure where the electorate unanimously vote in favour of surplus maximising institutional reform, we find that the preferences of these classes are often aligned in ways that creates a tension between surplus maximising and politically feasible institutional reforms.

Keywords: occupational choice, adverse selection, property rights, asset liquidation, political failure, market failure.

JEL Classification numbers: O12, O16, O17

1 Introduction

It is well known that market failures abound in the real world. A key insight from the institutional approach to development economics is that capital market failures prevent individuals and economies from reaching their full potential and can lead to poverty traps (see Banerjee and Newman (1993) and Galor and Zeira (1993)). In this literature institutional frictions are taken as exogenous.[1]

It is also well known that even fully accountable governments can fail to implement surplus maximising policies when they lack sufficient instruments for compensating losers. Furthermore, the political economy approach to development has emphasized how concentration of political

*We would like to thank David Austen-Smith, Tim Besley, Leonardo Felli, Greg Fischer, Mike Golosov, Ethan Ilzetzki, Ben Jones, James Peck, Torsten Persson, Miltos Makris, François Maniquet, Tomas Sjöström, Daniele Terlizzese, seminar participants at Northwestern (MEDS), Zurich, EIEF, the Midwest Mathematical Economics and Theory Conference, North Eastern Universities Development Consortium Conference, the EOPP Workshop, and three anonymous referees for their helpful feedback. The usual disclaimer applies.

[1]See Banerjee (2001) for a survey of this literature.

power in the hands of an elite, may allow the elites to distort the market outcome in their favour, and this typically leads to inefficiencies.[2]

In this paper we highlight the reverse link, namely that market failure may create a political failure even when political power is uniformly distributed. We think of political failure as the failure of the electorate to pick surplus maximising policies.[3] In our model, in the first-best world with well functioning markets, the electorate unanimously chooses institutions that maximise total surplus. However once a market imperfection in the form of unobservability of entrepreneurial talent is introduced, things change dramatically. The competitive market responds to this imperfection by screening agents based on their wealth. This leads to creation of a class structure in the economy with preferences that are aligned in ways that defeat surplus maximising reforms. Of course in the real world the political failures causing a debt crisis or an inability to reform the economic system in general depend on several factors. In this paper we isolate one particular channel, namely the effect of market failure on the electorate's inability to choose surplus maximising reforms.[4]

Our model focuses on the tension between the welfare properties and actual choice of property rights and contractual institutions. Specifically we find that improving property rights institutions is always surplus maximising but may not be politically feasible whereas improving contractual institutions is always politically feasible but may not be surplus maximising. Hence our model predicts that with respect to the institutions that are actually observed in the real world, we should observe a positive correlation between the property rights institutions and economic growth whereas the effect of contractual institutions on economic growth should be ambiguous. These predictions are in line with the empirical results of Acemoglu and Johnson (2005) who find that property rights institutions seem to have a first order impact on long run economic growth whereas contractual institutions do not. Our model supplies an explanation as to why such a correlation may arise; the majority may have incentives to focus on contractual institutions even when they do not increase welfare and neglect welfare enhancing reforms of property rights institutions.

There is an important distinction between our approach and the existing literature on political economy. Instead of taking political classes or interest groups as exogenous and studying the impact of their alignment on markets, we derive them from economic fundamentals, namely, the nature of technology and the informational environment in the economy. [5] Hence this paper differs from other models of endogenous institutions in that the heterogeneity which causes households

[2]This is most obvious when elites lobby for barriers to entry (Djankov et al. (2002)). Acemoglu (2003) makes the argument that concentration of political power may lead to distortion of the market through manipulation of factor prices in ways that benefit the political elites.

[3]For a discussion on somewhat different notions of political failure see Besley (2006).

[4]In terms of examples of recent events, one could describe our exercise as an attempt to isolate the effects of the market failure component of the recent financial crisis on the sluggish institutional reform response of the subsequent years in the western world. In section 3.3 we will interpret some of our results in this light.

[5]In this regard, the mechanism that our paper identifies relates to a theme present in both Marxist and Neo-Classical theories of institutions, namely, economic forces shape the base over which the political superstructure is built. See chapter 1 in Bardhan (1989) for a review of the common themes in these literatures concerning the theory of institutions.

to choose inefficient policies is itself the endogenous outcome of asymmetric information.

We argue that in addition to the well known impacts of market failures studied in the literature on poverty traps, there may also be a political impact. The latter problem could turn out to be more persistent since unlike the solutions to poverty traps that are easier to characterise[6], the solutions to political failure that are politically feasible may not exist. A more general message emerging from our model is that the fallout of market and political failures may not be simply additive since the two may complement each other in generating economic inefficiencies.

Policies in our model are chosen by workers who turn out to be in the majority and are therefore aimed at maximizing wages. Improving contractual institutions makes entrepreneurship more attractive and this increases the demand for labor and wages. However, the quality of the pool of entrepreneurs may decline, as rich low types may crowd out some poor high types. On the contrary, protecting property rights makes wealth more effective as collateral, inducing exit of low types and entry of high types. While this adjustment is efficient, its overall effect on labor demand, and consequently on wages, is ambiguous.

There is a related literature in political economy that looks at two questions: first, which institutions increase the size of the pie, and second, which institutions are more likely to be chosen given a certain distribution of political power? Boyer and Laffont (1999) examine which kind of environmental policies will be implemented under information and distribution constraints when there are political constraints such as majoritarianism or intervention from special interests, which shape policy. Perotti and Volpin (2004) develop a model where wealth inequality and political accountability undermine entry and financial development. Rajan and Zingales (2006) show how inequalities in endowments together with low average levels of endowment can create constituencies that combine to perpetuate an inefficient status quo against educational reform. Biais and Mariotti (2009) study how bankruptcy laws affect credit and wages in a general equilibrium setting. They show how the interests of the rich and the poor may not be aligned in favour of optimal bankruptcy laws since the rich prefer ones that would lower equilibrium wages whereas the poor prefer the opposite. Another paper that is related to ours is Caselli and Gennaioli (2008), who study reforms aimed at deregulation. Agents differ in talent and whether their endowment includes a license to run a firm. They show how a mismatch between the two leads to preferences for deregulation and legal reform. Lilienfeld-Toal and Mookherjee (2010) show how it may be efficient to restrict bonded labour clauses in tenancy and debt contracts. They also derive the political feasibility on the restriction to such clauses and show how this depends on wealth and the range of collateral instruments that are available. Bonfiglioli and Gancia (2011) propose a model where unobservability of the resources invested in reforms and of the ability of incumbent politicians leads to surplus maximising reforms not being chosen. A recent paper that is related to ours is Jaimocich and Rud (2011), who construct a general equilibrium model where unmotivated agents can end up in the bureaucracy, leading to rent seeking through increasing public sector employment. Although

[6]Micro-lending has been a big theme in this literature. See for example Ghatak and Guinnane (1999).

inefficient this equilibrium may be politically feasible since it leads to an increase in low skilled wage.

At the root of the inefficiencies showcased in the models discussed above are the problems in the political domain such as the informational asymmetries between citizens and political incumbents, rent seeking within the bureaucracy, or the presence of exogenous political alignments that undermine the support for best possible institutions. In our model on the other hand the problem in the political domain is endogenised and the fundamental source of inefficiency lies elsewhere, in the adverse selection problem in the marketplace created by the unobservability of entrepreneurial talent. Institutions, depending on their quality, would mitigate or worsen this problem. Once the adverse selection problem is removed, the constituencies created in the second-best world also disappear, and the electorate unanimously favours surplus maximising policies.

When the main frictions are political, the focus is typically on reforms to improve the quality of candidates and/or improve incentives for incumbents and bureaucrats so that inefficient rent-extracting policies are removed. In contrast, with market frictions the policies are far less easy to characterize, and this is especially so if they interact with the political system, even if such system is otherwise frictionless and the distribution of political power is uniform. We will also show that wealth inequality hikes and productivity shocks can further hamper the possibility of good institutional reforms, whereas sometimes the tightening of credit availability can generate an opportunity for efficient reforms that would otherwise be politically unfeasible.

The plan of the paper is as follows. In section 2 we set up the basic model with credit and labor markets, and characterize occupational choice in terms of ability and wealth given the informational and institutional frictions. In section 3 we analyse the political economy of the choice of credit market institutions. In section 3.3 we focus on reform of property rights and derive the predictions of the model about the effect of inequality on reform, and the presence of credit constraints on reform when assumptions are made to pin down the distribution of wealth. In section Section 4 looks at a wider range of policy choices to test the robustness of our results. Section 5 concludes.

2 Model

2.1 Technology, Preferences, and Endowments

The basic setup for the description of an economy is based on Ghatak et al. (2007). There are two technologies in the economy: a subsistence technology that yields $\underline{w}$ with certainty for one unit of labour and a more productive technology that yields a return R in case of success and 0 in case of failure and requires n workers and 1 entrepreneur to run it.

The economy is populated with measure one of risk neutral agents with a utility function that is additively separable in effort and money. We can interpret M as a private benefit from entrepreneurship (e.g., perks that entrepreneurs enjoy relative to workers such as a comfortable office, or the psychological payoff from not having a boss.) Alternatively, we can interpret it as the disutility of labour effort with that of entrepreneurial effort being normalized to zero.

Agents are endowed with one unit of labour, entrepreneurial talent and illiquid wealth. The talent of an agent is the probability of success of the more productive technology if she becomes an entrepreneur. We assume that the distribution of talent takes only two values. There are a proportion q of high types who succeed with probability one and a proportion $1-q$ of low types who succeed with probability θ which is less than one.[7] Assume that

$$\theta(R - n\underline{w}) + M > \underline{w} > \theta R - n\underline{w} + M. \tag{1}$$

The right hand side of this assumption implies that the returns from the project are not high enough to cover costs when the project is run by a low type entrepreneur. Hence in the first-best where talent is observable, only high type agents will choose entrepreneurship. The left hand side of the assumption allows us to focus on the interesting case when entrepreneurship is attractive for low types, when as a result of limited liability low types only bear the full costs when the project is successful. As we will see, this may happen when entrepreneurial talent is unobservable.

Agents are also endowed with illiquid wealth a that is distributed in the population with density $g(a)$. As will be clear in section 2.4, wealth is used in the credit market to screen agents when talent is unobservable. To fix ideas we can think of wealth here as the value of an agent's house or land. This is illiquid and at the same time may be used as collateral. Since the wealth of an agent is illiquid, agents need to borrow from the credit market to become entrepreneurs. This is because workers have to be paid upfront irrespective of whether the project succeeds or fails later.

2.2 Informational and Institutional Frictions

Entrepreneurial ability can be either observable or unobservable. In the first-best world this talent is observable and the first welfare theorem operates ensuring that the competitive equilibrium is Pareto efficient. When talent is unobservable, a market failure arises. The illiquid wealth a, and output, are verifiable. M is also verifiable but is not appropriable, being a private benefit.

The two institutional parameters in the model are ϕ and τ. The proportion of collateral that is recovered from a borrower when she defaults is denoted by ϕ. This can be thought of as the strength of judicial enforcement of contracts. The property rights parameter τ, is the probability with which the wealth a is expropriated. The efficiency of both these institutions affect the credit contract that an agent is offered in the second-best world as the credit market takes into account the efficiency of the judiciary and the risk of expropriation when accepting the agent's wealth as

[7] Our results apply *mutatis mutandis* to the case where the high types have talent θ_H such that $1 \geq \theta_H > \theta \geq 0$. In an earlier version we also considered a continuous distribution of talent. The results remain similar to the ones presented here although not as sharp. Note that this set up implicitly assumes that the distributions of wealth and talent are independent.

collateral. We discuss this in greater detail in section 3. Note that since agents are assumed to be risk neutral, a market for property insurance will not arise even though property rights are insecure.

In addition to these institutional variables, a limited liability constraint also operates in the economy. This implies that in the event an entrepreneurial project fails, the agent can only be liable upto the illiquid asset a. In other words agents are guaranteed a non negative payoff in all states of the world.

The timing of the model is as follows:

1. Agent's wealth and entrepreneurial type are realised.
2. Vote on institutional reform takes place.
3. Agents make occupational choices.
4. Output is realised. Expropriation of property and liquidation of collateral takes place.
5. Final payoffs realised and consumption takes place.

The model can be solved backwards. We start with stage 3 where agents make their occupational choices and show in Proposition 2 that there exists a unique equilibrium. It is possible to derive comparative statics of the equilibrium pay off of agents with respect to the institutional parameters ϕ and τ. Consequently, going into stage 2 agents know their expected payoff from the status quo and alternative values of ϕ and τ and have well defined preferences over these. In section 3 we show how stage 2 plays out both in the world with complete and incomplete information.

2.3 Occupational Choice

Agents choose their occupation. They can either choose to work in the subsistence sector, become workers, or become entrepreneurs. If they choose entrepreneurship, their payoff depends on their type, which is the probability of the entrepreneurial project being successful. To set up a firm an entrepreneur needs to hire n workers and pay them a wage w upfront, where $w \geq \underline{w}$ since working with the subsistence technology is an outside option that all agents have.

Our assumption that the productive technology requires n workers and 1 entrepreneur implies that workers and the entrepreneur are perfect complements in the production function. This assumption greatly simplifies our analysis and allows us to get sharp political economy results, although it is not central to our analysis. As we will see in section 3.2 what drives our political economy results is that in equilibrium workers constitute at least half the population. The assumption of $n \geq 1$ guarantees this neatly since there will be at least $\frac{n}{n+1} \geq \frac{1}{2}$ workers in equilibrium.

We will present a general equilibrium model with two markets; the labour and credit market. The need for credit arises as workers need to be paid upfront when an entrepreneurial project is set up and the wealth of agents is illiquid. Both markets are assumed to be perfectly competitive. The risk free gross interest rate is normalized to 1.

2.4 Credit Contracts

Since the wealth of an agent is illiquid, agents need to borrow from the credit market to become entrepreneurs as workers need to be paid upfront irrespective of whether the project succeeds or fails later. The credit market is assumed to be perfectly competitive. The supply of credit is assumed to be perfectly elastic at the gross interest rate equal to 1. We impose no restrictions on the type of contract that can be offered by a bank other than the condition that it does not make negative profits in equilibrium.

2.4.1 First Best

If talent were observable, given our assumption (1), only high types would become entrepreneurs. Since markets are perfectly competitive, the equilibrium would be pareto efficient. In addition, it turns out that in our model the equilibrium with observable talent would also be surplus maximising. The wage would depend on whether the economy is talent rich (i.e. when $\frac{q}{1-q} \geq \frac{1}{n}$) or talent poor (i.e., $\frac{q}{1-q} < \frac{1}{n}$). In the talent rich case the wage would be $\overline{w} = \frac{R+M}{n+1}$, while otherwise the equilibrium wage would be $\underline{w}$. This is because the wage in the first-best is determined by whoever is on the short side of the market.[8] Since each entrepreneur requires n workers, the abundance of talent depends on the proportion of high types in the economy relative to n. This leads us to the following observation.

Observation 1. *When talent is observable only high types choose entrepreneurship. The equilibrium wage is $\overline{w}$ if $\left(\frac{q}{1-q} \geq \frac{1}{n}\right)$ and $\underline{w}$ otherwise.*

2.4.2 Second Best

The second-best world is characterised by the unobservability of entrepreneurial talent. In all other respects it is identical to the first-best world. Due to the unobservability of talent, the credit market can no longer offer contracts that are indexed by the agent's talent. Since only the output and wealth of an agent are observable the contracts are constrained to be indexed by these two variables. Hence the credit contract will map an agent's wealth a to a pair (r, a) that is, the interest rate agents repay when their project succeeds and the collateral they post. Note that the principal along with the interest can be repayed only in case the project succeeds. In contrast, a contract where a part of the collateral is seized even when the project is successful is feasible.

[8] We require $R > nM$ for the appropriable returns from the project to be large enough to cover the wage payment when the wage is $\overline{w}$.

We impose no restrictions on the kind of contracts that can be offered other than the constraint imposed by the unobservability of talent.

We now turn to discuss the possible credit contracts that can be offered to entrepreneurs and subsequently we characterise the equilibrium in the credit and labour market. The reader who is only interested in the choice of institutions by the electorate in the first and second-best world can see the statements of Propositions 1 and 2 in section 2.5 that capture the characterisation of the equilibrium and skip directly to section 3.

2.4.2.1 Separating Contracts. Let us first consider the separating contracts that can be offered to the agents. A separating contract exists if the contract is such that agents have an incentive to reveal their types. Since the probability of success is increasing in type, high types are offered contracts with lower interest rates. This feature of the credit contract creates an incentive to lie for low ability agents. Hence for such contracts to be incentive compatible, agents need to have sufficient wealth that the credit market can use as a screen. Since M is independent of type and there is limited liability, it is impossible to offer an interest rate r and collateral that will separate the two types among those with too little wealth. Equation (6) will derive the lowest wealth level $\overline{a}$ such that a separating contract can exist.

Since high types succeed with probability one, we will see that the zero profit condition holds at $r_s(a)nw = nw$ and this implies that $r_s(a)$, which is the separating interest rate offered to an agent with wealth a, will be equal to one in equilibrium. From the right hand side of assumption (1) it should be clear that no credit contract will be offered to low types with wealth allowing for separation.

2.4.2.2 Pooling and Semi-Separating Contracts. In addition to a separating contract, there may also exist pooling and semi-separating contracts in this economy for lower wealth levels.

Let us first consider the region of wealth such that $R \geq r_p(a)nw$ where $r_p(a)$ is the pooling interest rate offered to an agent with wealth a. Any pooling or semi-separating contract that could be offered must satisfy the non-negative returns condition for the loan:

$$r_p(a)\theta_p(a)nw + (1-\theta_p(a))(1-\tau)\phi a \geq nw \tag{2}$$

where

$$\theta_p(a) = \frac{q + \theta(1-q)\lambda(a)}{q + (1-q)\lambda(a)}$$

is the average talent in the pool of entrepreneurs at wealth level a. The function $\lambda(a)$ is the probability with which low types with wealth a choose entrepreneurship. In a pooling contract $\lambda(a) = 1$ since all low types choose entrepreneurship, whereas in a semi-separating contract $0 < \lambda(a) < 1$. Since credit markets are perfectly competitive, equation (2) will hold with an equality yielding a zero profit condition. Rearranging this we can solve out for the pooling interest rate

$$r_p(a) = \frac{nw - (1 - \theta_p(a))(1 - \tau)\phi a}{\theta_p(a)nw} \tag{3}$$

which is decreasing as quality of contractual institutions improve (ϕ goes up) and protection of property rights gets better (τ goes down). Note that the formulation of the optimal contract implicitly assumes that all wealth is seized when the agent defaults. It is easy to see that the equilibrium contract will take this form since this is the preferred contract for the high type. High types succeed with a higher probability and hence, relative to low types, prefer contracts that are tougher in the bad state and yield a high payoff in the good state.

Now let us consider the zero profit condition for banks when $R < r_p(a)nw$ for $r_p(a)$ as defined in equation (3). In this region, in addition to the project returns R in the good state and collateral in the bad state, the banks also need to be pledged a proportion of collateral for them to break even. The zero profit contract is now defined by

$$\theta_p(a)(R + (1 - \gamma(a))(1 - \tau)\phi a) + (1 - \theta_p(a))(1 - \tau)\phi a = nw \tag{4}$$

where $(1 - \gamma(a))$ is the proportion of collateral that is taken over by the bank in case the project succeeds. Hence the contract in this region is defined by the pair $(\gamma(a), a)$. It is important to note that entrepreneurship is attractive not just because of the appropriable return R but also for the non-appropriable return M. If the latter is large enough, agents would be willing to choose entrepreneurship even if they need to pay banks a fraction $(1-\gamma(a))$ of their wealth in addition to the full R in the case when the project succeeds. Indeed a necessary condition for the existence of credit constraints in this model is $M > \underline{w}$. Note that $\gamma(a)$, the proportion of wealth agents retain when successful, is increasing in a since banks would have to appropriate a smaller share of wealth in the good state to satisfy the zero profit condition when the agent has greater wealth.

Rewriting (4), credit contracts can only be offered when

$$\theta_p(a)R + (1 - \tau)\phi a \geq nw.$$

This condition only holds when agents have sufficient wealth. This in turn defines the credit constraint $\underline{a}$, such that agents with wealth less than this threshold will not be offered a pooling or semi-separating contract. Note that at this wealth level $\gamma(a) = 0$ must hold since agents would have to forgo their entire wealth in order to secure the credit contract. Therefore, we have:

$$\underline{a} = \frac{nw - \theta_p(\underline{a})R}{\phi(1 - \tau)}. \tag{5}$$

2.5 Equilibrium

In the previous subsection we have discussed the types of credit contracts that can exist in the economy. The equilibrium interest rate $r(a)$ and the wage w will be determined in equilibrium that we now characterise. Before we proceed it is helpful to spell out the payoffs of agents conditional on their type and occupation. We will find that the expected payoffs of the agents will in equilibrium depend on their type and their endowment of wealth. In the range where $R \geq r_p(a)nw$, a standard credit contract will be possible and the expected payoff of low type entrepreneurs is $\theta(R - r(a)nw) + \theta(1-\tau)a + M$ whereas that of the high types is $R - r(a)nw + (1-\tau)a + M$. As discussed earlier, in the region where $R < r_p(a)nw$, all of R is pledged to the bank along with $1-\gamma(a)$ of the agents wealth is seized in the case the project is successful. On the other hand in case of failure, the entire collateral is seized. Hence the payoff of a low type entrepreneur is $\theta\gamma(a)(1-\tau)a + M$ and that of the high type entrepreneur is $\gamma(a)(1-\tau)a + M$. Workers regardless of their type earn $w + (1-\tau)a$.

2.5.1 Equilibrium in the Credit Market

We have shown that pooling, semi-separating and separating contracts are viable. Given that banks can introduce any contract that makes non-negative profits we will now characterise the equilibrium in the model. We will use the Rothschild and Stiglitz (1976) equilibrium concept that is standard in this literature. An equilibrium is characterised by the following two conditions: *i)* all the contracts in the equilibrium set make non negative profits and *ii)* there does not exist a contract that can be introduced that will determine a strictly positive profit. We will assume that $M > \underline{w}$ which in turn implies that $\underline{a} > 0$. If this does not hold, low type agents will not be attracted to entrepreneurship.

To begin with, note that a separating contract is only viable when agents have sufficient wealth. We define this wealth level as

$$\overline{a} = \frac{\theta(R - nw) + M - w}{(1-\tau)(1-\theta)}. \tag{6}$$

Lemma 2 in the appendix shows that a separating contract is not viable for agents with wealth less than $\overline{a}$. This is because low types below this wealth level are attracted to entrepreneurship if they are offered the zero profit separating contract designed for high types.

For agents with wealth less than $\overline{a}$ semi-separating contracts will exist in equilibrium. To see this, it is convenient to define

$$v_L(a, r_p(a), w) \equiv \theta(R - r_p(a)nw) + M - (1-\tau)(1-\theta)a$$

as the side of the occupational choice constraint when an agent chooses entrepreneurship. Whenever a low type agent with wealth a makes wage payments at the wage rate w, is offered a credit contract with interest rate $r_p(a)$ defined in equation (3), the net value he receives from entrepreneurship is $v_L(a, r_p(a), w)$. When he is indifferent between entrepreneurship and working for a wage, $v_L(a, r_p(a), w) = w$. When a low type is indifferent he randomises between the two occupations, choosing entrepreneurship with probability $\lambda(a)$. Lemma 1 shows that this probability is uniquely determined in equilibrium and is decreasing in wealth. The intuition for this is that a low type agent who is wealthy has more to lose when their project fail than one who is poor and hence entrepreneurship is less attractive at higher wealth levels. At $\overline{a}$ the interest rate $r_p(\overline{a}) = 1$ since $\lambda = 0$ as all low types have dropped out. As we move to wealth $a < \overline{a}$ entrepreneurship becomes attractive for low types. As low types become entrepreneurs the interest rate must rise, consequently decreasing $v_L(a, r_p(a), w)$, the net payoff from entrepreneurship, and this ensures $v_L(a, r_p(a), w) = w$ continues to hold. This is why there is a region of wealth $a < \overline{a}$ where $\lambda \in (0, 1)$ and the equilibrium contract is semi-separating. As we move lower down the wealth distribution there may come a point where $\lambda = 1$ and this corresponds to a pooling contract. Hence in equilibrium separating and semi-separating contracts must exist whereas a pooling contract may or may not exist. The existence of a pooling contract depends on whether at $\underline{a} = \frac{nw - R(q+(1-q)\theta)}{(1-\tau)\phi}$, the inequality $v_L(a(\lambda = 1), r_p(a(\lambda = 1)), w) \geq w$. That is, whether or not the low types find it attractive to become entrepreneurs at this level of wealth. This is shown in Lemma 3. In what follows we assume that $\underline{a} < \overline{a}$ to focus on the case where at least some low types are entrepreneurs in equilibrium. We are ready to characterise the equilibrium.

Proposition 1 (Occupational Choice)**.** *Agents with wealth $a < \underline{a}$ are credit constrained and hence become workers. Agents with wealth $a \in [\underline{a}, \bar{a}]$ and high talent become entrepreneurs, whereas agents in the same wealth bracket but with low talent randomize and choose entrepreneurship with probability $\lambda(a)$. Agents with wealth $a \geq \overline{a}$ and high talent become entrepreneurs and the rest become workers.*

Proof: In the appendix.

2.5.2 Equilibrium in the Labour Market

The labour market is assumed to be perfectly competitive. An equilibrium is characterised by the market clearing condition. It is much easier to characterise the equilibrium by thinking of the labour demand of a firm instead of the labour demand by an entrepreneur. A firm demands one entrepreneur and n workers. Aggregate supply is 0 for wage $w < \underline{w}$, and 1 for $w \geq \underline{w}$.

Proposition 2. *A unique market clearing wage $w \in [\underline{w}, \overline{w}]$ exists.*

Proof: In the appendix.[9]

Note that whenever $w > \underline{w}$, this implies that the labor market is tight in the sense that there is no subsistence sector. Workers are on the short side of the market and the wage must rise to

[9]In contrast with Ghatak et al. (2007) there are no multiple equilibria here since firm level labour demand is constant at n. This implies that the intensive margin effect is absent and the labour demand is driven solely by the extensive margin effect.

equilibrate the demand and supply of workers. The number of entrepreneurs in such an economy is $\frac{1}{n+1}$. Whenever the wage increases, the proportion of entrepreneurs in the economy must stay constant at $\frac{1}{n+1}$. Even though the wage increase does not affect the relative proportions of the population engaged in the two sectors, it does affect the composition. In particular, the increase in wage will affect the average quality of the pool of entrepreneurs in the economy.

3 Credit Market Institutions

Now that we have fully characterized the equilibrium credit contracts and wage in the economy for every pair of institutional parameters τ and ϕ, we can turn the attention to the preferences and choices over such institutional parameters (stage 2 of the game). The simplest way to model stage 2 is to simply assume that each institutional parameter is chosen separately by *pure majority rule*, i.e., it must be such that there does not exist any other institution that would defeat it in a direct binary vote.[10]

We recall that the parameter τ captures the security of property rights. A high τ implies that law enforcement is poor and assets are likely to be stolen by thieves or taken over by the local strongman. Hence a straightforward way to think about τ is how tough government is on property related crime and how well it enforces the claims of someone dispossessed of their property. Alternatively, τ can also be thought of as how well the titling system works. A high τ would imply that it is easy to bribe the local bureaucrat to get the name on someone's land title changed.

The treatment of ϕ is somewhat different since it is the proportion of collateralized wealth that can be liquidated. If an agent pledges wealth a as collateral to become an entrepreneur, and his project fails, the bank only recovers ϕa due to payments to lawyers, etc. Hence $\phi < 1$ lowers the value of an agent's wealth as collateral and consequently there is a strong case for thinking that $\phi = 1$ will be the surplus maximising policy. However as we will see in Proposition 4, this effect may be dominated through the inefficiencies caused in the occupational choices since a high ϕ can end up making entrepreneurship attractive to low types.

We assume that there is no direct inefficiency from τ and ϕ. Here we think of expropriated property τa as simply a transfer from an agent to a thief or local strongman. Similarly $(1-\phi)a$ of the liquidated collateral is simply a transfer to lawyers and judges who facilitate the liquidation process. This is a plausible interpretation of our treatment of ϕ and τ. We do not explicitly model these thieves and lawyers although it would be quite easy to add a predatory non productive sector to the existing model. It is important to note however that this "no waste" treatment of ϕ and τ is not important. This assumption is useful only because it allows us to focus on the inefficiency caused by the effect of ϕ and τ on occupational choices in the second best world as we will see in section 3.2. There are two alternatives to this treatment. First, we could assume instead that

[10]See e.g. Persson and Tabellini (2000) for a simple text-book treatment of pure majority rule.

wealth that leaks away as a result of inefficient institutions is simply redistributed to all agents through lump sum transfers. This assumption creates the well understood incentive for a poor median voter to pick inefficient policies since she focuses on policies that increase redistribution rather than ones that are surplus maximising. Since adding this channel will strengthen our results somewhat misleadingly, we shut it down to focus on the inefficiency arising from the median voter distorting institutions for their effect through occupational choices on the equilibrium wage. Second, we could assume that there is a direct dead weight loss of wealth when it is expropriated or liquidated with some inefficiency. This merely changes the calculation of the total surplus without changing our results qualitatively.

We have focused only on institutional frictions involving wealth because wealth is the instrument that banks can use to mitigate the inefficiencies due to the unobservability of talent, and we want to show that the political process can fail to choose the right reforms even when there is no redistributive objective. The distinction between the two institutions is important as emphasized by the empirical analysis of Acemoglu and Johnson (2005). Also, they relate to two distinct aspects of property rights, namely, use rights and exchange rights.[11] However, in most applications one can think of, ϕ and τ would interact together creating aggregate transaction costs that would dampen the incentives for market transactions involving wealth. In our model, both enter multiplicatively when agents post their wealth as collateral to become entrepreneurs. The credit market takes into account both the insecurity of the property right over the collateral and the costs of enforcing the credit contract in case of default.

3.1 Institutions in the first-best World

We now show that in the first-best world the surplus maximising institutions are chosen.

Proposition 3. *When talent is observable, voters unanimously choose surplus maximising institutions, namely,* $\tau = 0$ *and* $\phi \in [0, 1]$*.*

Proof. Total surplus in the economy is maximized when the most talented agents become entrepreneurs regardless of their wealth. This is equivalent to the quality of the pool of entrepreneurs being maximised. Under the first best the total surplus in the economy is:

$$W_{fb} = q(R + M) + \mathbb{1}_{[q(n+1)<1]}\underline{w}(1 - q(n + 1)) \tag{7}$$

Note that $\mathbb{1}_{[q(n+1)<1]}$ is an indicator function that is switched on whenever there's a subsistence sector in the economy. This happens whenever the economy is talent poor, that is $q < \frac{1}{n+1}$.

[11] In Besley (1995) three channels through which property rights affects investment incentives are laid out. These are the security of tenure, the use of property as collateral, and the benefits of gains from trade (e.g., rental). Of these the first one is the channel through which τ would affect investment incentives whereas the second one is the channel through which ϕ would work. The third channel is affected by an interaction of τ and ϕ. Of course wealth in our model is exogenous and therefore the issue of investment incentives does not arise.

By inspecting this expression it is clear that the total surplus does not depend on the value of τ since expropriation of property is simply a transfer from the agents to the thieves. Hence all values τ are surplus maximising. Since all voting agents lose a part of their wealth as τ increases, it is at least weakly dominant for all agents to vote for $\tau = 0$ and this is unanimously chosen in any binary choice against any other value of τ. Similarly ϕ does not appear in (7) as there is no screening problem in the first best and collateral is unnecessary to secure a credit contract. Consequently all values of ϕ are surplus maximising. Since collateral is never posted in the first best agents are indifferent between any value of ϕ. □

When talent is observable, $\tau = 0$ is chosen because better property rights increase the expected payoff of all agents. Similarly the optimal ϕ would be chosen to the extent there are any contractual transactions involving wealth. Note that in the first-best in our model there are no contractual transactions involving wealth since talent is observable and wealth has no use as a screen. Hence all values of ϕ are optimal in the first-best world.[12]

3.2 Institutions in the second-best World

We have shown that in the first-best world the preferences of the electorate are unanimously aligned with surplus maximisation. We will show that as soon as there's a departure from the first-best, the inefficiency of the market gets further amplified by the choices of the electorate due to the preferences induced by the inefficient market. In the second-best world with unobservable talent, the total surplus is:

$$W_{sb} = (R+M)q(1-G(\underline{a})) + (\theta R + M)(1-q)\int_{\underline{a}}^{\overline{a}} \lambda(a)g(a)da \tag{8}$$

$$\mathbb{1}_{\left[(n+1)\int_{\underline{a}}^{\infty} q+(1-q)\lambda(a)g(a)da<1\right]}\underline{w}\left(1-(n+1)\int_{\underline{a}}^{\infty}\Big(q+(1-q)\lambda(a)\Big)g(a)da\right).$$

Note that $\mathbb{1}_{\left[(n+1)\int_{\underline{a}}^{\infty} q+(1-q)\lambda(a)g(a)da<1\right]}$ is an indicator function that is switched on when there's a subsistence sector in the economy. This happens when the mass of entrepreneurs is insufficient to soak up all the workers in the economy, that is $\int_{\underline{a}}^{\infty} q+(1-q)\lambda(a)g(a)da < \frac{1}{n+1}$.

In this economy there are two productive activities, the subsistence sector where a worker produces $\underline{w}$, and the modern sector where n workers and 1 entrepreneur generate a surplus $R+M$ if the entrepreneur has high ability and $\theta R + M$ if the entrepreneur has low ability. The wage paid to the worker in the modern sector is simply a transfer from the entrepreneur to the worker which doesn't enter the total surplus. In the world of full information, the first-best is guaranteed, where all high types become entrepreneurs and the rest become workers. It is possible that there is a

[12] In the extension of the model where the probability of success for a high type is less than one, $\phi = 1$ is optimal and is chosen by voters when talent is observable.

subsistence sector in the first-best world if the economy is talent poor. This is what the indicator function in equation (7) captures.

The dimension of heterogeneity that generates the class structure is wealth, which is observable and can be used as collateral but has no other productive use. However in our setting the two institutional frictions that we study, both have to do with impediments to hold on to or to transfer wealth. As expected, very poor agents are credit constrained independent of talent and have to be workers. Also, rich agents can post enough collateral so that the adverse selection problem is solved and so only those with talent above a certain level choose to be entrepreneurs. For agents with moderate levels of wealth, there isn't enough collateral to solve the adverse selection problem and so pooling contracts are offered such that low talent agents might become entrepreneurs, which would not be the case if they were either very rich or very poor. As a result we have both types of distortions: talented agents who become workers because they are poor, and non-talented agents who become entrepreneurs because they have some moderate level of wealth. Any change in the credit constraint $\underline{a}$ will affect the former and any change in proportion of low type who choose entrepreneurship $\lambda(a)$ will affect the latter. We state this formally in the following lemma .

Lemma 4. *A policy that decreases* $\underline{a}$ *or* $\lambda(a)$ *increases total surplus.*

Proof. First consider a policy that decreases $\underline{a}$. This will increase the access to entrepreneurship. There are two possible scenarios. First, the case when the wage stays constant at $\underline{w}$ as a result of the change. In this case note that agents who do not change their occupation remain unaffected since wage or the credit contract they receive remains unchanged. The low and high type agents who switch from being workers to being entrepreneurs as a result of being unconstrained must be better off by revealed preference since the wage stays unchanged. Second, consider the case when the wage increases as a result of increased labour demand. Note that the proportion of entrepreneurs in the population must stay constant at $\frac{1}{n+1}$ for wage to increase. In this case since high types who were previously entrepreneurs remain so, the change in composition of entrepreneurs must come from rich low types who are replaced by poor high and low types who were previously constrained. Consequently the increase in the proportion of high types in the pool of entrepreneurs increases the average quality of entrepreneurs in the economy thereby increasing total surplus.

Next, consider a policy that decreases $\lambda(a)$. This reduces the number of low type entrepreneurs at wealth level a. It is clear by assumption made in equation (1) that this increases total surplus. □

The first-best can be replicated in the world with incomplete information if all agents have sufficient wealth and can be offered a separating contract. Therefore if the average wealth in this economy is greater than the threshold level of wealth required for separation, a policy of redistribution can restore full efficiency in this economy. If the total level of wealth is insufficient or if the instruments for carrying out such a redistribution are unavailable, then there will always be some inefficiency, in the sense that there would be low types who choose entrepreneurship. Moreover when a credit constraint exists, there would also be high types that are forced to work for a wage.

Now the question is whether voters, if given the opportunity to do so with pure majority rule, choose the institutions that minimize the loss of total surplus due to the two types of mismatch of talent described above. Since redistributive instruments are lacking, it is possible that agents inefficiently use institutions to redistribute rather than to maximise surplus. Indeed such a choice of institutions is not inefficient in the Paretian sense.[13] What is interesting here however is that the alignment of interest groups is itself created by the existence of market failure and this alignment may take the economy away, in terms of total surplus, even from the second-best world with market failures. Hence the creation of political failure highlighted below lies in the fact that the total surplus is even lower when market failure is allowed to contaminate political outcomes through class formation.

The key to understanding why agents may choose non surplus maximising institutions is the following: in this economy there are always at least $\frac{n}{n+1}$ agents who expect to be workers under the status quo values of τ and ϕ. A policy of changing ϕ that increases wage enjoys their support which makes up at least half the population since $n \geq 1$.[14] This is because the payoff of agents who expect to be workers under the status quo institutions can only go up as a result of an increase in wage due to change in ϕ. To see this note that after the change in ϕ these agents either remain workers, in which case it is clear that their payoff increases, or they voluntarily switch to being entrepreneurs in which case their payoff must have increased by revealed preference since they could have continued to work at a higher wage. When these $\frac{n}{n+1}$ agents have little wealth, the same logic leads to a support for a change in τ that increases the wage. As long as any negative impact on their wealth is small compared with the increase in their wage, they will support the alternative τ to the status quo.

However, policies that increase the wage may not decrease the credit constraint $\underline{a}$ and the rich low type entrepreneurs $\lambda(a)$. As shown in Lemma 4, this would be at odds with surplus maximisation. This is the insight that we will use to generate the results in the rest of this section. Efficient institutions are those that decrease the credit constraint and the mass of low type entrepreneurs, and consequently increase the quality of the pool of entrepreneurs whereas institutions that increase wage are politically feasible. This is in sharp contrast to the first-best world without market failure where the choice of institutional reform does not affect wage and consequently institutions are chosen optimally.

[13] The political process (here simplified to a binary vote) is merely picking a point on the constrained pareto frontier, but the chosen institution may induce lower total surplus than the surplus maximising institution.

[14] In Propositions 5 and 4 we show how there is also an additional mass of agents that supports the policy such that the proportion of population in favour of the policy is always strictly greater than one half.

3.2.1 Support for improvement in judicial enforcement

The parameter ϕ in the model denotes the amount of collateral that banks can liquidate in case of default and is the parameter that denotes the quality of the judiciary.[15] Given the discussion on efficiency and political feasibility, we are ready to state the following proposition.

Proposition 4. *$\phi = 1$ is always selected by pure majority rule when talent is unobservable, but $\phi = 1$ may not be surplus maximising.*

Proof. An improvement in contractual institutions is captured by an increase of ϕ. We will first prove that a policy of increasing ϕ is guaranteed majority support. To see this note that the labour demand is weakly increasing in ϕ

$$\frac{\partial L_D}{\partial \phi} = (1+n)\left(-g(\underline{a})\frac{\partial \underline{a}}{\partial \phi}\left(q + (1-q)\lambda(\underline{a})\right) + (1-q)\int_{\underline{a}}^{\overline{a}} \frac{\partial \lambda(a)}{\partial \phi} g(a)da\right) > 0 \tag{9}$$

It is easy to see from equation (5) that the credit constraint is decreasing in ϕ. To see that $\frac{\partial \lambda(a)}{\partial \phi} > 0$ note that

$$\frac{\partial v_L(a, r_p(a), w)}{\partial \phi} = \frac{\partial v_L(a, r_p(a), w)}{\partial r_p(a)}\frac{\partial r_p(a)}{\partial \phi} > 0. \tag{10}$$

Since ϕ makes entrepreneurship more attractive by decreasing the interest rate $\lambda(a)$ must decrease to keep $v_L(a, r_p(a), w) = w$ satisfied. This shows that labour demand is increasing in ϕ. The wage is non decreasing in labour demand and hence $\frac{\partial w}{\partial \phi} \geq 0$ must be true. Workers that comprise at least one half of the population support a higher ϕ against a lower ϕ always, and this monotonicity guarantees that $\phi = 1$ is chosen at stage 2.[16]

We now show that the effect of an increase in ϕ on total surplus is ambiguous. Note that there are two conflicting effect of an increase in ϕ on total surplus:

$$\frac{\partial \underline{a}}{\partial \phi} < 0 \qquad \text{but} \qquad \frac{\partial \lambda(a)}{\partial \phi} > 0. \tag{11}$$

Lemma 4 shows how $\frac{\partial \underline{a}}{\partial \phi} < 0$ increases total surplus but $\frac{\partial \lambda(a)}{\partial \phi}$ decreases it. The net effect depends on which of the two dominates and is consequently ambiguous. □

We have shown that the equilibrium wage is non-decreasing in ϕ. This happens because workers and entrepreneurs are perfect complements and an increase in ϕ increases the supply of entrepreneurs, which increases the demand for labour. Since the equilibrium wage is increasing in

[15] Alternatively, the quality of the judiciary could be modelled as a combination of fixed and variable costs that need to be paid for seeking liquidation. In such a model the credit constraint would instead be determined by the zero profit condition $\theta_p(\underline{a})(R + (1-\tau)\phi a - f) + (1-\theta_p)((1-\tau)\phi a - f) = nw$ where f is the additional fixed cost. Adopting this formulation does not affect our results.

[16] Furthermore a positive measure of low types who are currently entrepreneurs in the semi-separating region also support this, since they switch to a higher payoff as workers as a consequence of the policy. Hence it is guaranteed supermajority support.

ϕ, a policy for improving contractual institutions enjoys majority support, and hence $\phi = 1$ is the only value of ϕ that cannot be defeated by another value of ϕ in a binary vote. However, total surplus may not be increasing in ϕ since the effect of an increase in ϕ on the quality of the pool of entrepreneurs is ambiguous.

To understand why $\phi = 1$ may not be optimal note that if the credit constraint worsens as a result of an increase in ϕ then the total surplus must decrease. Credit constraints can worsen if the effect of ϕ on the increase in the equilibrium wage through an increase in the low type entrepreneurs overwhelms the effect on the credit constraint. In this case the proportion of entrepreneurs in the population must stay constant at $\frac{1}{n+1}$ for the wage to have increased even though the credit constraint has worsened. If the credit constraint worsens there would be a positive measure of previously unconstrained high types who would now be forced out of entrepreneurship. Since they must be replaced by rich low types due to an increase in $\lambda(a)$, the average quality of the pool of entrepreneurs must decrease. In short when ϕ increases it is possible that rich low types who were previously workers are attracted to entrepreneurship. This can in turn increase the wage and crowd out some high types due to an increase in the credit constraint and this has a negative effect on total surplus.

This result is quite striking when contrasted against the standard intuition about contracting institutions. Here improving the quality of contracting institutions (increasing ϕ) is not always good since that makes entrepreneurship more attractive and this induces low types to become entrepreneurs. This result arises because there are inherent externalities when agents borrow money: the low type entrepreneurs by their very existence impose an externality on the high types.

3.2.2 Support for Improvement in Property Rights

Imperfect protection of property rights reduces the value of wealth. This in turn makes entrepreneurship more attractive since agents do not place as much weight on default and consequent loss of collateral. We show that the political support for a change in τ is ambiguous because the effect on the wage is ambiguous.

Proposition 5. *A policy of improving property rights institutions is always surplus maximising but may not be politically feasible.*

Proof. An improvement in property rights institutions is captured by a decrease in τ. We will first prove that the effect on a decrease in τ on wage is ambiguous and hence it may not enjoy majority support.

$$\frac{\partial L_D}{\partial \tau} = (1+n)\left(-g(\underline{a})\frac{\partial \underline{a}}{\partial \tau}\left(q + (1-q)\lambda(\underline{a})\right) + (1-q)\int_{\underline{a}}^{\overline{a}} \frac{\partial \lambda(a)}{\partial \tau} g(a)da\right). \tag{12}$$

The sign of this expression is indeterminate since it depends on the relative magnitude of $\frac{\partial \underline{a}}{\partial \tau} > 0$ and $\frac{\partial \lambda(a)}{\partial \tau} > 0$. It is easy to check that $\frac{\partial \underline{a}}{\partial \tau} > 0$. To see that $\frac{\partial \lambda(a)}{\partial \tau} > 0$, note that due to risk neutrality an increase in τ effectively works as a reduction in the expected wealth of an agent. Equation (30) in lemma 1 shows that $\frac{\partial v_L(a, r_p(a), w)}{\partial a} < 0$. As a result it must be true that $\frac{\partial \lambda(a)}{\partial \tau} > 0$ to keep $v_L(a, r_p(a), w) = w$ satisfied. This implies the effect of a decrease in τ on the labour demand and consequently on the wage is ambiguous. Hence a policy of reducing τ may not be supported by the majority.[17]

To see that decreasing τ is surplus maximising note that τ affects total surplus in two ways

$$\frac{\partial \underline{a}}{\partial \tau} > 0 \qquad \text{and} \qquad \frac{\partial \lambda(a)}{\partial \tau} > 0. \tag{13}$$

Lemma 4 shows how both these effects go towards reducing total surplus. Hence it is unambiguously surplus maximising to decrease τ.

□

Credit constraints are increasing in τ. When τ increases, the effective wealth of an agent decreases, and the interest rate at all levels of wealth increases. This is intuitive since an increase in τ decreases the value of wealth as a screen. Since agents are likely to have their wealth expropriated anyway, posting a high collateral is less effective in revealing an agent's type. Take the limiting case where τ goes close to one. In this case the credit market correctly anticipates that all agents are equally eager to post any collateral since they know that their wealth will be expropriated and hence don't attach any value on recovery of collateral in the event of success and consequent repayment of the loan.

There are two opposing effects on wage of a decrease in τ. Firstly decreasing τ reduces the level of credit constraint. This increases the number of entrepreneurs. Decreasing τ also decreases the attractiveness of entrepreneurship for marginal agents who are in the region where the semi-separating contract operates that is where $v_L(a, r_p(a), w) = w$. As a result of this, some low type entrepreneurs drop out and $\lambda(a)$ falls. The political feasibility of decreasing τ depends on the effect on the wage which depends on the magnitude of two opposing effects. However the effect on total surplus is unambiguous since decreasing τ allows more high types to become entrepreneurs and disincentivizes some low types from entrepreneurship.

The intuition for the differential impact of τ and ϕ on a low type entrepreneur's payoff is the following. As ϕ increases we can see from equation (3) that the interest rate an entrepreneur is offered decreases and consequently entrepreneurship becomes more attractive. On the other hand when τ decreases, there are two effects. First, as in the case of ϕ, there is a decrease in the interest rate making entrepreneurship more attractive. Second, decreasing τ increases an agent's effective wealth irrespective of occupational choice. This second effect makes entrepreneurship less

[17] This will be true when the median voter is poor enough to care primarily about the effect of τ on the wage. We will see some interesting comparative statics below.

attractive to rich low types since they prefer to become workers rather than risking the loss of their increased expected wealth in the event of project failure. It turns out that this second effect always dominates the first, and consequently decreasing τ induces some low types to drop out of entrepreneurship whereas increasing ϕ makes entrepreneurship more attractive for all agents. In a nutshell, leaving aside the general equilibrium effects that arise through changes in wage, an improvement in contractual institutions primarily benefits the entrepreneurs in the modern sector where credit is necessary and contractual institutions play a role, whereas improvement in property rights institutions increases an agent's effective wealth regardless of occupational choice inducing low types to drop out of entrepreneurship.

Propositions 4 and 5 seen together bring into sharp relief the trade-off between political feasibility and efficiency of institutional reform. Only reforms that increase wages are politically feasible but these may not correspond to reforms that are surplus maximising. While contractual institutions are politically feasible they may not be surplus maximising. On the other hand reform of property rights which is always surplus maximising may not be politically feasible.

3.3 Predicting Property Rights Reform

In this section we derive some results about how the possibility of property rights reforms varies with changes in the parameters. To do so we have to make assumptions about the distribution of wealth in the economy that has been left unspecified so far. In particular we analyse how the preferences of the median voter over property rights reforms change with changes in inequality when wealth is assumed to follow a discrete distribution with two wealth levels in the economy (section 3.3.1). We find that the effect of inequality depends on the ratio of appropriable and non-appropriable entrepreneurial returns. If this ratio is small, inequality can lead to inefficient reforms. Thereafter (section 3.3.2) we analyse how an exogenous change in the cost of borrowing arising, for instance as a consequence of a credit crisis, can affect the choice of τ when wealth is assumed to follow a Pareto distribution. We find that distortion of property rights will happen only if credit market imperfection leads to too much credit in equilibrium rather than when it leads too little credit through the creation of a credit constraint.

3.3.1 Inequality and Protection of Property Rights

In this section we consider how property rights chosen in a political equilibrium vary with changes in the level of inequality in the distribution of wealth. To pin down ideas we consider the case where the distribution of wealth is discrete. There are the rich with wealth a and the poor with wealth 0. The poor form a proportion p of the population where

$$\frac{1}{2} > 1 - p > \frac{1}{n+1}.$$

This parametric assumption implies that since more than half the agents are poor, the median voter will also be poor. The right hand side of the assumption implies that there are enough rich agents in the economy such that the labour market can be 'tight', that is, the wage must rise above $\underline{w}$ if all rich agents prefer entrepreneurship. Assume that $q < \frac{1}{n+1}$, which implies that the economy is talent-poor. Furthermore assume that $(q + (1-q)\theta)R < n\underline{w}$. This ensures that the poor are always credit constrained regardless of the value of τ.

The occupational choice condition for rich low types is

$$\theta(R - r(a)nw) + M - (1-\theta)(1-\tau)a = w. \tag{14}$$

From this equation it is clear that the poor who form the majority of the population would like to increase τ to induce rich low types into entrepreneurship since this will raise the equilibrium wage. The feasibility condition for the credit market to sanction loans to rich entrepreneurs is

$$\frac{(q + (1-q)\theta\lambda(w))R}{q + (1-q)\lambda(w)} + (1-\tau)\phi a \geq nw \tag{15}$$

where $\lambda(w)$ is the proportion of rich low types who are entrepreneurs. This equation gives us an upper bound to τ. The poor who are in the majority would want to vote for a τ low enough to satisfy this constraint so that the rich can still access entrepreneurship. Indeed this constraint will hold with an equality because if it doesn't, the poor can always increase the wage by lowering τ. Finally the labour market equilibrium is defined by

$$1 = (n+1)(1-p)(q + (1-q)\lambda(w)). \tag{16}$$

Equations (14), (15), and (16) jointly determine the proportion of rich low type entrepreneurs $\lambda(w)$, the equilibrium wage

$$w = \frac{\phi M + R(\theta + (1-\theta)(n+1)(1-p)q)}{n + \phi} \tag{17}$$

and the median voter's preferred τ which we call τ^*. This is

$$1 - \tau^* = \frac{nM - R(\theta + (1-\theta)(n+1)(1-p)q)}{a(n+\phi)}. \tag{18}$$

Note that τ^* is increasing in a, the wealth of the rich. Moreover we can see the appropriable and non-apropriable components of an entrepreneur's payoff have different effects on τ^*. As R increases, the feasibility condition for the credit market is relaxed and as a result the workers can distort τ further to capture some of the gains from high type entrepreneurs. On the other hand an increase in M has no impact on the feasibility condition in equation (15) since M is non-appropriable. Moreover, we can see from equation (17) that an increase in M directly translates into an increase in wage as more of the rich low types choose entrepreneurship and hence there is no need to distort τ. Finally as the productivity of the workers increases and fewer workers are required for each project, τ^* increases. This is because a fall in n relaxes the feasibility condition for the credit contract which allows the poor to increase τ^*.

Moreover we can see what happens as we increase a while keeping the mean wealth level $(1-p)a$ constant. We find that

$$\frac{\partial \tau^*}{\partial a}|_{(1-p)a} = \frac{nM - R\theta - 2R(1-\theta)(n+1)(1-p)q}{a^2(\phi+n)}. \tag{19}$$

The sign of this is not always positive and depends on whether $\frac{M}{R} > \frac{1}{n}\left(\theta + 2(1-\theta)(n+1)(1-p)q\right)$. This indicates that an effect of a change in inequality on τ depends on the ratio of M to R. If this ratio is low enough, an increase in inequality leads to a lower τ^*. On the other hand if the appropriable returns from entrepreneurship are relatively low compared to the non appropriable returns, an increase in inequality will lead to a higher τ^* being chosen. In a nutshell, this means that when the production technology is not that great (low R) wealth inequality hikes can hamper the ability of a polity to obtain good institutional reforms.

3.3.2 Credit Crisis and the Protection of Property Rights

In this section we explore what happens when there is an exogenous shock to to the supply of credit. So far we have assumed that the supply of credit is perfectly elastic at interest rate equal to one. We now assume that the supply is elastic at interest rate $\rho \geq 1$. This changes the zero profit condition for the pooling contracts described in equation (5) to

$$\underline{a} = \frac{\rho n w - R(q + (1-q)\theta)}{\phi(1-\tau)}. \tag{20}$$

Note that the credit constraint is increasing in ρ. This is intuitive since an exogenous increase in the cost of capital leads to more agents with low wealth being excluded from the credit market. Recall that with a general distribution of wealth the effect of τ on the wage is ambiguous. We now assume that wealth follows a Pareto distribution.

Proposition 6. *If wealth follows a Pareto distribution, the equilibrium wage is decreasing in τ if and only if the economy has a credit constraint.*

Proof: In the appendix.

This result shows that the effect of τ on wage depends on whether a credit constraint exists. In economies where credit is easily available and agents are not credit constrained there is an incentive to distort τ since this will not lead to poor high types being excluded from the market potentially driving down the wage. Indeed the distortion of τ only leads to more rich low types choosing entrepreneurship and this increases the wage.[18] If the median voter, who must be a worker, is poor enough she would prefer to increase τ to increase the wage. In this case there will be a distortion of τ leading to even more low type borrowers. On the other hand in economies with a credit constraint, increasing τ keeps more poor high types out of entrepreneurship and the effect this has on wage dominates the other effect arising through more rich low types being induced into entrepreneurship. To the extent an exogenous change in the cost of borrowing raises the cost of capital, for example, due to an international financial crisis, ρ will increase. This may create a credit constraint since a large enough increase in ρ will lead to $\underline{a} > \alpha$, where α is the parameter in the Pareto distribution that characterises its lower bound. Our model then predicts that this will in fact lead to an efficient reform in τ. This result arises due to the downward sloping density function of the Pareto distribution: the effect of the credit constraint always dominates since $g(\underline{a}) > g(\overline{a})$ and it indicates that we should expect inefficient distortion of τ in economies where credit market imperfection leads to too much lending in equilibrium. Conversely in economies where credit market imperfection leads to too little lending at least for some agents as a result of a credit constraint, we should expect efficient reforms of τ.

These results can be related to some of the lessons of the recent financial crisis. If a financial crisis leads to an increase in the cost of borrowing and makes it difficult to obtain credit, then the pressure and political support for improvements in property rights protection can lead to higher welfare. This is an example of the claim sometimes made that a deep crisis can be an "opportunity for otherwise unfeasible reforms".

4 Introducing More Policies

In this section we expand the set of policies that the electorate can vote on. This allows us to examine whether an increased set of fiscal instruments allows the electorate to escape the negative results derived in Proposition 5. In particular we allow the electorate a choice of the efficient value of τ coupled with a subsidy to workers financed through a tax on entrepreneurs. We show that such a bundle may not always be feasible and that the electorate could end up being stuck with an inefficient τ.

4.1 Talent Rich Economy

Consider a status quo with $\tau > 0$ that is supported by a majority when the option of voting on entrepreneurial tax t along with wage subsidy s was not available. We want to see if it is possible to induce the electorate to vote in favour of $\tau = 0$ by introducing a more efficient channel of compensation for the workers.

[18] Of course the distortion must not be severe enough to create a credit constraint since, as Proposition 6 shows, this would switch the effect of τ on wage from positive to negative.

The following proposition shows that when $q > \frac{1}{n+1}$, then a s exists such that agents vote for $\tau = 0$.

Proposition 7. *In a talent-rich economy, a welfare maximising, budget balanced t and s exists that would increase total surplus and would at the same time be supported by the majority.*

Proof. Consider a subsidy that makes a high type entrepreneur with an arbitrary wealth level indifferent between working for a wage and being an entrepreneur at interest rate 1:

$$v_H(a, 1, w) - t = w + s, \tag{21}$$

where $v_H(a, 1, w) \equiv R - nw + M$ is the net payoff from entrepreneurship for a high type with wealth a, who is offered a credit contract at interest rate equal to 1, and when the wage is w. Note that v_H is independent of wealth and $v_H(0, 1, w) > v_L(0, 1, w)$:

$$R - nw + M - t = w + s > \theta(R - nw) + M - t. \tag{22}$$

Since the attractiveness of entrepreneurship is decreasing in wealth for low types, it must be the case that all low types prefer working for a wage.

Consider the political economy problem. Denote the wage in status quo as $\hat{w}$. Note that all workers strictly prefer this policy to status quo since their payoff is $w + s = \overline{w} > \hat{w}$. Since a fraction $n/(n+1)$ are workers, and $n \geq 1$, the policy is guaranteed a majority support. In the status quo there is a positive measure of agents who are credit constrained. Hence there must be at least one high type agent who was previously credit constrained and worked for a wage and is an entrepreneur as a result of the policy intervention. This agent prefers the policy to status quo since his payoff after the intervention is $v_H(1, \overline{w}) = \overline{w} > \hat{w}$. Hence the policy is favoured by more than 50% of the population.

To see that this policy is budget balanced, note that in this economy there are n workers for each entrepreneurs. Hence $t = ns$ ensures budget balance. □

This condition guarantees that high types are indifferent between entrepreneurship and working for a wage. Note that since the high wage equilibrium is defined as $\overline{w} = v_H(1, \overline{w})$, in this case it can be checked that $w + s = \overline{w}$.

4.2 Talent Poor Economy

Recall that in a talent poor economy, with $(\frac{q}{1-q} < \frac{1}{n})$, the wage is $\underline{w}$ in the first-best. This is because only high types find it profitable to become entrepreneurs at the interest rate that satisfies the zero-profit condition. Since the number of high type agents is small relative to n, not all agents work in the modern sector, and consequently a subsistence sector exists. In the second-best world however, the wage can be greater than $\underline{w}$ due to the possibility of low type agents in the pool of entrepreneurs.

We will now show that it is possible for a suboptimal value of τ to be chosen even when there are other instruments present in the economy that could be put to redistributive ends by the electorate. To show this we construct an example of an economy where a vote on decreasing τ is defeated.

Assume there are two wealth classes, the rich with wealth a and the poor with wealth zero. Let the proportion of the rich be $\alpha > \frac{1}{n+1}$ and assume that $a > M - \underline{w}$. This ensures that when $\tau = 0$ rich low types prefer to be workers. Assume that $qR < n\underline{w}$ which ensures that the poor are always credit constrained. To simplify things further assume that low types possess no entrepreneurial talent, that is $\theta = 0$ and that the contractual institutions are perfect, that is $\phi = 1$. Furthermore, assume that

$$M \geq \underline{w} \geq M - n\underline{w}. \tag{23}$$

With the status quo $\tau > 0$ let us assume that rich low types prefer entrepreneurship. The interest rate at this wealth level will be define by the zero profit condition for the banks:

$$\frac{q}{q + (1-q)\lambda} r_p(a) n w + \frac{(1-q)\lambda}{q + (1-q)\lambda}(1-\tau)a = nw. \tag{24}$$

Since the rich low types prefer entrepreneurship, in equilibrium the wage must rise to keep the low types indifferent. Hence for the appropriate λ to arise the following must hold:

$$M - (1-\tau)a = w. \tag{25}$$

Now consider a proposal for improving property rights to $\tau = 0$ through a budget balanced tax on entrepreneurs and subsidy to workers. Budget balance implies $\alpha q t \geq (1 - \alpha q)s$. For workers to be indifferent to a policy that reduces their wage, the subsidy they receive must be high enough to offset the loss in their income. That is $s \geq w - \underline{w}$. Similarly the tax on entrepreneurs cannot exceed the increase in surplus they experience as a result of a decrease in τ. Hence $R - n\underline{w} + M + a \geq R - r_p(a)nw + M + (1-\tau)a$. Using these conditions along with budget balance we have

$$\alpha q \left(\frac{nw(q + (1-q)\lambda)}{q} - \frac{a(1-\tau)(1-q)\lambda}{q} + \tau a - n\underline{w} \right) \geq (1 - \alpha q) n (w - \underline{w}). \tag{26}$$

We are now ready to state:

Proposition 8. *When n is large enough it is impossible to construct a budget balanced tax and subsidy package that will enable the improvement of property rights institutions.*

Proof: In the appendix.

This result demonstrates that it is not possible to always avoid a choice of inefficient institution by constructing a budget balanced package of wage subsidy and entrepreneurial tax. The reason for this is that part of the efficiency gains from a reduction in τ go to rich low types who were previously entrepreneurs. Since these agents switch their occupation in response to a decrease in τ they are not subject to the entrepreneurial tax. The revenues generated from t come only from rich high types since they continue to be entrepreneurs.

This proposition acts as a robustness check to our results. It shows that a simple package of tax and subsidy that is conditioned on occupational choices is insufficient to avoid the inefficiency of Proposition 5. To get around our inefficiency results the state would need a richer set of instruments. In particular it would need the capacity to condition its policies on not only the occupational choice but also the wealth level of an agent.

5 Conclusion

To summarise our result on institutional efficiency and feasibility, we find that improving contractual institutions is always feasible but may not always be efficient, since it induces too many low type agents to choose entrepreneurship. On the other hand, we find that improving property right protection institutions increase total surplus but may not always be politically feasible. These results are consistent with Acemoglu and Johnson (2005), who find that property rights institutions have a strong positive impact on the economic outcomes whereas the impact of contractual institutions is less obvious. Moreover our result show why even when the welfare properties of these institutions are well known we may not expect the best policies to be chosen.

When there's a market failure, the competitive equilibrium is no longer guaranteed to be on the (unconstrained) Pareto frontier. Our model makes the point that in the event of a market failure, competitive markets can passively play a political role of creating constituencies. These constituencies can have a preference for inefficient policies. This leads to the inefficiencies of market failure being further amplified by the policy choices that constituencies created in a flawed market make. In this sense our paper provides an additional reason to worry about market failure: market failure may lead to a political failure even in a fully representative democracy. Moreover, we have shown by example that wealth inequality hikes and lower productivity can exacerbate this political failure effect, while tightening of credit may cause efficient reforms to become feasible.

Finally, the last propositions of the paper highlight the possibility that the feedback effects we uncover between market and political failures generate a kind of "poverty trap", in the sense that it is only in talent rich economies that the introduction of transfers or bundling of policies can eliminate the possibility of a democratic endogenous choice of bad property right protection laws.

Appendix

Lemma 1.
$$\frac{\partial \lambda(a)}{\partial a} \leq 0 \tag{27}$$

Proof. $\lambda(a)$ is jointly determined by the zero profit condition for the banks

$$\left(\frac{q+(1-q)\theta\lambda(a)}{q+(1-q)\lambda(a)}\right) r_p(a)nw + \left(\frac{(1-q)(1-\theta)\lambda(a)}{q+(1-q)\lambda(a)}\right)\phi(1-\tau)a = nw \tag{28}$$

and the occupational choice condition for low types. In particular $\lambda(a) = 1$ when $v_L(a, r_p(a), w) > w$ since low types strictly prefer entrepreneurship, $\lambda(a) = 0$ for $v_L(a, r_p(a), w) < w$ since low types strictly prefer working for a wage. In these regions $\frac{\partial\lambda(a)}{\partial a} = 0$. Lastly $\lambda(a) \in [0, 1]$ when $v_L(a, r_p(a), w) = w$ since low types randomise when indifferent. In this region substituting the interest rate $r_p(a)$ using equation (28) into $v_L(a, r_p(a), w)$ we find

$$v_L(a, r_p(a), w) = \theta R - \frac{q+(1-q)\lambda}{q+(1-q)\theta\lambda} nw - (1-\tau)(1-\theta)a\left(1 - \frac{(1-q)\lambda\phi}{q+(1-q)\theta\lambda}\right) + M. \tag{29}$$

This allows us to check that
$$\frac{\partial v_L(a, r_p(a), w)}{\partial a} < 0. \tag{30}$$

Finally since
$$\frac{\partial v_L(a, r_p(a), w)}{\partial \lambda} = \frac{\partial v_L(a, r_p(a), w)}{\partial r_p(a)} \frac{\partial r_p(a)}{\partial \lambda} < 0 \tag{31}$$

λ must decrease as wealth increases for $v_L(a, r_p(a), w) = w$ such that an equilibrium can exist. $\square$

Lemma 2. *Only agents with wealth $a \geq \overline{a}$ are offered a separating contract and this contract is defined by the collateral - interest rate pair $(\overline{a}, 1)$.*

Proof. First note that $\overline{a}$ is the collateral requirement such that low types with this wealth are unwilling to become entrepreneurs even at interest rate of one. That is

$$\theta(R - nw) + M - (1-\tau)(1-\theta)\overline{a} = w. \tag{32}$$

Rearranging this we get equation (6). Hence high types can be offered the contract $(\overline{a}, 1)$ and this will make zero profits. To see that this is unique assume a contract $(\overline{a}, r')$ exists that dominates $(\overline{a}, 1)$. For this to be true, $r' < 1$ must be true since at a given wealth level the contract with the lowest interest rate dominates. The bank that offers this contract makes losses since the opportunity cost of capital is 1, and hence, this contract will not be offered. But this is a contradiction. This proves that the separating contract $(\overline{a}, 1)$ is viable and unique for wealth $a \geq \overline{a}$.

We will now argue that separating contracts are dominated for wealth $a < \overline{a}$ and will therefore not exist in equilibrium. To see this note that at wealth a the contract $(r_p(a), a)$ makes use of the entire wealth as collateral. A separating contract (r', a) for $r' < r_p(a)$ will make losses since $r_p(a)$ is already a zero profit interest rate. A separating contract (r', a) for $r' > r_p(a)$ will be dominated by the contract $(r_p(a), a)$. This rules out a separating contract with collateral requirement a. Finally a separating contract with a collateral requirement $a' < a$ for agent with wealth a will not be incentive compatible since for any interest rate it would be more attractive for low types if it is attractive for high types. Hence no separation is possible for wealth $a < \overline{a}$. □

Proof of Proposition 1. Since $\overline{a}$ is assumed to be greater than $\underline{a}$, the proof follows from lemma 1, and 2. □

Lemma 3. *A pooling contract exists if and only if* $v_L(\underline{a}(\lambda = 1), r_p(\underline{a}(\lambda = 1)), w) \geq w$.

Proof. If $v_L(\underline{a}(\lambda = 1), r_p(\underline{a}(\lambda = 1)), w) > w$ then low types prefer entrepreneurship with a pooling contract. Since $\underline{a}(\lambda = 1)$ is defined in a way that ensures banks break even with a pooling contract, this contract is viable. Banks cannot offer a semi-separating contract here since it is not incentive compatible as $v_L(\underline{a}(\lambda = 1), r_p(\underline{a}(\lambda = 1), w) > w$.

Now we show that if a pooling contract exists in equilibrium it must be the case that $v_L(\underline{a}(\lambda = 1), r_p(\underline{a}(\lambda = 1)), w) > w$. To see this let us consider whether $\exists a' \neq \underline{a}(\lambda = 1)$ such that a pooling contract is feasible for banks and attractive for agents. First note that $a' < \underline{a}$ is not feasible for banks since this would imply negative profits. Next note that $\frac{\partial v_L(a, r_p(a), w)}{\partial a} < 0$. This implies that if $v_L(\underline{a}(\lambda = 1), r_p(\underline{a}(\lambda = 1)), w) < w$ then $v_L(a', r_p(a), w) < w$ must also be true. Hence a pooling contract will not exist in equilibrium.

The condition on parameters that corresponds to $v_L(\underline{a}(\lambda = 1), r_p(\underline{a}(\lambda = 1)), w) \geq w$ is

$$R(q + (1 - q)\theta) - nw + \phi M \geq w. \tag{33}$$

□

Proof of Proposition 2. The Labour markets are assumed to be perfectly competitive. Labour supply is 0 for wage lower than $\underline{w}$ and 1 for any wage $w \geq \underline{w}$. Labour demand is given by:

$$(1 + n)\left(q(1 - G(\underline{a})) + (1 - q)\int_{\underline{a}}^{\overline{a}} \lambda(a)g(a)da\right). \tag{34}$$

First we will see that the labour demand is monotonically decreasing in the wage.

$$\frac{\partial L_D}{\partial w} = (1 + n)\left(-g(\underline{a})\frac{\partial \underline{a}}{\partial w}(q + (1 - q)\lambda(\underline{a})) + (1 - q)\int_{\underline{a}}^{\overline{a}} \frac{\partial \lambda(a)}{\partial w} g(a)da\right) < 0. \tag{35}$$

This is true since

$$\frac{\partial \underline{a}}{\partial w} < 0 \qquad \text{and} \qquad \frac{\partial \lambda(a)}{\partial w} < 0. \tag{36}$$

This implies that there's a unique $w \geq \underline{w}$ that clears the market. Wage w is bounded from above by $\overline{w} = \frac{R+M}{n+1}$ since even high types would exit entrepreneurship if wages rise above this. If $w = \overline{w}$ then high types must randomise between entrepreneurship and working for a wage with probability $p = \dfrac{1}{q(n+1)}$.

This is true because $w = \overline{w}$ implies that $q \geq \frac{1}{n+1}$. To see this note two things:

1. Define $v_H(1, w)$ as the value from entrepreneurship that a high type agent gets when the interest rate the bank charges him is 1. It is easy to see that this is independent of his wealth. By definition: $\overline{w} = v_H(1, \overline{w})$. Since $v_H(1, w) > v_L(1, w)$, $\overline{w} > v_L(1, \overline{w})$. This implies that in an economy where the wage is $\overline{w}$ there are no low type entrepreneurs.

2. Note that when $w > \underline{w}$ none of the agents are engaged in the subsistence sector and hence $\frac{1}{n+1}$ are entrepreneurs This is true because in this economy the capacity for entrepreneurship is limited by the size of the population due to the perfect complements production function. When none of the agents are engaged in the subsistence sector ($w > \underline{w}$), only $\frac{1}{n+1}$ will be entrepreneurs and $\frac{n}{n+1}$ will be workers (the population is normalised to 1).

1 and 2 imply that $q \geq \frac{1}{n+1}$. If high types randomise and become entrepreneurs with probability p, since the number of agent in the economy is infinite, by law of large numbers, there will be pq entrepreneurs and $(1-p)q + (1-q)$ workers in the economy. It is easy to see that this yields $\frac{1}{n+1}$ entrepreneurs and $\frac{n}{n+1}$ workers.

Hence a unique $w \in [\underline{w}, \overline{w}]$ exists that clears the market. □

Proof of Proposition 6. Assume that wealth follows a Pareto distribution such that

$$G(a) = 1 - \left(\frac{\alpha}{a}\right)^{\beta} \tag{37}$$

where $\alpha > 0$ is the lower bound of the distribution and $\beta > 0$ is the shape parameter. Recall that the labour demand is

$$(1+n)\left(q(1 - G(\underline{a})) + (1-q)\int_{\underline{a}}^{\overline{a}} \lambda(a)g(a)da\right). \tag{38}$$

We will first analyse sufficiency of $\underline{a} > \alpha$ for the effect of τ on wage to be negative. Since $\lambda(a) \in [0, 1]$, the labour demand is at its highest if $\lambda(a) = 1$. This simplifies the labour demand to

$$L_D = (n+1)\Big(q(1 - G(\underline{a})) + (1-q)(G(\overline{a}) - G(\underline{a}))\Big) \tag{39}$$

$$= (n+1)(q - G(\underline{a}) + (1-q)G(\overline{a})). \tag{40}$$

Substituting for $G(a)$ using the Pareto distribution we find

$$L_D = (n+1)\left(\left(\frac{\alpha}{\underline{a}}\right)^{\beta} - (1-q)\left(\frac{\alpha}{\overline{a}}\right)^{\beta}\right). \tag{41}$$

Taking the derivative with respect to τ

$$\frac{\partial L_D}{\partial \tau} = \frac{\beta(n+1)}{1-\tau}\left(-\left(\frac{\alpha}{\underline{a}}\right)^{\beta} + (1-q)\left(\frac{\alpha}{\overline{a}}\right)^{\beta}\right) < 0. \tag{42}$$

This expression holds since we assume that $\underline{a} < \overline{a}$.

This shows that even when $\lambda(a)$ takes the maximum possible values, the effect of τ through the second term in equation (38) is still dominated by the effect on the first term.

Now we show the necessity of the existence of credit constraint for the effect of τ on wage to be negative. Consider the case where $\underline{a} \leq \alpha$. The labour demand simplifies to

$$L_D = (n+1)\left(q + (1-q)\int_{\alpha}^{\overline{a}} \lambda(a)g(a)da\right). \tag{43}$$

Now since $\lambda(\overline{a}) = 0$ and $\lambda(\alpha) = 1$ we can see that

$$\frac{\partial L_D}{\partial \tau} = (n+1)(1-q)\int_{\alpha}^{\overline{a}} \frac{\partial \lambda(a)}{\partial \tau} g(a)da. \tag{44}$$

This is positive since $\frac{\partial \lambda(a)}{\partial \tau} > 0$. □

Proof of Proposition 8. Simplifying equation (26) we have

$$\alpha q a \geq (w - \underline{w})(1 - \alpha q(n+1)) + \alpha(M - w)(q + (1-q)\lambda) - \alpha(1-q)\lambda n w. \tag{45}$$

Since we are concerned with a talent poor economy with $q < \frac{1}{n+1}$, we can rewrite $q = \frac{\beta}{n+1}$, where $\beta \in (0,1)$. Similarly we can rewrite $\alpha = \frac{A}{n+1}$ for $A > 1$. Substituting this into equation (45) we have

$$\beta a + (1-\beta)M \geq (w - \underline{w})\frac{1}{A}\left(1 + \frac{1}{n}\right)(n + 1 - A\beta) + a(1-\tau)\left(\frac{1}{n} + 1 - \beta\right). \tag{46}$$

It is possible to see that the first term on the right hand side is unbounded in n whereas the rest of the equation converges to a constant as $n \to \infty$. Hence the equation will not hold for an n that is large enough. □

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