Credit market frictions and political failure

Madhav S. Aney, Maitreesh Ghatak, and Massimo Morelli *

October 3, 2015

Abstract

We study how an excessively favorable regulatory environment for banks could arise even with a perfectly competitive credit market in a median voter world. In our occupational choice model with heterogeneous wealth endowments, market failure due to unobservability of entrepreneurial talent endogenously creates a misalignment between surplus maximizing reforms and reforms that are preferred by the median voter, who is a worker. This is in contrast to the world without market failure where the electorate unanimously vote in favor of surplus maximizing institutional reforms. This paper illustrates how market failure could lead to political failure even in the benchmark political system that is free from capture by interest groups.

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

JEL Classification numbers: D72, D82, O16

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 (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 maximizing 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, Patrick Bolton, Ethan Bueno de Mesquita, Leonardo Felli, Greg Fischer, Mike Golosov, Matias Iaryczower, Ethan Ilzetzki, Ben Jones, James Peck, Torsten Persson, Miltos Makris, François Maniquet, Tomas Sjöström, Daniele Terlizzese and many participants at many workshops 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 maximizing policies.[3]

In our model, in the first best world with well-functioning markets, the electorate unanimously chooses institutions that maximize 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. A notable feature of our model of the credit market is the coexistence of two types of distortions that are typically studied in isolation in the context of asymmetric information-based models of the credit market, namely the Rothschild and Stiglitz (1976) and the de Meza and Webb (1987) type distortions. Some high ability agents who would be entrepreneurs in a full-information world end up becoming workers as they are credit rationed by not having enough collateral, while some low ability agents who would be workers in a full-information world, become entrepreneurs as they are cross-subsidized by some high ability entrepreneurs. We show that this leads to creation of a class structure in the economy, with preferences that are aligned in ways that defeat surplus maximizing reforms, even though markets are competitive and no group earns economic rents.

The government can decide to propose reforms on two different dimensions of the economy: on the one hand, the government can focus on reducing the institutional frictions that affect security of property rights for the whole economy, i.e., reforms that treat banks at the same level as families and firms. On the other hand, the government can propose reforms targeted to help the financial sector: in particular, a reform of this kind could reduce institutional frictions affecting banks, allowing each bank to effectively recover a larger fraction of the assets that borrowers have pledged as collateral for loans, hence encouraging an expansion of credit.

The simple mechanism at work is as follows: policies in our model are chosen by the median voter, who is typically a worker; hence the criterion for a policy reform to pass must have to do with its effect on wages. Therefore, even without invoking powerful interest groups, the simple fact that the median voter is typically a supplier of labor implies that governments, of all kinds, policy or office motivated, support reforms aimed at making liquidation easier for banks, because that raises labor demand and wages. However, as we show, this is not always necessarily welfare enhancing, because excessive liquidation can reduce the quality of the pool of endogenous entrepreneurs too much, as rich low types may crowd out some poor high types.

On the other hand, if the government tried to propose the more general reforms aimed at improving property rights, these are always welfare enhancing because it makes wealth more effective

[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).

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. As a result, under some conditions these reform proposals would be blocked by the median voter. This is the main message of this paper - surplus maximizing policies may not be politically feasible while politically feasible policies may not be surplus maximizing due to the effect of information asymmetries in the financial sector.

In summary, our model is the first simple median voter model of banking regulation favoritism. Hence the model can help understand what happened before the global financial crisis – the introduction of excessively favorable environment for banks as a result of median voter preferences.[4] More generally, the model serves also as a clean example about how market failure can feed political failure. Of course in the real world the political failures causing an inability to reform the economic system 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 maximizing reforms.

As a side result, we show that in underdeveloped economies where wealth and talent are scarce, the redistributive policies that could correct market failure and achieve the first best in talent rich economies or wealthy economies are not feasible. This suggests that when reforms are subject to democratic implementation constraints, the political feasibility of surplus maximizing reforms goes up with the level of development.

The paper is organized as follows. After analyzing the relationship with the literature, in section 1 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 2 we analyse the political economy behind the choice of credit market institutions. In section 2.3 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. Section 3 looks at a wider range of policy choices to test the robustness of our results. Section 4 concludes.

Relationship with the literature

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

[4]The great attention given to helping banks even after the crisis is related in spirit to the model and the motivation for it, but we do not model bail-out favoritism per se.

[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.

from other models of endogenous institutions in that the heterogeneity which causes households 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 channel. The latter could turn out to be more persistent since unlike the solutions to market failures which are easier to characterize[6], the solutions to political failure may be more intractable. 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.

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 labor 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 maximizing reforms not being chosen. A recent paper that is related to ours is Jaimovich 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 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 many models discussed in the above paragraph 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 contrast, in our model, the problem in the political domain is endogenized 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

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

problem. Once the adverse selection problem is removed, the constituencies created in the second best world also disappear, and the electorate unanimously favours surplus maximizing policies.

1 Model

1.1 Technology, preferences, and endowments

The basic setup for the description of an economy is based on Ghatak, Morelli, and Sjostrom (2007). There are two technologies in the economy: a subsistence technology that yields $\underline{w}$ with certainty for one unit of labor and a more productive "modern" technology that yields a return R in case of success and 0 in case of failure. The latter requires n workers and 1 entrepreneur to run it. The modern technology also yields a non-appropriable benefit M (not appropriable by others) to the entrepreneur. 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 labor effort, the disutility of entrepreneurial effort being normalized to zero.

The economy is populated with measure one of risk neutral agents. Agents are endowed with one unit of labor, entrepreneurial talent and illiquid wealth. We assume that wealth and talent are independently distributed. 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 is binary. There are a proportion q of agents who succeed with probability one and a proportion $1-q$ of agents who succeed with probability θ which is less than one.[7] We refer to these two types of agents as "high" and "low" types. Agents are also endowed with illiquid wealth a that is distributed in the population with density $g(a)$. To fix ideas we can think of wealth here as the value of an agent's house or land. Agents need to borrow from the credit market to become entrepreneurs. This is because workers are paid up-front irrespective of whether the project succeeds or fails later.

1.2 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 appropriable whereas M, being a private benefit, is not appropriable. As will be clear in section 1.5, wealth is used in the credit market to screen agents when talent is unobservable.

In addition to asymmetric information about entrepreneurial quality, now we introduce two institutional frictions. The first relates to the quality of property rights and affects the value

[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.

of wealth of all agents - agents with wealth a only receive an expected payoff of $(1-\tau)a$ from holding their wealth. This could reflect insecure property rights (with τ being the probability that the owner loses the property) or the legal and institutional frictions that make it costly to hold property (with τ being a proportional measure of these transaction costs). The second is specific to the credit market and affects the ease with which collateral can be transferred from a borrower who is unable to repay the loan to the bank: when a borrower who posts wealth a as collateral defaults, banks only recover a fraction $\phi \in [0,1]$ of that asset. An increase in ϕ increases the degree to which collateral can be liquidated, e.g., how easy it is to foreclose on a mortgaged property.

We treat τ and ϕ symmetrically and independently. Both τ and ϕ are deadweight losses, with no redistributive component (one agent's or bank's loss is not another agent's or borrower's gain), and both occur independently - if a is pledged as collateral then $a(1-\tau)\phi$ is the expected collateral value to the bank. To make our argument in a particularly stark way, we assume that it is costless to choose any value of τ or ϕ. In particular, as it is possible to choose $\tau = 0$ and $\phi = 1$ at no direct resource cost, and no one *directly* gains from having these frictions, it becomes interesting to study why voters may choose other values of τ and ϕ due to their indirect effect on the credit and labor markets. We return to a further discussion of these parameters in section 2.

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 up to the illiquid asset a. In other words agents are guaranteed a non negative payoff in all states of the world.

We 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 explore 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.

1.3 Occupational choice

Agents 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 up-front[8], where $w \geq \underline{w}$ since all agents have the option

[8]The assumption that workers are paid regardless of project success is a simplifying one. Allowing entrepreneurs to choose between paying a wage at the start or a wage conditional on project returns would add a signaling element to the model where workers update their belief about an entrepreneur's type based on the wage offer made. In such

of working with the subsistence technology.

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 2.2 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 $\frac{1}{n+1}$ firms, and hence, $\frac{n}{n+1} \geq \frac{1}{2}$ workers in equilibrium.

Our model features the interaction of two markets, labor and credit. The need for credit arises as workers need to be paid up-front when an entrepreneurial project is set up and the wealth of agents is illiquid. Both markets are assumed to be perfectly competitive.

The payoff of an agent who works for a wage is $w + (1 - \tau)a$ regardless of type. Her payoff if she chooses entrepreneurship depends on the kind of credit contract she accepts.

1.4 Timing

The timing of the model is as follows:

1. An agent's wealth and entrepreneurial type are realised.
2. Agents vote on institutional reform (i.e., a direct vote on τ and ϕ).
3. Agents make occupational choices.
4. Output is realised, and expropriation of property and liquidation of collateral takes place.
5. Final payoffs are realised and consumption takes place.

The model is solved backwards. We start with stage 3 where agents make their occupational choices and show in Proposition 2 that there exists a unique equilibrium. Then we derive comparative statics of the equilibrium payoff 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 2 we show how stage 2 plays out both in the world with complete and incomplete information. Next we see what kind of credit contracts are offered.

1.5 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 up-front irrespective of whether the project succeeds or

a model, the equilibrium derived here would be still preserved because high types succeed with a higher probability than low types, and consequently high types prefer to offer a wage at the start of the enterprise rather than a higher wage in the event of success to offset the low wage in case of failure.

fails later. 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.

1.5.1 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 maximizing. 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 $\overline{w} = \frac{R+M}{n+1}$. Otherwise, the equilibrium wage would be $\underline{w}$. This is because the wage is determined by whoever is on the short side of the market. We assume $R > nM$ for the appropriable returns from the project to be large enough to cover the wage payment when the wage is $\overline{w}$. 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 $\frac{q}{1-q} \geq \frac{1}{n}$ and $\underline{w}$ otherwise.*

1.5.2 Second best

The second best world is characterized by the unobservability of entrepreneurial talent. Due to the unobservability of talent, the credit market screens agents based on wealth since contracts can no longer be based on an agent's talent. Since only the output and wealth of an agent are observable the banks are constrained to rely only on two variables. Note that the principal along with the interest can be repaid 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. 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 characterize the equilibrium in the credit and labor market.

1.5.2.1 Pooling and semi-separating credit contracts. The banks can screen agents based on collateral. Consider an agent with wealth a. There are two states of the world ex post – either the project succeeds or fails. Let the wealth that banks take over in the state of failure and success be $\hat{a}_f$ and $\hat{a}_s$, respectively. Feasibility imposes the restriction that $\hat{a}_f, \hat{a}_s \in [0, a]$. In the success state, the banks may also charge interest $r_p(a)$. In case of failure, there is no interest since there are no appropriable returns from the project.

A high type succeeds with a higher probability and hence, relative to low type, prefers a contract that is tougher in the bad state ($\hat{a}_f$ as high as possible) and yields a high payoff in the good state ($\hat{a}_s$ as low as possible). From assumption (1) we know that low types will never accept an actuarially fair contract and hence it is unprofitable to lend to them. This implies that at least as long as low types are in the pool of borrowers, which they will be in a pooling or a semi-separating equilibrium, banks will offer contracts where $\hat{a}_f = a$.

1.5.2.1.1 Non-negative net appropriable returns Let us first consider the range of wealth such that $R \geq r_p(a)nw$ where the net appropriable returns are large enough to repay the loan with interest even when we set $\hat{a}_s = 0$. For the contract to make non-negative profits, the interest rate $r_p(a)$ must satisfy the following condition

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

where

$$\theta_p(a) = \frac{q + \theta(1 - q)\lambda(a)}{q + (1 - q)\lambda(a)} \tag{3}$$

is the average talent in the pool of entrepreneurs at wealth level a. This average talent in the pool at a given wealth level is endogenously determined by the demand for credit by low types at that level of wealth. 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 $0 < \lambda(a) < 1$. Notice that $\theta_p(a)$ is decreasing in $\lambda(a)$ because $\theta < 1$. This is what we would expect: the greater the fraction of low types in the pool, the lower is average quality of the pool.

We can solve for $\lambda(a)$ explicitly by simultaneously solving (2) and (3). 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

$$r_p(a) = \frac{nw - (1 - \theta_p(a))(1 - \tau)\phi a}{\theta_p(a)nw}, \tag{4}$$

which is decreasing as frictions affecting the credit market decrease (ϕ goes up). This is because increasing the proportion of collateral that can be liquidated allows banks to break even at a lower interest rate. Similarly, the interest rate decreases as the protection of property rights improves (τ goes down).

With this credit contract the payoff of low type entrepreneurs is

$$\theta(R - r_p(a)nw) + \theta(1 - \tau)a + M \tag{5}$$

whereas that of a high type entrepreneur is

$$R - r_p(a)nw + (1-\tau)a + M. \tag{6}$$

1.5.2.1.2 Negative net appropriable returns Now let us consider the zero profit condition for banks when $R < r_p(a)nw$ for $r_p(a)$ as defined in equation (4). 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 in the good state for them to break even and consequently $\hat{a}_s > 0$. The zero profit contract is now defined by

$$\theta_p(a)(R + (1-\gamma(a))(1-\tau)\phi a) + (1-\theta_p(a))(1-\tau)\phi a = nw \tag{7}$$

where $\hat{a}_s = (1-\gamma(a))a$ is expressed as the proportion of collateral that is taken over by the bank in case the project succeeds.[9]

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 $\gamma(a)$, which is the proportion of wealth successful entrepreneurs retain, is decreasing 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.

With this credit contract the payoff of a low type entrepreneur is

$$\theta\gamma(a)(1-\tau)a + M \tag{8}$$

and that of the high type entrepreneur is

$$\gamma(a)(1-\tau)a + M. \tag{9}$$

Setting $\gamma(a) = 0$ in (7) it follows that this credit contract can only be offered when

$$\theta_p(a)R + (1-\tau)\phi a \geq nw. \tag{10}$$

[9] Admittedly, collecting a part of wealth when the project succeeds does not fit with the usual notion of collateral. We could alternatively assume that the bank demands a certain amount of wealth transfer ex ante, independent of the outcome of the project, and then demands the remaining amount as collateral, in case the project fails. So long as the transfers from borrowers to banks are subject to the institutional friction (captured by $\phi < 1$) whether these are collected before or after the project is carried out, and so long as wealth is subject to imperfect property rights (captured by $\tau > 0$) irrespective of whether the borrower or the bank has a claim to it, our results will be unaffected.

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:

$$\underline{a} = \frac{nw - \theta_p(\underline{a})R}{\phi(1-\tau)}. \tag{11}$$

Lemma 1 in the appendix shows that $\lambda(a)$ is decreasing in a for $a \geq \underline{a}$.

We can see that an increase in ϕ or a decrease in τ would both decrease $\underline{a}$, as it would enhance the collateral value of a given amount of wealth. For future reference, when we analyze choice of policy, we will treat $\underline{a}$ as a function of ϕ and τ as defined by the above expression, and denote it by $\underline{a}(\phi, \tau)$.

1.5.2.2 Separating credit contracts. Let us now consider the separating contracts that can be offered to the agents. In a separating contract there is no cross subsidy from high to low types. Given assumption (1) low types will never accept a separating contract as their payoff from entrepreneurship is lower than what they receive working in the subsistence sector. Let the separating interest rate that banks offer at wealth a be $r_s(a)$. 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 since the credit market is perfectly competitive. From the right hand side of assumption (1) it should be clear that no separating credit contract will be accepted by low types with wealth large enough to allow for separation.

A separating contract is only viable when agents have sufficient wealth. We define this wealth level as $\overline{a}$ where

$$\overline{a} = \frac{\theta(R - nw) + M - w}{(1-\tau)(1-\theta)}. \tag{12}$$

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. Hence the separating contract specifies that a borrower repays nw when the project succeeds and that collateral $\hat{a}_f = \overline{a}$ is taken over by the bank in case of failure. The payoff of a high type entrepreneur with a separating contract is

$$R - nw + (1-\tau)a + M. \tag{13}$$

1.6 Equilibrium

In the previous subsection we have discussed the types of credit contracts that can exist in the economy. We will now characterize the equilibrium wage and credit contracts. We will use the

Rothschild and Stiglitz (1976) equilibrium concept to characterize the credit market equilibrium. This is also used in Ghatak, Morelli, and Sjostrom (2007) and is standard in this literature. An equilibrium is characterized 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. If this does not hold, low type agents will not be attracted to entrepreneurship.

We are ready to characterize the equilibrium. For what follows we assume that $\underline{a}$ from (11) evaluated at $\underline{w}$ is strictly positive. In other words, credit constraints are binding in equilibrium. Note that for this to happen we need

$$M > \underline{w} \qquad \text{and} \qquad n\underline{w} > (q + (1-q)\theta)R \tag{14}$$

and the support of the wealth distribution $g(a)$ to include zero.

Proposition 1 (Occupational choice)**.** *All 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 $\lambda(a) \in [0,1]$. Among agents with wealth $a \geq \overline{a}$, those with high talent become entrepreneurs and the rest become workers.*

Proof. In the appendix. □

The labor market is assumed to be perfectly competitive. An equilibrium is characterized by the market clearing condition. It is easier to characterize the equilibrium by thinking of the labor demand of a firm instead of the labor demanded 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 (Labor market)**.** *A unique market clearing wage $w \in [\underline{w}, \overline{w}]$ exists.*

Proof. In the appendix. □

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 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.[10] In particular, the increase in wage will affect the average quality of the pool of entrepreneurs in the economy.

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

2 Institutional frictions

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 our 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 institutional parameter that would defeat it in a direct binary vote.[11]

We focus only on institutional frictions involving wealth because wealth is the instrument that banks use to screen agents when talent is unobservable, and we want to show that the political process can fail to choose the right reforms even when there is no redistributive objective. Recall that the parameter τ captures the broad institutional wedges that affect all property related transactions. A high τ implies that law enforcement is poor and assets are likely to be lost to external predators (e.g., roving bandits as in Olson 1993). Similarly, to the extent τ captures transaction costs, we interpret them as passive waste as opposed to corruption (e.g., Bandiera, Prat, and Valletti 2009). Hence τ is a parameter that captures all institutional inefficiencies that affect asset ownership, and is independent of occupational choice.[12]

The parameter ϕ is a particular institutional friction that affects credit markets. This is a fairly standard assumption that reflects the costs of foreclosing on collateral. If an agent pledges wealth a as collateral to become an entrepreneur, and his project fails, the bank only recovers $a(1-\tau)\phi$. A fraction $a(1-\tau)(1-\phi)$ disappears due to the legal process of foreclosing on property. Note that under our assumptions, τ affects all property related transactions including posting wealth as collateral.[13] Wealth that is posted as collateral is either expropriated with probability τ or a fraction τ of its value disappears due to transaction costs and the banks take this into account when negotiating the collateral amount. Hence $\phi < 1$ lowers the value of an agent's wealth as collateral and consequently, one would think that $\phi = 1$ will be the surplus maximizing policy. This may not be true in the second best world because of its effect on wages, as we shall see in the analysis below.

It is important to note that this treatment of ϕ and τ is not substantive as far as the results are concerned. We could assume instead that wealth that leaks away as a result of inefficient

[11]See, for example, Persson and Tabellini (2000) for a simple text-book treatment.

[12]Although property rights protection problems could apply to incomes also, we restrict our attention to the effect of property rights on wealth to make the comparison with ϕ as sharp as possible. If τ is allowed to affect incomes, either wage or appropriable entrepreneurial returns or both, the political feasibility and surplus maximizing property of $\tau = 0$ varies from case to case, but the main message that surplus maximization does not coincide with political feasibility is very robust.

[13]Besley (1995) discusses the three channels through which property rights affects an agent's payoff. These are the security of tenure, the use of property as collateral, and the benefits of gains from trade (e.g., rental). To map this to our model, we think of τ as affecting all three channels whereas ϕ captures the additional frictions that only affect the use of property as collateral. Of course wealth in our model is exogenous and therefore the issue of investment incentives does not arise.

institutions is simply redistributed to all agents through lump sum transfers or the provision of some public good funded by the revenue from what then is a "wealth tax". 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 maximizing. 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. We could also assume that there is no deadweight loss when wealth is expropriated or liquidated - what is someone's loss is another person's gain either as extortion or bribes (in the case of τ) or fees (in the case of ϕ). For reasons of parsimony, we did not take this route (because we have to then model these other occupations) but it would merely change the calculation of the total surplus without changing our results qualitatively.

2.1 Institutions in the first best world

In the first best world the surplus maximizing institutions are chosen.

Proposition 3. *When talent is observable, voters unanimously choose surplus maximizing institutions, that is $\tau = 0$.*

Proof. Under the first best the total surplus in the economy is:

$$W_{fb} = q(R+M) + \mathbb{1}_{[q(n+1)<1]}\underline{w}(1-q(n+1)) - \tau \int_0^\infty a g(a) da. \tag{15}$$

$\mathbb{1}_{[q(n+1)<1]}$ 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 $q < \frac{1}{n+1}$.

It is clear upon inspection that the total surplus is decreasing in τ. Hence $\tau = 0$ is surplus maximizing. 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. □

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 subsistence sector in the first best world if the economy is talent poor. This is what the indicator function in equation (15) captures.

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 transactions involving wealth with banks. Note that in the first best in our model since talent is observable, wealth is no longer used as collateral to screen agents. Hence ϕ does not affect total surplus and all values of ϕ are consistent with surplus maximization in the first best world.

2.2 Institutions in the second best world

We now show that as soon as there's a departure from the first best, the inefficiency of the market is 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:

$$\begin{aligned} W_{sb} = \quad & (R+M)q(1-G(\underline{a})) + (\theta R + M)(1-q)\int_{\underline{a}}^{\overline{a}} \lambda(a)g(a)da \\ & + \mathbb{1}_{\left[(n+1)\int_{\underline{a}}^{\infty}(q+(1-q)\lambda(a))g(a)da<1\right]} \underline{w} \left(1-(n+1)\int_{\underline{a}}^{\infty}\Big(q+(1-q)\lambda(a)\Big)g(a)da\right) \\ & -\tau\int_0^{\infty} ag(a)da - (1-\phi)(1-q)(1-\tau)(1-\theta)\int_{\underline{a}}^{\infty} a\lambda(a)g(a)da. \end{aligned} \tag{16}$$

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 absorb all the workers in the economy, that is, $\int_{\underline{a}}^{\infty}(q+(1-q)\lambda(a))g(a)da < \frac{1}{n+1}$. The last two terms capture the passive waste created by $\tau > 0$ and $\phi < 1$. The first of these is the same as in the first best world, namely, the loss of surplus due to imperfect property rights. The other term captures the waste created by $\phi < 1$ which only arises when a project run by a low ability entrepreneur fails and collateral needs to be liquidated. The explanation for the specific expression is as follows. The fraction of low types is $(1-\theta)$ and for any $a \geq \underline{a}$ a measure $\lambda(a)$ of them are entrepreneurs. A fraction $(1-\tau)$ of their wealth remains as potential collateral that could be collected by banks in the event of default. The probability of default is $(1-q)$ and a fraction $(1-\phi)$ of the amount of collateral collected disappears due to transactions costs. The last term captures this deadweight loss.

Notice that in the second best world, in addition to the direct effect of poor institutions on surplus captured in the last two terms, there are indirect effects on total surplus through $\underline{a}$ and $\lambda(a)$.

The dimension of heterogeneity that generates the preference for inefficient policies is wealth, which is observable and can be used as collateral but has no other productive use. However both the institutional frictions we study 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 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 $\lambda(a)$, which is the proportion of low types with wealth a who choose entrepreneurship, will affect the latter. We state this formally in the following lemma.

Lemma 4. *Holding all else constant, a policy that decreases $\underline{a}(\phi, \tau)$ or $\lambda(a)$ increases total surplus.*

Proof. First consider a policy that decreases $\underline{a}$. This will increase access to entrepreneurship and consequently increase labor demand. 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 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 labor demand. 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 the assumption made in equation (1) that this increases total surplus. $\square$

The coexistence of $\underline{a} > 0$ and $\lambda(a) > 0$ indicates the coexistence of under-lending and over-lending in this model. Lemma 4 captures these two main effects through which policy may affect surplus. The first effect is through a change in the credit constraint; all else constant, increasing the credit constraint $\underline{a}$ reduces total surplus as previously unconstrained high type entrepreneurs are forced to become workers.[14] We can think of this as the SW effect (after Stiglitz and Weiss 1981). In line with Stiglitz and Weiss (1981) this is the effect that leads to under-lending relative to the full information case.[15] The second effect is through a change in the proportion of low type entrepreneurs: all else constant increasing the proportion of low type entrepreneurs $\lambda(a)$ decreases total surplus as fewer low types chose their optimal occupation of working for a wage. We can think of this as the DW effect (after de Meza and Webb 1987). In line with de Meza and Webb (1987) this is the effect that leads to over-lending relative to the full information case. Hence in equilibrium both over-lending, for regions of wealth where $\lambda(a) > 0$, and under-lending for wealth less than $\underline{a}$, coexist.

[14] Although increasing $\underline{a}$ also leads to some low type entrepreneurs being credit constrained, lemma 4 shows that the net effect of increasing the credit constraint on total surplus is still negative.

[15] de Meza and Webb (1987) show that the Stiglitz and Weiss (1981) model implies that there is under-lending in the asymmetric information equilibrium relative to full information.

Now we analyze 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 maximize surplus. Indeed such a choice of institutions is not inefficient in the Paretian sense.[16] 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 its effect on occupational choice and consequently on preferences.

The key to understanding why agents may choose non surplus maximizing 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 $n \geq 1$.[17] 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 a change in ϕ. 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 measure of rich low type entrepreneurs, $\lambda(a)$. As shown in Lemma 4, this would be at odds with surplus maximization. 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 proportion 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.

2.2.1 Support for reforms specific to banking sector

The parameter ϕ in the model denotes the fraction of collateral that banks can liquidate in case of default. and can capture the quality of the judiciary.[18] Given the discussion on efficiency and political feasibility, we are ready to state the following proposition.

[16] 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 maximizing institution.

[17] 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.

[18] Alternatively, the quality of the judiciary could be modeled 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.

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

Proof. A reduction in institutional frictions that affect liquidation of collateral by banks 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 labor demand is weakly increasing in ϕ

$$\frac{\partial L_D}{\partial \phi} = (1+n)\left(-g(\underline{a})\frac{\partial \underline{a}}{\partial \phi}(q + (1-q)\lambda(\underline{a})) + (1-q)\int_{\underline{a}}^{\overline{a}} \frac{\partial \lambda(a)}{\partial \phi} g(a)da\right) > 0 \tag{17}$$

It is easy to see from equation (11) that the credit constraint is decreasing in ϕ. Furthermore $\frac{\partial \lambda(a)}{\partial \phi} > 0$ holds since an increase in ϕ increases the terms of the credit contract. Since ϕ makes entrepreneurship more attractive by decreasing the interest rate $\lambda(a)$ must decrease to keep the occupational choice constraint of a low type entrepreneur satisfied. This shows that labor demand is increasing in ϕ. The wage is non decreasing in labor demand and hence $\frac{\partial w}{\partial \phi} \geq 0$ must be true. Agents who expect to become workers under the status quo comprise at least one half of the population, and always support a higher ϕ against a lower ϕ, and this monotonicity guarantees that $\phi = 1$ is chosen at stage 2. Furthermore there is always a positive measure of low types who expect to be entrepreneurs in the semi-separating region under the status quo, who also support this, since they switch to a higher payoff as a consequence of the policy. Hence it is guaranteed majority support.

We now show that the effect of an increase in ϕ on total surplus is ambiguous. The first effect of an increase in ϕ is to reduce the passive waste that arises in liquidation which is captured in the last term in (16). This leads to an increase in total surplus. The increase in ϕ also affects total surplus through a change in $\underline{a}$ and the function $\lambda(a)$. We can see that

$$\frac{\partial \underline{a}}{\partial \phi} < 0 \qquad \text{but} \qquad \frac{\partial \lambda(a)}{\partial \phi} > 0. \tag{18}$$

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 of an increase in ϕ on total surplus depends on which of these three dominates and is consequently ambiguous. It is possible to construct examples where negative effect on surplus as a result of an increase in $\lambda(a)$ dominates the other effects.[19] $\square$

This shows that the equilibrium wage is non-decreasing in ϕ. This is because both the SW and the DW effect work in the same direction to increase lending, and consequently the wage. Since workers and entrepreneurs are perfect complements and an increase in the supply of entrepreneurs increases the demand for labor. Since the equilibrium wage is increasing in ϕ, a policy increasing ϕ enjoys majority support, and hence $\phi = 1$ is the only value of ϕ that cannot be defeated by

[19] In a previous version we had included an example that illustrates that an increase in ϕ leads to a decrease in total surplus. It is available on request.

another value of ϕ in a binary vote. However, total surplus may not increase 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 SW and DW effects work in the opposite direction when it comes to total surplus as ϕ increases. Although increasing ϕ leads to less under-lending to agents who deserve to receive credit (SW effect), it also leads to more over-lending to low types (DW effect). If the negative DW effect on total surplus is large enough to dominate the SW effect and the reduction in passive waste, the net effect of an increase in ϕ on total surplus will be negative. In this model reducing the frictions banks encounter in liquidating collateral (increasing ϕ) is not always good in the second best world since it makes entrepreneurship more attractive and this induces low types to become entrepreneurs.

2.2.2 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 is always surplus maximizing 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.

$$\frac{\partial L_D}{\partial \tau} = (1+n)\left(-g(\underline{a})\frac{\partial \underline{a}}{\partial \tau}\left(q + (1-q)\lambda(\underline{a})\right) + (1-q)\int_{\underline{a}}^{\overline{a}} \frac{\partial \lambda(a)}{\partial \tau} g(a)da\right). \tag{19}$$

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. Lemma 1 shows that the relative payoff from entrepreneurship is decreasing in wealth for low types. As a result $\frac{\partial \lambda(a)}{\partial \tau} > 0$ as τ decreases an agent's effective wealth. This implies the effect of a decrease in τ on the labor demand and consequently on the wage is ambiguous. Hence a policy of reducing τ may not be supported by the majority. This will be true when the median voter is poor enough to care primarily about the effect of τ on the wage.

To see that decreasing τ is surplus maximizing, note that τ affects total surplus in two ways. First there is a direct effect of reducing surplus through destruction of wealth. By inspecting the last two terms of (16), we see that this effect is negative. The second effect of τ on total surplus is through its effect on the equilibrium values of $\underline{a}$ and the function $\lambda(a)$. We can see that

$$\frac{\partial \underline{a}}{\partial \tau} > 0 \qquad \text{and} \qquad \frac{\partial \lambda(a)}{\partial \tau} > 0. \tag{20}$$

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

□

The effect of τ on equilibrium wage is ambiguous. This is because the SW and the DW effects work in opposite directions when it comes to the effect on aggregate lending. A decrease in τ leads to less under-lending (SW effect) since the credit constraint relaxes for some agents. This drives up the number of entrepreneurs and consequently the demand for labor. On the other hand a decrease in τ also leads to less over-lending (DW effect) since it increases the outside option to entrepreneurship for low type workers as wealth becomes more valuable, inducing some of them to drop out. This drives down the number of entrepreneurs and the labor demand for workers. Hence the net effect on labor demand and equilibrium wage is ambiguous. Consequently the political feasibility of a decrease in τ is also ambiguous, and it is easy to construct examples where a poor median voter would oppose a decrease in τ due to a reduction in equilibrium wage.

To understand why $\tau = 0$ is optimal (maximizes total surplus) note that the SW and DW effects work in the same direction when τ decreases. A decrease in τ leads to less under-lending (SW effect) which increases the total surplus as more high types join the pool of entrepreneurs. A decrease in τ also leads to less over-lending (DW effect) as a decrease in τ effectively increases an agent's wealth and this makes working for a wage more attractive for low types relative to entrepreneurship where the agent loses his wealth in case of project failure.

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 (4) 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 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, reducing frictions that affect liquidation of collateral primarily benefits the entrepreneurs in the modern sector where credit is necessary and collateral plays a role, whereas improving property rights more broadly 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 the efficiency of institutional reform. Only reforms that increase wages are politically feasible but these may not correspond to reforms that are surplus maximizing. While reforms affecting only the banking sector are politically feasible they may not be surplus maximizing. On the other hand broader property rights reforms are surplus maximizing but may not be politically feasible.

2.3 Some comparative statics

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 and productivity. An exogenous change in the cost of borrowing arising, for instance as a consequence of a credit crisis, can affect the choice of τ.

To pin down ideas, in this section we consider the case where the distribution of wealth is binary - the rich have wealth $a > 0$, and the poor have 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 labor market can be 'tight', i.e., 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 $(q + (1-q)\theta)R < n\underline{w}$ and $M > \underline{w}$. This ensures that the poor are always credit constrained regardless of the value of τ.

Let us explore what happens when there is an exogenous shock 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 (11) to

$$\underline{a} = \frac{\rho n w - \theta_p(\underline{a})R}{\phi(1-\tau)}. \tag{21}$$

The credit constraint bound $\underline{a}$ 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.

It can be shown that efficient reform of τ happens if and only if the SW effect exists in equilibrium. Whenever there is at least some under-lending, the effect of decreasing τ on wage is positive.[20] Conversely when the SW effect does not exist, there only exists over-lending in equilibrium and decreasing τ only leads to a reduction in low type entrepreneurs. Although from Proposition 5 the effect on surplus is positive, the effect on labor demand and wage is negative leading to its political infeasibility given that the median voter is poor.

To see some other comparative statics, recall that the labor market equilibrium is defined by

$$1 = (n+1)(1-p)(q + (1-q)\lambda(a)). \tag{22}$$

and assume that $\rho = 1$. The occupational choice constraint for the low types is

$$\theta(R - r(a)nw) + M - (1-\theta)(1-\tau)a = w. \tag{23}$$

The feasibility condition for the credit market to sanction loans to rich entrepreneurs which defines the $\underline{a}$ in (21) is

$$\frac{(q + (1-q)\theta\lambda(w))R}{q + (1-q)\lambda(w)} + (1-\tau)\phi a \geq \rho n w \tag{24}$$

Equations (23), (24), and (22) jointly determine the proportion of rich low type entrepreneurs $\lambda(a)$, the equilibrium wage

$$w = \frac{\phi M + R(\theta + (1-\theta)(n+1)(1-p)q)}{n+\phi}, \tag{25}$$

and the median voter's preferred τ which we call τ^*. Maximizing the median voter welfare, we get

$$1 - \tau^* = \frac{nM - R(\theta + (1-\theta)(n+1)(1-p)q)}{a(n+\phi)} < 1. \tag{26}$$

Note that τ^* is increasing in a, the wealth of the rich. Note also that 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 (24) since M is non-appropriable. Moreover, we can see from equation (25) 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^*.

To see the effects of an increase in wealth inequality, let us see what happens as we increase a

[20] These results can be related to some of the lessons of the global 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".

while keeping the mean wealth level $(1-p)a$ constant. We find that

$$\frac{\partial \tau^*}{\partial a}|_{(1-p)a} = \frac{nM - R\theta - 2R(1-\theta)(n+1)(1-p)q}{a^2(\phi+n)}. \tag{27}$$

The sign of this is not always positive and depends on whether $\frac{M}{R} > \frac{1}{n}(\theta + 2(1-\theta)(n+1)(1-p)q)$. 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 further hamper the ability of a polity to obtain good institutional reforms. Therefore, we see that under certain conditions increase in inequality leads to an increase in the median voter's preferred τ if and only if the ratio of appropriable to non-appropriable entrepreneurial returns $\frac{R}{M}$ is low.

3 Other 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, in section 3.2 we introduce the possibility of wealth redistribution and in section 3.1 we allow them to vote for a budget balanced subsidy to workers financed by a tax on entrepreneurs.

3.1 Tax and subsidy package

In this section we attempt to see the effect of allowing income based redistribution on the median voter's preference for an inefficient τ. 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 politically feasible.

3.1.1 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. The following proposition shows that when $q > \frac{1}{n+1}$ (talent-rich economy), then a subsidy s along with a tax t exists such that agents vote for $\tau = 0$.

Proposition 6. *In a talent-rich economy, a welfare maximizing, budget balanced t and s exist 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:

$$R - nw + M + a - t = w + s + a. \tag{28}$$

t must also satisfy the constraint $t \leq R - nw$ since t must come from the appropriable returns of the project. To ensure that all low types choose to be workers s and t must satisfy

$$w + s > \theta(R - nw - t) + M. \tag{29}$$

This ensures that even a low type agent with zero wealth prefers to work for a wage when paid a subsidy s. 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. A package of t and s satisfying these constraints will ensure that high types would prefer entrepreneurship and low types will prefer paid employment.

Now consider the political economy problem. Denote the wage in status quo as $\hat{w}$. This must be less than $\overline{w}$ for there to be some low types in the pool of entrepreneurs. Since the highest possible wage is defined as $\overline{w} = R - n\overline{w} + M$ in this case we will have $w + s = \overline{w}$. Note that all workers strictly prefer this policy to status quo since their payoff is $w + s = \overline{w} > \hat{w}$.

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. Finally since we have assumed $R > nM$, appropriable returns are large enough to cover wage payment even when wage is $\overline{w}$. Hence the constraint $t \leq R - nw$ is satisfied. $\square$

3.1.2 Talent poor economy

In this section we construct an example with a talent poor economy where it will not be possible to ensure a vote in favor of $\tau = 0$ even when the electorate tie it with a subsidy to workers financed through a tax on all entrepreneurs. Recall that in a talent poor economy, with $(\frac{q}{1-q} \leq \frac{1}{n})$, the wage is $\underline{w}$ in the first best since there are only high type entrepreneurs. 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.

Assume there are three wealth classes, the rich with wealth a_r, the middle class with wealth a_m and the poor with wealth zero. Let the proportions of the rich, middle, and the poor in the population be α_r, α_m and α_p. Assume that the following holds

$$\alpha_r > \frac{1}{n+1}, \qquad \frac{1}{n+1} > q\alpha_r + \alpha_m \qquad \text{and} \qquad \alpha_p > \frac{1}{2}. \tag{30}$$

This implies that the median voter is poor but the proportion of rich is large enough such that the wage will be greater than $\underline{w}$ if all the rich decided to become entrepreneurs. However, the proportion of rich high types together with the middle class is not large enough for wage to rise above $\underline{w}$ with unobservable talent.

To simplify things assume that low types possess no entrepreneurial talent, that is $\theta = 0$. Using assumption (1), this implies that

$$M > \underline{w} > M - n\underline{w}. \tag{31}$$

and (14) modifies to $qR < n\underline{w}$ ensuring that the credit constraint binds. Also assume that $\phi = 1$.

Consider a situation where only the rich are entrepreneurs. Since $\alpha_r > \frac{1}{n+1}$, the wage must rise to ensure that rich low types must be indifferent between entrepreneurship and the equilibrium wage. As a result the pool of entrepreneurs must be of size $\frac{1}{n+1}$. Hence we must have

$$q + (1-q)\lambda(a_r) = \frac{1}{\alpha_r(n+1)} \tag{32}$$

where $\lambda(a_r)$ is the proportion of rich low types who choose entrepreneurship. The following occupational choice condition must hold for the rich low types

$$M - (1-\tau^*)a_r = w(\tau^*), \tag{33}$$

where $w(\tau^*)$ is the equilibrium wage when $\tau = \tau^*$. We can see that increasing τ would increase the wage. The highest τ such that the credit market still lends to the rich must satisfy (11) and hence we must have

$$a_r(1-\tau^*) = nw(\tau^*) - \theta_p(a_r)R. \tag{34}$$

Using (3) we have

$$\theta_p(a_r) = \frac{q}{q + (1-q)\lambda(a_r)} \qquad \text{and hence} \qquad a_r(1-\tau^*) = nw(\tau^*) - q\alpha_r(n+1)R. \tag{35}$$

We have two equations in (33) and (35) and two unknowns namely the status quo τ^* and the equilibrium wage $w(\tau^*)$. Solving out for the equilibrium wage we have

$$w(\tau^*) = \frac{M + q\alpha_r(n+1)R}{n+1}. \tag{36}$$

We are now ready to state the result.

Proposition 7. *In a talent poor economy it is impossible to construct a budget balanced tax and subsidy package that will enable the improvement of property rights institutions if*

$$a_r > M - \underline{w} > a_m \tag{37}$$

Proof. If τ changes from τ^* to 0, rich low types will drop out of entrepreneurship as a consequence of the left hand side of (37). Since $q\alpha_r + \alpha_m < \frac{1}{n+1}$, and the poor are always credit constrained, we must have wage $w(0) = \underline{w}$ at $\tau = 0$. At $\underline{w}$ we can see from the right hand side of (37) that a low type middle class agent strictly prefers to be an entrepreneur.

Note that the appopriable returns for middle-class entrepreneurs are negative since $qR < n\underline{w}$ by (14). This implies that in the event of success the returns R are fully pledged to the bank and consequently a positive tax on entrepreneurs would violate the limited liability constraint for middle class entrepreneurs. However there must be a positive subsidy to induce a poor median voter ($\alpha_p > \frac{1}{2}$) to vote for a change in τ since wage falls from $w(\tau^*)$ to $\underline{w}$. □

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. When M, the non-appropriable return from entrepreneurship is large enough, agents are attracted to entrepreneurship even when the appropriable returns are low. In this case it is not possible to tax entrepreneurs since all the appropriable returns are already pledged to banks. 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.

3.2 Wealth redistribution

In this section we study the effect of allowing wealth based redistribution on the median voter's preference for an inefficient τ. In particular we allow agents to vote for a redistribution package that equalizes the wealth in the population coupled with an efficient vote on $\tau = 0$.

3.2.1 Wealth rich economy

If the average wealth in the economy is sufficiently high, a vote on wealth redistribution tied to an efficient reform of $\tau = 0$ is always politically feasible. We show this formally in the following proposition.

Proposition 8. *If the average wealth in the economy exceeds $\overline{w} - \underline{w}$, i.e.,*

$$\int_0^\infty ag(a)da > \overline{w} - \underline{w}, \tag{38}$$

the median voter always chooses redistribution coupled with $\tau = 0$ over any other value of τ without redistribution.

Proof. Note that $\overline{w}$ is the highest possible wage in the economy. A median voter's payoff from voting for $\tau > 0$ is at most $\overline{w}$. On the other hand if wealth is redistributed equally with all agents receiving average wealth, wage may fall but will be at least $\underline{w}$. Hence the payoff of the median voter is at least $\int_0^\infty ag(a)da + \underline{w}$. The inequality in (38) ensures that the payoff from redistribution always dominates. $\square$

This result shows that regardless of the distribution of wealth and talent, if the average wealth in the economy is high enough, tying redistribution of wealth to efficient reform of τ will always be politically feasible.

3.2.2 Wealth poor economy

In this section we construct a simple example of a wealth poor economy where tying an efficient vote of τ to redistribution of wealth will not work. Assume that the distribution of wealth is discrete. A proportion α of agents have wealth a and the rest have no wealth. Assume also that

$$\frac{n}{n+1} > \alpha > \frac{1}{n+1}. \tag{39}$$

This guarantees that the median voter is poor but at the same time there are sufficient mass of rich to raise the wage over $\underline{w}$. Assume further that $\theta = 0$. This is similar to the example we constructed in section 3.1.2. In this case we can solve for τ^*, the value of τ that maximizes the equilibrium wage, and the corresponding wage $w(\tau^*)$ that is supported by τ^*. The solution to these two can be found by solving the occupational choice constraint for the rich low types and the credit constraint threshold. Hence we have

$$w(\tau^*) = \frac{M + q\alpha(n+1)R}{n+1}. \tag{40}$$

Proposition 9. *If the average wealth in the economy αa is such that:*

$$\alpha a < \min\{w(\tau^*) - \underline{w}, n\underline{w} - qR\} \tag{41}$$

the median voter never chooses redistribution coupled with $\tau = 0$ over τ^* without redistribution.

Proof. Since the median voter has no wealth, his payoff when he votes for τ^* is simply $w(\tau^*)$. On the other hand if he votes in favor of redistribution all agents receive the average wealth αa. However this is lower than the credit constraint from (11) since $\alpha a < n\underline{w} - qR$. This implies that all agents are credit constrained and work in the subsistence sector with wage $\underline{w}$. Hence the payoff of the median voter is $\underline{w} + \alpha a$, which is less than $w(\tau^*)$, the payoff from choosing τ^*. $\square$

We have seen that enriching the set of available policies helps in the case of a talent rich or a wealth rich economy. In particular in a talent rich economy, allowing for a subsidy to workers financed through a tax on entrepreneurs allows for the wage to increase to $\overline{w}$, thereby eliminating the incentives to vote for values of $\tau > 0$. Similarly in a wealth rich economy, allowing for redistribution of wealth ensures that efficient reform of τ is politically feasible. However we have shown that in an economy that is poor in both wealth and talent neither of these two policies will work. As such these results suggest that the political failure we highlight in this model will be harder to overcome in economies poor in wealth and talent.

3.3 Taxes conditional on wealth

We can ensure that the median voter supports $\tau = 0$ by constructing an entrepreneurial tax that is conditional on wealth.

Proposition 10. *For any $\tau > 0$, it is possible to construct an entrepreneurial tax schedule conditional on wealth, which coupled with $\tau = 0$, is preferred by the median voter.*

Proof. Note that $\tau > 0$ is only preferred to $\tau = 0$ when $w(\tau > 0) > w(\tau = 0)$. Also note that since the credit market always makes zero profits, and the net surplus generated by low type entrepreneurs is negative, the increase in wage for $\tau > 0$ is a redistribution from high type entrepreneurs to workers. It is therefore possible to construct an enterpreneurial tax schedule conditional on wealth to finance a subsidy to workers s such that $s + w(\tau = 0) = w(\tau > 0)$ such that the median voter votes in favor of $\tau = 0$. □

The political infeasibility of $\tau = 0$ in Proposition 7 relies on the entrepreneurial tax being the same for all entrepreneurs. The closer an entrepreneur is to the credit constraint, the lower are his appropriable returns, and so it is not possible to extract much tax from him. However, Proposition 10 shows that if entrepreneurs at different levels of wealth can be charged a different tax, it is possible to restore the political feasibility of $\tau = 0$. This result is in line with the notion that introducing sufficient instruments for taxation restores a vote in favor of the first best policies.

4 Conclusion

To summarize our main results on efficiency and feasibility of institutional reforms, we find that reforms that affect the banking sector are always feasible but may not always be efficient, since they induce too many low type agents to choose entrepreneurship. On the other hand, we find that improving property rights institutions more broadly increases total surplus but may not always be politically feasible.

In the event of a market failure, even 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 made by constituencies that are generated due to market failure in the first place. 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 functioning democracy without powerful interest groups or other types of political failure that the political economy usually focuses on. Moreover, we have shown by example that greater wealth inequality and lower productivity can exacerbate this political failure effect, while tightening of credit may cause efficient reforms to become feasible.

Finally, the last set of results in the paper highlights 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.

Our paper highlights some potentially fruitful avenues of future research that looks at this two way interaction between market and political failure. For example, consider the finding of Acemoglu and Johnson (2005) that property rights institutions seem to have a first order impact on long run economic growth whereas contractual institutions do not. An extension of our model could supply 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.

Appendix

Lemma 1.

$$\frac{\partial \lambda(a)}{\partial a} \leq 0 \qquad a \in [\underline{a}, \infty) \tag{42}$$

Proof. Note first that since agents below $\underline{a}$ are credit constrained, $\lambda(a) = 0$ for $a < \underline{a}$. For $a \in [\underline{a}, \infty)$, $\lambda(a)$ is jointly determined by the zero profit condition for the banks and the occupational choice condition for low types. Before we begin, note that the average quality of entrepreneurs at wealth a is

$$\theta_p(a) = \left(\frac{q + (1-q)\theta\lambda(a)}{q + (1-q)\lambda(a)} \right) \tag{43}$$

and

$$\frac{\partial \theta_p(a)}{\partial a} = \underbrace{\frac{\partial \theta_p(a)}{\partial \lambda}}_{-ve} \cdot \frac{\partial \lambda(a)}{\partial a}. \tag{44}$$

Hence we need to show $\frac{\partial \theta_p(a)}{\partial a} \geq 0$. Let us consider the region of wealth where $R - r_p(a)nw > 0$. In this region the interest rate $r_p(a)$ is determined by

$$\theta_p(a) r_p(a) nw + (1 - \theta_p(a))\phi(1-\tau)a = nw \tag{45}$$

and by a low type entrepreneur's occupational choice constraint when he is indifferent between entrepreneurship and working for a wage:

$$\theta(R - r_p(a)nw) + \theta(1-\tau)a + M = w + (1-\tau)a. \tag{46}$$

Define $v_L(a, r_p(a), w) := \theta(R - r_p(a)nw) - (1-\theta)(1-\tau)a + M$. We must have $\lambda(a) = 1$ when $v_L(a, r_p(a), w) > w$ since low types strictly prefer entrepreneurship, and $\lambda(a) = 0$ 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 randomize when indifferent. In this region substituting the interest rate $r_p(a)$ using equation (45) into $v_L(a, r_p(a), w)$ we find that $\lambda(a)$ is determined by

$$\theta R - \frac{\theta}{\theta_p(a)} nw - (1-\tau)a \frac{(\theta_p(a)(1-\theta) - \theta(1-\theta_p(a))\phi)}{\theta_p(a)} + M = w. \tag{47}$$

Differentiating this expression we find

$$\frac{\partial\theta_p(a)}{\partial a} = \frac{(1-\tau)(1-\theta)\theta_p(a)^2}{nw - (1-\tau)\phi a} > 0 \tag{48}$$

since $nw > a(1-\tau)\phi$. Hence in this region we have $\frac{\partial\lambda(a)}{\partial a} < 0$.

Now consider the region where $R - r_p(a)nw < 0$. In this region $\lambda(a)$ is determined jointly by the zero profit condition

$$\theta_p(a)(R + (1-\gamma(a))(1-\tau)\phi a) + (1-\theta_p(a))(1-\tau)\phi a = nw \tag{49}$$

and by the low type's indifference between entrepreneurship and working for a wage

$$\theta\gamma(a)(1-\tau)a + M = w + (1-\tau)a, \tag{50}$$

through its effect on pool of entrepreneurs $\theta_p(a)$. Define $v_L(a, \gamma(a), w) := M - (1-\theta\gamma(a))(1-\tau)a$. When low types are indifferent we have $v_L(a, \gamma(a), w) = w$. Similar to the previous case when this indifference does not hold we must have $\lambda(a) \in \{0, 1\}$ and $\frac{\partial\lambda(a)}{\partial a} = 0$. When the indifference does hold we can substitute for $\gamma(a)$ from (50) into (49) and differentiate to find

$$\frac{\partial\theta_p(a)}{\partial a} = \frac{(1-\tau)\phi(\theta_p(a) - \theta)}{\theta(R - (1-\tau)\phi\gamma(a)a)}. \tag{51}$$

Note that $1 - \gamma(a)\theta = \frac{M-w}{(1-\tau)a}$. $R > (1-\tau)\phi\gamma(a)a$ is guaranteed by assumption in (1) since $\theta R + M - (n+1)w < 0$ and $R - nw > 0$ for $w \in [\underline{w}, \overline{w}]$. Since $\theta_p(a) > \theta$, we have $\frac{\partial\theta_p(a)}{\partial a} > 0$ and consequently $\frac{\partial\lambda(a)}{\partial a} < 0$ in this region. □

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

$$\theta(R - nw) + M - (1-\tau)(1-\theta)\overline{a} = w. \tag{52}$$

Rearranging this, we get equation (12). 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 show that separating contracts will not exist in equilibrium for wealth $a < \overline{a}$. 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 an 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. To begin with note that $\underline{a}(\underline{w}) > 0$ implies that $\underline{a}(w) > 0$ for all $w \geq \underline{w}$. To see this note from (11) that $\underline{a}(w)$ is increasing in w.

Furthermore we must have $\overline{a} > \underline{a}$. If not, low types with wealth $\underline{a}$ would not choose entrepreneurship since their wealth will be greater than what is required to offer high types a separating contract which they will accept (lemma 2). This would mean the quality of the pool of entrepreneurs $\theta_p(\underline{a})$ defined in (3) equals one since there are only high type entrepreneurs. Plugging $\theta_p(\underline{a}) = 1$ into (11) we see that this implies $nw - R > 0$. This is a contradiction since, by assumption, we have $R - nw \geq 0$ for $w \in [\underline{w}, \overline{w}]$. Hence if $\underline{a}(\underline{w}) > 0$, we must have $\overline{a} > \underline{a} > 0$.

We begin with wealth $a \geq \overline{a}$. Lemma 2 shows that in this region high type agents are offered a separating contract which they accept. By assumption (1), low types must become workers in this region. This implies that $\lambda(a) = 0$ in this region of wealth. Low type agents with wealth $a = \overline{a}$ are indifferent between working for a wage and entrepreneurship. For wealth $a < \overline{a}$, we see from lemma 1 that the proportion of low types who choose entrepreneurship increases as $\frac{\partial \lambda(a)}{\partial a} < 0$. Finally from (11) agents with $a < \underline{a}$ are credit constrained.

□

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

$$(1+n)\left(q(1-G(\underline{a}))+(1-q)\int\limits_{\underline{a}}^{\overline{a}}\lambda(a)g(a)da\right). \tag{53}$$

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

$$\frac{\partial L_D}{\partial w}=(1+n)\left(-g(\underline{a})\frac{\partial \underline{a}}{\partial w}\left(q+(1-q)\lambda(\underline{a})\right)+(1-q)\int_{\underline{a}}^{\overline{a}}\frac{\partial \lambda(a)}{\partial w}g(a)da\right)<0. \tag{54}$$

This is true since

$$\frac{\partial \underline{a}}{\partial w}<0 \qquad \text{and} \qquad \frac{\partial \lambda(a)}{\partial w}<0. \tag{55}$$

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 randomize between entrepreneurship and working for a wage with probability $p=\dfrac{1}{q(n+1)}$.

As $w=\overline{w}$ implies that $q \geq \frac{1}{n+1}$. To see this note two things. First when $w=\overline{w}$ there cannot be any low type entrepreneurs since $\overline{w}=\frac{R+M}{n+1}>M$. Second, note that when $w>\underline{w}$ none of the agents are engaged in the subsistence sector and consequently fraction $\frac{1}{n+1}$ of the population must be entrepreneurs. This implies that the economy is talent rich, that is $q \geq \frac{1}{n+1}$. If high types randomize and become entrepreneurs with probability p, there will be pq entrepreneurs and $(1-p)q+(1-q)$ workers in the economy, which 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. □

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