Credit, Wages, and Bankruptcy Laws*

Bruno Biais† Thomas Mariotti‡

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Abstract

We study the impact of bankruptcy laws in general equilibrium, taking into account the interactions between the credit and the labor markets, as well as wealth heterogeneity. Soft bankruptcy laws often preclude liquidation in order to avoid ex-post inefficiencies. This worsens credit rationing, depresses investment and reduces aggregate leverage. Yet, tough laws do not necessarily maximize social welfare or emerge from the legislative process. Relatively rich agents, who can invest irrespective of the law, favor soft laws which exclude poorer entrepreneurs from the credit market and thus reduce labor demand and wages. This raises the pledgeable income of the entrepreneurs who can still raise funds, and thus lowers their liquidation rates and the associated inefficiencies. Hence, a soft law can maximize social welfare. Last, a soft bankruptcy law may be a more effective instrument than investment subsidies from a welfarist point of view.

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†Université de Toulouse (CRG-GREMAQ-IDEI), and CEPR.

‡London School of Economics and Political Science, Université de Toulouse (CNRS-GREMAQ-IDEI), and CEPR.

1. Introduction

Should contracts be enforced? The standard view in economics is that the prospect that they would not may deter agents from committing resources to meet their contractual obligations. This in turn may jeopardize economic activity. Yet, bankruptcy laws often entail violations of clauses stated in financial contracts. As stated by La Porta et al. (1998), "the most basic right of a senior collateralized creditor is the right to repossess—and then liquidate or keep—collateral when a loan is in default (see Hart (1995)). In some countries law makes it difficult for such creditors to repossess collateral, in part because such repossession leads to the liquidation of firms, which is viewed as socially undesirable." The goal of this paper is to offer a theoretical investigation of the causes and consequences of such violations of contractual rights.

Bankruptcy laws indeed vary quite significantly across countries.[1] The US Constitution gave Congress large powers to create bankruptcy laws interfering with the application of contracts (Berglöf and Rosenthal (2000)). The current US law, in particular the Chapter 11 procedure, allows to maintain distressed firms in operation. Whenever creditors disagree with the reorganization plan, the judge can decide to use the "cram down" procedure to implement the plan in spite of their opposition.[2] The French bankruptcy law goes even further in this direction than the US law (Biais and Malécot (1996)). Its first stated objective is to help distressed firms and to avoid laying off workers. To reach this goal, judges enjoy large discretionary powers, to the point that they can unilaterally write-off the creditors' rights. According to La Porta et al. (1998), "the French civil law countries offer creditors the weakest protection." Russian courts also have significant discretion in bankruptcy procedures. Lambert-Mogiliansky, Sonin and Zhuravskaya (2000) note that "the judge does not need to follow the creditor's request. This clause in the law was motivated by the fact that creditors may opt for inefficient liquidation." These laws contrast with those prevailing in the UK or Germany. Franks and Sussman (1999) argue that "the English procedure was developed by lenders and borrowers, exercising their right to contract freely [...] The role of the state in this process was relatively limited, largely confined to enforcing the contract." Correspondingly, the current UK bankruptcy code emphasizes the protection of creditors' rights.[3] Similarly, under the German law, companies that default on their debt repayment obligations are usually liquidated, and the proceeds distributed to debtholders (Kiefer (2000)). As stated in La Porta et al. (1998), "German civil law countries are very responsive to secured creditors."

While debtor-oriented (soft) bankruptcy laws can avoid inefficient liquidations ex-post, they have adverse effects ex-ante. Anticipating the violation of creditors' rights, banks are reluctant to grant loans. This amplifies credit rationing. Indeed, La Porta et al. (1997, 1998) and Giannetti (2000) find that access to debt financing is lower in countries with soft

[1] See Franks, Nyborg and Torous (1994), White (1994), Atiyas (1995), and La Porta et al. (1998).

[2] Franks and Torous (1989, 1994) study the bankruptcy process in the US, and Fisher and Martel (1995, 1999, 2000) compare it to its Canadian counterpart.

[3] Franks and Sussman (2000) offer an empirical analysis of the bankruptcy process in the UK.

bankruptcy codes. Also, the weak enforcement of creditors' rights is one of the reasons why Russian companies have virtually no access to external finance (Boycko, Shleifer and Vishny (1993)). As we argue in this paper, soft bankruptcy laws also indirectly affect the labor market. By restricting access to credit, soft bankruptcy laws reduce investment. In turn, this lowers the demand for labor, and thus the opportunities of wage earners. Thus both entrepreneurs, interested in access to credit, and workers, interested in job creation and high wages, should reject soft bankruptcy laws that restrict the freedom of contracting. This suggests that the optimal bankruptcy law should simply enforce contracts, and avoid interfering with their application.

This paper provides some foundations, as well as some challenges, to these conjectures. We consider a simple general equilibrium model, where the interactions between the credit and the labor markets can be analyzed, and heterogeneity across agents can be taken into account. There is a population of risk-neutral agents, who differ only in terms of their initial wealth. All these agents face the choice between becoming wage earners or entrepreneurs. The latter invest in a business project and hire the former in their firm. Workers incur some disutility to supply labor, and are compensated by wages. Entrepreneurs must exert costly efforts to make the investment project profitable and are compensated by profits (net of wages and reimbursements) and non-transferable private benefits. As a benchmark, we analyze the case where there are no imperfections on the labor and the credit markets. In the socially optimal competitive equilibrium, agents are indifferent between becoming a worker or an entrepreneur. The corresponding first-best aggregate level of investment is independent of the distribution of wealth across agents, and only reflects the disutility of labor and the profitability of investment. When the former is low and the latter is large, it is optimal that a high proportion of agents become entrepreneurs, raise funds and invest in the project.

Our analysis turns next to the case of imperfect financial markets. We assume that entrepreneurial effort is unobservable, as in Holmström and Tirole (1997), which raises a moral hazard problem. After the realization of the cash-flow, a firm can be liquidated or maintained in operation, as in Bolton and Scharfstein (1990). We consider the case where ex-post efficiency goes against liquidation, as private benefits from continuation exceed liquidation proceeds. Nevertheless, an ex-ante optimal financial contract can involve the liquidation of the firm when the cash-flow from the project is low. Indeed, the threat of liquidation enhances the entrepreneur's incentives to exert effort, and thus reduces agency rents. Furthermore, since liquidation proceeds are allocated to the investors, liquidation increases their willingness to fund the project. Hence, the income that entrepreneurs can pledge to outside financiers is increasing in the liquidation rate in case of failure. It is also decreasing in the wages paid to the workers.

Two possible financing regimes emerge from our analysis. Very wealthy agents need little outside financing and can therefore raise funds without committing to liquidation in case of failure. This corresponds to equity financing. Relatively poorer agents need greater outside financing, and thus must promise greater repayments to outside financiers. To raise their pledgeable income, they must commit to higher liquidation rates in case of failure, and thus issue risky debt.[4] Agents with even lower initial wealth cannot obtain a loan, as their need for outside funds exceeds their pledgeable income. They have thus no other choice than to become workers.

In this context, we first consider the case of a tough law, that simply enforces the contracts written by the entrepreneurs and the financiers. We identify two regimes. The first regime arises when the socially optimal level of investment is relatively limited, e.g., because the disutility of labor is large. Moral hazard reduces social welfare, by requiring inefficient liquidation, but it does not generate credit rationing, in the sense that all agents who prefer to become entrepreneurs can do so. Hence, as in the first-best, the marginal entrepreneur is indifferent between investing and being a wage earner. The second regime arises when the socially optimal level of investment is relatively large. In this case, relatively poor agents would be better off as entrepreneurs, but they cannot obtain a loan, because their pledgeable income is less than their outside financing needs. Hence, these agents are credit rationed, and must therefore become wage earners. Not only does this reduce investment—by increasing labor supply and reducing labor demand, this also lowers wages.

We consider next the equilibrium arising with a soft law. In our setting, a soft law enables the judge to interfere with the application of contracts, and rule in favor of continuation in cases where the contract called for liquidation. This makes it more difficult for agents to obtain credit and amplifies credit rationing, reducing investment and wages. Our analysis delivers the following new testable implications:

(i) The positive impact of collateral for access to credit should be greater in countries with tough bankruptcy laws;

(ii) The amplification of business fluctuations due to credit rationing, identified by Bernanke and Gertler (1989), should be more pronounced in countries with soft bankruptcy laws;

(iii) With tough laws, agents who are not very wealthy can raise funds by committing to a large liquidation rate, that is, by issuing risky debt. In countries with soft bankruptcy laws, this is not feasible, as large liquidation rates will not be systematically enforced. Consequently, these agents are credit rationed, and wages are lower, which enables more agents to become equity financed. As a result, countries with soft bankruptcy laws should have a lower economy-wide aggregate leverage;

(iv) By depressing investment, soft laws reduce labor demand, and thus wages. Thus the share of wages in total value added should be greater relative to profits in tough law countries, where contracts are strictly enforced;

(v) Last, a positive labor productivity shock should lead to an increase in investment. This requires that relatively less wealthy agents raise funds to invest in business projects.

[4] Note that in our model financial contracts are optimal. Agents who issue risky debt, and thus face the risk of inefficient liquidation, would not have been able to rely on equity financing.

To obtain funding, these agents must accept a relatively large liquidation rate. Hence, a positive productivity shock should induce an increase in the average leverage in the economy. This is consistent with the empirical results of Koracjczyk and Levy (2001) that, for financially constrained firms, leverage is pro-cyclical. In addition, our model predicts that these effects should be muted in countries with soft bankruptcy laws, where investment and leverage will be less responsive to productivity shocks.

Our analysis underscores the divergence between the preferences of different agents relative to bankruptcy laws. Soft laws reduce wages. Hence, poor agents, who are wage earners irrespective of the law, should be in favor of a strict enforcement of contracts. By contrast, rich agents, who can finance their investment project irrespective of the law, are in favor of restricting the freedom of contracting. Indeed, soft laws exclude relatively poor agents from the credit market. This reduces the competition for labor, lowers wages, and thus raises the profits of the rich. This is in line with the empirical finding of Rajan and Zingales (2003) that incumbents are opposed to efficient financial systems, which facilitate entry and thus lower their profits. Our analysis thus predicts that in countries where the economic elite strongly influences the political process, bankruptcy laws should tend to be soft. As an illustration, the very soft 1841 US bankruptcy law was pushed by the Whigs, which represented the economic elite in nineteenth century America. When this law was repealed by the Congress, the New England Whigs, clearly the richest people in the country, still voted in favor of it (Berglöf and Rosenthal (2000)).

Somewhat unexpectedly, our theoretical analysis shows that, in spite of their adverse effect on access to credit, soft laws can maximize the ex-ante utilitarian social welfare. This apparent paradox arises because, with moral hazard, the interaction between the credit market and the labor market endogenously generates externalities. The mechanism is the following. When one agent opts for entrepreneurship, this raises wages. In turn, this reduces the income that the other entrepreneurs can promise to outside investors. To maintain their pledgeable income, these entrepreneurs need to commit to greater liquidation rates in case of failure. This reduces social welfare, by raising the frequency of inefficient liquidations. This mechanism is particularly strong whenever, with a tough law, there is no credit rationing. The marginal entrepreneur commits to a relatively large liquidation rate, such that he has access to funds, and at which he is indifferent between becoming a wage earner or an entrepreneur. In this context, a softer law generates greater social welfare than the tough law. Indeed, the soft law worsens credit rationing and excludes the marginal entrepreneur from accessing the credit market. But this does not reduce social welfare significantly, since the utility of this agent as a worker is the same as his utility as an entrepreneur. On the other hand, the corresponding decrease in wages benefits all the agents who remain entrepreneurs, by reducing their liquidation rates and the corresponding ex-post inefficiencies.

While the main focus of the paper is on bankruptcy laws, other public policies could be relied upon to cope with credit market imperfections. These are related to the distribution of wealth in the population: while rich agents have access to credit, poor citizens do not. This points to fiscal redistribution as a natural alternative policy. To close the gap between their pledgeable income and their outside financing needs, entrepreneurs could receive investment subsidies. To fund the latter without adverse effects on incentives, one could rely on a lump-sum tax on labor income. In contrast with a soft bankruptcy law, such a fiscal policy would raise both investment and wages. We show that investment subsidies can increase ex-ante social welfare, by relaxing the financial constraint on firms. Yet, they are not Pareto improving: the positive impact of subsidies on wages is not strong enough to compensate the workers for having to pay the tax. Thus, while workers favor stimulating investment through tough bankruptcy laws, they would rather tax capital than labor when it comes to decide on a fiscal policy—even if this leads to lower investment and wages. Last, we show that, even if the ex-post costs of liquidation are small, a soft bankruptcy law may be a more effective instrument than investment subsidies to raise ex-ante social welfare. Indeed, while improving access to credit, investment subsidies do not eliminate all the inefficiencies associated with credit market imperfections. As discussed above, an important inefficiency in our model arises because investment, by raising wages, reduces the pledgeable income and thus raises liquidation rates for the other entrepreneurs. While soft bankruptcy laws mitigate this negative externality, investment subsidies enhance it.

Our paper builds on the substantial literature analyzing the design of bankruptcy procedures (see, e.g., Harris and Raviv (1993), White (1989), Bebchuck (1988), Aghion, Hart and Moore (1992), Berkovitch, Israel and Zender (1997), and Berkovitch and Israel (1999)). There are three major difference between our approach and that literature. First, we emphasize the difference between laws and contracts. As stated in La Porta et al. (1998), "the view that securities are inherently characterized by some intrinsic rights is incomplete [...] It ignores the fact that these rights depend on the legal rules of the jurisdictions where securities are issued." Thus we study how the agents take into account the bankruptcy law when writing financial contracts. Second, we consider a general equilibrium setting, where the interaction between the credit market and the labor market generates endogenous externalities in the presence of entrepreneurial moral hazard.[5] Third, we study the political underpinnings of the bankruptcy law, and thus analyze how different laws can emerge.

Our focus on the interaction between financial decisions and politics or legislation in a general equilibrium context is in line with the insightful paper by Bolton and Rosenthal (2002). A key difference is that, in their analysis, voting on moratoria occurs ex-post. In our setup, the bankruptcy law is set ex-ante, before financial contracts are written and economic decisions taken, reflecting the legal context. Furthermore, their focus on how laws complete contracts by making their application contingent on macro-shocks, differs from our focus on how laws take into account externalities imposed on third parties by financial contracts. In contrast to their results, the soft law that can emerge in our setting can be interpreted as a form of contractual incompleteness.

[5] Our approach thus differs from Biais and Recasens (2000), who assume exogenous social costs of liquidation in a partial equilibrium setup.

Our emphasis on the interactions between imperfect credit markets and the labor market is in line with Acemoglu (2001) and Pagano and Volpin (2001). However, their focus differs from ours. Acemoglu (2001) studies how credit market imperfections magnify the consequences of labor market imperfections. This is outside the scope of the present paper, since we consider a perfect labor market. On the other hand, while we offer a detailed analysis of financial contracting, Acemoglu (2001) takes a more reduced form approach, by simply assuming that external financing is impossible. Thus our analysis of determinants of credit rationing such as the legal context or the wage level are distinct from his approach. Pagano and Volpin (2001) focus on a different instrument to discipline managers, namely takeovers. While we emphasize the classical conflict between managers and workers over wages, they identify a situation where the interests of managers and workers can be aligned. Specifically, incumbent managers favor long-term labor contracts promising high wages, to the extent that these deter takeovers, and thus help them enjoy private benefits.

Our general equilibrium analysis of credit rationing in a context where some agents can seek to become entrepreneurs is in the spirit of Aghion and Bolton (1997). In their analysis, however, the fraction of agents who become entrepreneurs determines the cost of capital, while in ours it determines the wage rate. Further, our focus on the potential inefficiencies of liquidations and the violation of creditors' rights induced by soft bankruptcy laws is a distinctive feature of our analysis.

Our paper is also related to Japelli, Pagano and Bianco (2002). While we focus on laws, they study the enforcement of laws. They show theoretically and empirically that an improvement in judicial efficiency increases lending.[6] Both papers show that the agents with the highest endowments do not benefit from strict enforcement of debt contracts. In Jappelli, Pagano and Bianco (2002) the rich dislike strict enforcement because it facilitates rent extraction by monopolistic banks. In the present paper, rich agents dislike tough laws because they enhance access to credit, and thus raise labor demand and wages.

The paper is organized as follows. Section 2 presents our model and the first-best benchmark. Section 3 analyzes equilibrium with moral hazard under a tough law. Section 4 considers the case of a soft law. Section 5 compares bankruptcy laws and investment subsidies. The conclusion, in Section 6, discusses the empirical and policy implications of our analysis. Proofs not given in the text are in the Appendix.

2. Model and First-Best Benchmark

2.1. The Environment

The basic model is in line with Holmström and Tirole (1997). There is a continuum of mass one of risk-neutral agents. Each agent has an investment project, requiring initial investment I. While all investment projects are identical, agents differ in terms of their initial wealth $A < I$. We denote by F the cumulative distribution function of wealth among the population

[6] In a similar vein, Biais and Recassens (2002) show that judicial corruption worsens credit rationing.

of agents, which is assumed to be continuously differentiable on $[0, I]$, with a density f that is bounded away from zero on this interval. To undertake the investment project, and thus become an entrepreneur, an agent with initial wealth A needs to raise outside funds $I - A$. Competitive risk-neutral outside financiers are willing to lend if they break even in expectation. For simplicity, their required rate of return is normalized to zero, and their participation constraint will be saturated in equilibrium. If a project is undertaken, it can yield a payoff R or zero. If an entrepreneur exerts effort by incurring a disutility e, then the probability that the payoff is R is p_H, while if he does not exert effort, the probability of success is lowered to $p_L = p_H - \Delta p$. Success or failure are independent across projects. Each entrepreneur is protected by limited liability.

Our model departs in two ways from Holmström and Tirole (1997). First, besides the investment I, each project also requires one unit of labor, which is purchased at price w on a competitive labor market.[7] The workers are agents that chose, or possibly were forced not to become entrepreneurs. (Self-employment is ruled out.) Supplying l units of labor entails a disutility $C(l)$. We assume that C is strictly increasing, strictly convex, twice continuously differentiable, and satisfies the usual Inada conditions $C(0) = 0$, $C'(0) = 0$ and $\lim_{l \to +\infty} C'(l) = +\infty$. Second, after the payoff of the investment is realized, a project can be continued or liquidated. In the latter case, liquidation proceeds L are obtained. If the project is continued, the entrepreneur obtains non-transferable private benefits B. It can be interpreted as the psychological benefit enjoyed by the entrepreneur when his firm is not liquidated. Non-transferable benefits from continuation would also arise in a dynamic extension of our model. In that context, they would reflect the expectation of the rents to be obtained by the entrepreneurs in the future. B can be understood as a reduced form representation of these future rents. We assume that $B \leq e/\Delta p$. This ensures that the maximum income that can be pledged to investors in case of success is less than R, which must be the case as B is non-transferable. We also assume that ex-post liquidation is inefficient in the sense that $B > L$. This ex-post inefficiency will play a key role in our model by generating a trade-off between the ex-ante and ex-post consequences of tough bankruptcy laws. Finally, a project has a negative net present value if the entrepreneur does not exert effort:

$$p_L R + B - I < 0, \tag{1}$$

and a positive net present value if the entrepreneur exerts effort and the project is not liquidated except perhaps in the bad state:

$$p_H(R + B) + (1 - p_H)L - e - I > 0. \tag{2}$$

2.2. Efficient Allocations without Moral Hazard

As a benchmark, we characterize the efficient allocations of agents into workers and entrepreneurs when entrepreneurial effort is contractible, so that there is no moral hazard

[7] By convention, wages are paid only conditional on a project being successful, and not upfront. This is without loss of generality given that agents are risk-neutral.

problem. For each project that is undertaken, it is efficient to exert high effort and not to liquidate. The first-best surplus from a project is then:

$$S^{FB} = p_H R + B - e - I.$$

In the absence of moral hazard constraints, only the total mass of workers, not their identity, matters for efficiency. To see this formally, let μ be the measure corresponding to the cumulative distribution function F. An efficient allocation is described by a measurable set of workers W and a measurable labor supply function l that solve:

$$\max_{W,l} \left\{ [1 - \mu(W)] S^{FB} - \int_W C(l(a))\, \mathrm{d}\mu(a) \right\}$$

subject to:

$$\int_W l(a)\, \mathrm{d}\mu(a) = 1 - \mu(W).$$

Because C is strictly convex, efficiency requires that all workers supply the same amount of labor. Specifically, we have the following proposition.

Proposition 1 *An efficient allocation is reached when there is a mass μ^{FB} of workers, and each worker supplies $l^{FB} = (1 - \mu^{FB})/\mu^{FB}$ units of labor, where:*

$$\mu^{FB}\left[S^{FB} + C(l^{FB})\right] = C'(l^{FB}). \tag{3}$$

A key implication of Proposition 1 is that the efficient proportion of workers, and thus the level of aggregate investment, does not depend on the distribution of wealth among agents. As shown in the next section, this property of first-best allocations no longer holds in the second-best environment.

2.3. Competitive Equilibrium without Moral Hazard

Absent any frictions, any efficient allocation can be decentralized in a competitive equilibrium. Specifically, given wage w, a typical worker solves:

$$\max_l \{p_H w l - C(l)\}.$$

Let $l^*(w)$ be the solution to this problem. Equilibrium requires that wages equal the marginal disutility of labor:

$$C'(l^*(w)) = p_H w. \tag{4}$$

The second equilibrium condition relates to occupational choices. It requests that the utility from becoming a worker equals that from becoming an entrepreneur:

$$p_H w l^*(w) - C(l^*(w)) = S^{FB} - p_H w. \tag{5}$$

Finally, the labor market clearing condition implies that, at the competitive equilibrium wage w^{CE}, individual labor supply is given by:

$$l^*(w^{CE}) = \frac{1-\mu^{CE}}{\mu^{CE}}, \tag{6}$$

where μ^{CE} is the total mass of workers in equilibrium. Using (4)-(6), we obtain that:

$$\mu^{CE}\left[S^{FB} + C(l^*(w^{CE}))\right] = C'(l^*(w^{CE})),$$

which is the clear counterpart of (3). It follows that $\mu^{CE} = \mu^{FB}$, as expected. The fact that the equilibrium proportion of workers is independent from the distribution of wealth reflects that gains from trade in (5) are independent of initial endowments.

As for efficient allocations, the identity of workers and entrepreneurs is irrelevant in equilibrium. However, it will be helpful for future reference to consider the case where agents who become workers are those with wealth below some cutoff $\hat{A}$, to be determined in equilibrium. Labor market clearing implies that individual labor supply is $(1 - F(\hat{A}))/F(\hat{A})$. The utility of a worker, as a function of $\hat{A}$, is then given by:

$$U_W(\hat{A}) = C'\left(\frac{1-F(\hat{A})}{F(\hat{A})}\right)\frac{1-F(\hat{A})}{F(\hat{A})} - C\left(\frac{1-F(\hat{A})}{F(\hat{A})}\right),$$

while the utility of an entrepreneur, as a function of $\hat{A}$, is given by:

$$U_E^{FB}(\hat{A}) = S^{FB} - C'\left(\frac{1-F(\hat{A})}{F(\hat{A})}\right).$$

The convexity of the cost function C implies that U_W is decreasing and U_E^{FB} is increasing. This reflects that, the more workers there are, the lower is the wage rate. The equilibrium value of $\hat{A}$, A^{FB}, is determined by the indifference condition $U_W(A^{FB}) = U_E^{FB}(A^{FB})$, and we have $\mu^{FB} = F(A^{FB})$. The competitive equilibrium in the first-best case is illustrated on Figure 1.

—Insert Figure 1 Here—

Again, while the equilibrium threshold of wealth below which agents become workers depends on the distribution of wealth, the total mass of workers does not.

3. Equilibrium with Moral Hazard and a Tough Bankruptcy Law

When entrepreneurial effort is not observable, agents cope with the resulting moral hazard problem by designing optimal financial contracts. These contracts must ensure that investors are ready to lend and entrepreneurs to exert effort. They rely on two instruments. First, a minimal amount of initial wealth may be required in order to grant funds, as in Holmström and Tirole (1997). Second, inefficient ex-post liquidation in case of failure may be used as an incentive to exert effort, as in Bolton and Scharfstein (1990). In this section we consider a tough bankruptcy law, which simply enforces the contracts. In the next section we will consider soft laws, interfering with the application of contracts.

3.1. The Credit Market

Consider an entrepreneur with wealth A. A financial contract stipulates a transfer ρ to the entrepreneur whenever the project succeeds, and a liquidation probability λ whenever the project fails.[8] Equivalently, λ could be thought of as the deterministic proportion of the firms' assets to be liquidated, leaving private benefits $(1-\lambda)B$ to the entrepreneur.[9] Given a wage rate w, the incentive compatibility constraint of the entrepreneur is:

$$p_H(\rho + B - w) + (1 - p_H)(1 - \lambda)B - e \geq p_L(\rho + B - w) + (1 - p_L)(1 - \lambda)B.$$

The left-hand side of this inequality is the expected utility the entrepreneur derives from the project if he exerts effort, and the right-hand side is his expected utility without effort. The incentive compatibility condition requires that the payoff to the entrepreneur in case of success, ρ, be at least as large as:

$$\frac{e}{\Delta p} + w - \lambda B.$$

Given a liquidation rate λ, the highest income in case of success that can be pledged to the investors without jeopardizing the entrepreneur's incentives is thus:

$$R + \lambda B - w - \frac{e}{\Delta p}.$$

Taking into account ex-post liquidation, the expected pledgeable income is then:

$$p_H\left(R - \frac{e}{\Delta p}\right) + \lambda[p_H B + (1 - p_H)L] - p_H w.$$

As usual, the expected pledgeable income is decreasing in $e/\Delta p$, which measures the severity of the moral hazard problem. More interestingly, the expected pledgeable income is increasing in λ. This reflects two effects. First, an increase in the liquidation rate raises the investors' revenue in case of failure. Second, it strengthens the incentives of the entrepreneur to exert effort in order to avoid liquidation.

[8] It is easy to check that it is never optimal to liquidate the project following a success, as doing so would result in a tighter incentive constraint for the entrepreneur.

[9] In practice, when borrowing firms enter financial distress, their files are managed by a specialized department of the lending bank, that has its own staff and procedures. Franks and Sussman (2000) offer an empirical analysis of the workings of such recovery units in several British banks. Committing to a given liquidation rate can be achieved by an appropriate specification of the objectives and procedures of the recovery unit.

We shall maintain in what follows that the minimum ex-wages pledgeable income is positive, so that agents with large initial wealth can raise funds without committing to liquidation:

$$p_H\left(R-\frac{e}{\Delta p}\right)>0. \tag{7}$$

We also assume that the maximum ex-wages pledgeable income is less than the level of investment expenditures, so that some initial wealth is required for investing:

$$p_H\left(R-\frac{e}{\Delta p}\right)+p_H B+(1-p_H)L<I. \tag{8}$$

In order for investors to break even, the expected pledgeable income must exceeds the investors' commitment:

$$p_H\left(R-\frac{e}{\Delta p}\right)+\lambda[p_H B+(1-p_H)L]-p_H w\geq I-A. \tag{9}$$

It follows that, given the wage rate w, an agent can obtain a loan with liquidation rate λ if and only if his initial wealth A is above the threshold level $A(\lambda,w)$, where:[10]

$$A(\lambda,w)=I-p_H\left(R-\frac{e}{\Delta p}\right)-\lambda[p_H B+(1-p_H)L]+p_H w.$$

Let $\lambda(A,w)$ be the optimal liquidation rate for an entrepreneur with wealth A, given wage w. Since liquidation is ex-post inefficient, it is optimal to keep the liquidation rate as low as possible. We therefore obtain two distinct financing regimes, outlined in the following proposition.

Proposition 2 *Given a wage rate w, only agents with wealth $A\geq A(1,w)$ can obtain a loan. Out of the agents who obtain a loan, those with wealth $A\geq A(0,w)$ are never liquidated in case of failure, while those with wealth $A(1,w)\leq A<A(0,w)$ are liquidated at a positive rate in case of failure.*

If $A<A(1,w)$, there is no value of the liquidation rate such that the participation constraint of the investors is satisfied. Agents with wealth below $A(1,w)$ have thus no other choice than to become workers. For agents with wealth $A\geq A(1,w)$, a larger initial wealth reduces the amount of external finance and thus the debt overhang. When $A\geq A(0,w)$, the optimal financial contract precludes liquidation in case of failure. Thus, while outside financiers obtain a share of the cash-flow in case of success, they cannot force liquidation in case of failure. This corresponds to external financing by minority shareholders. By contrast, the optimal

[10]The fact that a minimum amount of wealth is required to obtain a loan is directly in line with Holmström and Tirole (1997). It is also similar to the result by Bernanke and Gertler (1989) that the greater the net worth of the borrower, the lower the agency cost implied by the optimal contract.

contract when $A(1,w) \leq A < A(0,w)$ can be thought of as a debt contract. The optimal liquidation rate in that case is obtained whenever (9) is binding,

$$\lambda(A,w) = \frac{I - A - p_H(R - e/\Delta p) + p_H w}{p_H B + (1 - p_H)L}. \tag{10}$$

The larger the initial wealth of an entrepreneur, the smaller the optimal liquidation rate. As wealthy entrepreneurs need relatively little external finance, they need to pledge only limited revenues. As a consequence, they do not need to concede a large liquidation rate. Eventually, entrepreneurs with wealth $A \geq A(0,w)$ are never liquidated in case of failure, and therefore $\lambda(A,w) = 0$ for these agents.

3.2. Competitive Equilibrium

Given wage w, the utility of an agent with wealth $A \geq A(1,w)$ who decides to become an entrepreneur is given by:

$$S^{FB} - p_H w - \lambda(A,w)(1 - p_H)(B - L).$$

Since $B > L$ and $\lambda(A,w)$ is a decreasing function of A, the utility of an entrepreneur is an increasing function of his initial wealth, in contrast with the first-best. This reflects that, since wealthy entrepreneurs can avoid frequent liquidations, they avoid the corresponding welfare losses. In contrast, the utility from becoming a worker,

$$p_H w l^*(w) - C(l^*(w)),$$

is independent of wealth. Moreover, only agents with wealth above $A(1,w)$ can be financed. Thus, in a competitive equilibrium, those who choose, or are forced to become workers must be the poorest agents. Let $\hat{A}$ be the cutoff level of wealth below which an agent becomes a worker. Labor market clearing then implies that individual labor supply is $(1 - F(\hat{A}))/F(\hat{A})$. The wage rate w corresponding to $\hat{A}$ is given by the first-order condition (4). For this to be compatible with equilibrium in the credit market, it must be that:

$$\hat{A} \geq A\left(1, \frac{1}{p_H} C'\left(\frac{1 - F(\hat{A})}{F(\hat{A})}\right)\right), \tag{11}$$

otherwise the marginal agent with wealth $\hat{A}$ could not obtain a loan. It is not difficult to check that there exists some cutoff $\underline{A} \in (0, I)$ such that (11) holds if and only if $\hat{A} \geq \underline{A}$.[11] Intuitively, this represents the minimal amount of wealth required from the marginal agent to become an entrepreneur, taking into account the endogeneity of wages. Equivalently, this is

[11] Using the definition of $A(\lambda, w)$ together with the convexity of C, it is easy to verify that the right-hand side of (11) is decreasing in $\hat{A}$. The existence of $\underline{A}$ then follows directly from the positivity of the maximum ex-wages expected pledgeable income, together with the Inada conditions on C.

the amount of wealth for the marginal entrepreneur at which the maximal pledgeable income, as given by (8), is equal to the required funding:

$$p_H\left(R-\frac{e}{\Delta p}\right)+p_H B+(1-p_H)L-C'\left(\frac{1-F(\underline{A})}{F(\underline{A})}\right)=I-\underline{A}.$$

To complete the description of the equilibrium, we need only to determine the equilibrium value of $\hat{A}$. For this, we need to compare a worker's utility with the utility that the marginal agent with wealth $\hat{A}$ would obtain if he became an entrepreneur. To compute the latter, define, for any $\hat{A}\geq\underline{A}$,

$$\Lambda(\hat{A})=\lambda\left(\hat{A},\frac{1}{p_H}C'\left(\frac{1-F(\hat{A})}{F(\hat{A})}\right)\right). \tag{12}$$

This is the optimal liquidation rate for a marginal entrepreneur with wealth $\hat{A}$, given the labor market clearing wage rate. Note that, by construction, $\Lambda(\underline{A})=1$. If he becomes an entrepreneur, the utility of the marginal agent is therefore given by:

$$U_E^{SB}(\hat{A})=U_E^{FB}(\hat{A})-\Lambda(\hat{A})(1-p_H)(B-L).$$

It is easy to check from (10) and (12) that Λ is decreasing in $\hat{A}$, and thus that U_E^{SB} is increasing in $\hat{A}$. We then have the following proposition, whose proof is immediate.

Proposition 3 *There exists a unique competitive equilibrium, with the following properties*:

(i) If $U_E^{SB}(\underline{A})>U_W(\underline{A})$, there is credit rationing in equilibrium, and agents with initial wealth below $\underline{A}$ must become workers, while those with greater initial wealth prefer to become entrepreneurs;

(ii) If $U_E^{SB}(\underline{A})\leq U_W(\underline{A})$, there is no credit rationing in equilibrium. The agents who become workers are those with initial wealth below A^T, where $A^T\geq\underline{A}$ is the unique value of $\hat{A}$ such that $U_E^{SB}(\hat{A})=U_W(\hat{A})$.

If $U_E^{SB}(\underline{A})>U_W(\underline{A})$, then the competitive equilibrium with moral hazard exhibits quantity rationing in the sense that the marginal entrepreneur with wealth $\underline{A}$ obtains a strictly higher utility than the typical worker. Agents with wealth slightly below $\underline{A}$ would rather become entrepreneurs, but there is no way of satisfying simultaneously incentive compatibility and investors' participation for those agents, even if the liquidation rate in case of failure is set at its maximal value of one. A competitive equilibrium with rationing is shown on Figure 2.

—Insert Figure 2 Here—

Note that if $\hat{A}$ is large enough, the liquidation rate of the marginal entrepreneur vanishes and he obtains the same utility as in the first-best, $U_E^{SB}(\hat{A})=U_E^{FB}(\hat{A})$. Whenever there is rationing in equilibrium, the maximal ex-post liquidation rate is $\Lambda(\underline{A})=1$ by construction.

By contrast, if there is no rationing in equilibrium, the maximal ex-post liquidation rate is typically bounded away from one.

Contrary to what happens in the first-best environment, the distribution of wealth is a key factor in explaining the allocation of workers and entrepreneurs in equilibrium. Specifically, the following proposition holds.

Proposition 4 *Suppose that F_1 first-order stochastically dominates F_2. Then, if there is rationing under F_1, there is rationing under F_2. Moreover, the mass of workers in equilibrium is higher under F_2 than under F_1, and the minimal amount of wealth required to become an entrepreneur is higher under F_1 than under F_2.*

This proposition states that an overall increase in wealth reduces credit rationing. Bernanke and Gertler (1989), Kiyotaki and Moore (1997) and Suarez and Sussman (1997) show that credit market imperfections amplify business cycle fluctuations. The intuitive mechanism highlighted in these papers is that downturns in the business cycle reduce agents' net wealth which worsens credit rationing and thus depresses investment. Proposition 4 illustrates this idea, to the extent that a downturn in the business cycle leads to a stochastically dominated distribution of wealth. Our model brings an additional twist to this argument. Since downturns in business cycle worsen credit rationing, they reduce labor demand and increase labor supply. This reduces the income of the poorest agents in the economy, the wage earners. In a dynamic extension of our model, this would in turn reduce the initial wealth of these agents in the next period, and thus exacerbate the credit rationing problems they face.

3.3. The Uniform-Quadratic Example

We now present a simple example, in which some of the key variables in our model can be readily examined. This enables us in turn to conduct some comparative statics exercises. Specifically, suppose that the cost of labor is quadratic, $C(l) = cl^2/2$, and that the distribution of wealth is uniform over $[0, I]$, $F(A) = A/I$. By Proposition 1, the optimal mass of workers in the first-best is $\mu^{FB} = \sqrt{c/(2S^{FB} + c)}$. Intuitively, as c approaches zero, it becomes efficient to have as many entrepreneurs as possible in order to maximize total surplus. Let $P_{\max} \in (0, I)$ be the maximum ex-wages pledgeable income, that is:

$$P_{\max} = p_H\left(R - \frac{e}{\Delta p}\right) + p_H B + (1 - p_H)L.$$

In this simple case, we can solve explicitly for the minimum amount of wealth that the marginal entrepreneur must have:

$$\underline{A} = \frac{I - P_{\max} - c + \sqrt{(I - P_{\max} - c)^2 + 4cI}}{2}.$$

The greater the cost of labor c, the greater the minimum amount of wealth the marginal entrepreneur must have. In the limit case where c goes to zero, the minimum amount of wealth the marginal entrepreneur must have goes to $I - P_{\max}$. All agents with wealth below that threshold must be wage earners. Hence, in contrast with the first-best case, the mass of workers in the competitive equilibrium with moral hazard is bounded away from zero.

There is credit rationing whenever $U_E^{SB}(\underline{A}) > U_W(\underline{A})$. After some calculations, this condition can be rewritten as:

$$p_H(R+B) + (1-p_H)L - e - I > \frac{(P_{\max} - I + \underline{A})(I + \underline{A})}{2\underline{A}}. \tag{13}$$

By (2), the left-hand side of (13) is strictly positive. The right-hand side is increasing in $\underline{A}$. Whenever c is close to zero, $\underline{A}$ is close to $I - P_{\max}$, and the right-hand side of (13) is close to zero. Thus there will always be rationing in equilibrium when the cost of labor is low. The intuition is that efficiency calls then for a low proportion of workers with a high individual labor supply. The resulting high proportion of entrepreneurs is however not compatible with equilibrium in the credit market, due to the presence of entrepreneurial moral hazard. Whenever c is large, $\underline{A}$ is close to I, and the right-hand side of (13) is close to $P_{\max}$. From (1) and (7), one has $I > p_L e/\Delta p + B$, which implies that:

$$p_H(R+B) + (1-p_H)L - e - I < P_{\max}.$$

Thus there is no rationing in equilibrium if c is large enough. The financial regimes arising in equilibrium can be characterized as in the following proposition.

Proposition 5 *Suppose that the cost of labor is quadratic, $C(l) = cl^2/2$, and the distribution of wealth is uniform over $[0, I]$. Then, there is no rationing in equilibrium if the cost of labor is above a threshold $\underline{c}$, and the liquidation rate of the marginal entrepreneur in case of failure is a weakly decreasing function of c. Debt and equity coexist in equilibrium only whenever c is lower than a threshold $\bar{c} > \underline{c}$. For $c \geq \bar{c}$, all investment projects are equity financed.*

This result can be interpreted as follows. When the cost of labor is low, $c < \underline{c}$, productive efficiency requires that many agents should become entrepreneurs. For relatively poor agents, however, this contradicts incentive compatibility. Hence there is credit rationing. By contrast, when the cost of labor is relatively high, $c \geq \underline{c}$, productive efficiency calls for less investment. Consequently, there is no credit rationing. Two cases can then arise. If the cost of labor is not too high, $\bar{c} > c \geq \underline{c}$, there is still a relatively large proportion of agents who become entrepreneurs. The poorest of these agents have relatively little initial wealth to invest. In order to obtain funding they must commit to some liquidation in case of failure, i.e., they issue risky debt. By contrast, if the cost of labor is high enough, $c \geq \bar{c}$, then only a few investment projects should be undertaken. Thus, only the richest agents become entrepreneurs, and their projects are entirely equity financed.

This simple example allows to discuss the impact of labor productivity shocks. A positive shock implies that less hours of labor are needed to generate the same service. In our model, this corresponds to a decrease in c, which implies that one unit of labor service can be provided at a lower utility cost for the laborer. An increase in labor productivity should lead to an increase in investment. To achieve this, relatively less wealthy agents must obtain funding to become entrepreneurs. To access the credit market, however, these agents must commit to a relatively large liquidation rate. Hence, a positive productivity shock should increase the fraction of projects financed with risky debt. This corresponds to an increase in the average leverage of the economy. Bearing in mind that the firms in our sample are financially constrained, because they have limited wealth and face a moral hazard problem, our theoretical result is in line with the empirical finding by Korajczyk and Levy (2003) that, for financially constrained firms, leverage is pro-cyclical.

The link between financing and business cycles implied by Proposition 5 above is different from that analysed by Bernanke and Gertler (1989), Kiyotaki and Moore (1997), and Suarez and Sussman (1990). These papers analyze the link between past wealth creation and access to financing, in a context where debt is the unique optimal financial contract. The implication of Proposition 5 bears upon the link between productivity shocks, current wealth creation, and the structure of financing, in a context where debt or equity can be optimal.

4. Equilibrium with Moral Hazard and a Soft Bankruptcy Law

As discussed in the introduction, bankruptcy laws in many countries do not strictly enforce financial contracts. In contrast, they frequently force continuation of activity in cases where the existing contract requested liquidation. While such continuations are ex-post efficient, they worsen credit rationing ex-ante, as we discuss in the first part of this section. We then spell out the empirical implications of this analysis. Finally, we discuss the divergent political preferences of different citizens relative to the bankruptcy law and show that a soft law can maximize ex-ante social welfare.

4.1. Financial Contracts with a Soft Bankruptcy Law

When an entrepreneur is financed by debt, the optimal financial contract typically specifies a positive liquidation rate in case of failure. Under a soft bankruptcy law, however, courts can interfere with the application of the contract, and impose continuation. To model this process in the simplest possible way, we assume that, in the states in which the contract entails liquidation, the project is liquidated with probability π, while with probability $1-\pi$ the court overrules the contract and imposes continuation. Thus, when the financial contract states a nominal liquidation rate λ in case of failure, the actual liquidation rate is $\lambda\pi$. The parameter π can thus be seen as a measure of the toughness of the law: the higher it is, the tougher the law.

How do contracting parties react to this legal environment? Consider an agent endowed with wealth A. For a given wage w, the optimal liquidation rate for this agent is $\lambda(A, w)$. To obtain an actual liquidation rate equal to $\lambda(A, w)$, the agent must state in the contract a nominal liquidation rate $\lambda = \lambda(A, w)/\pi$. Since λ must be lower than one, the agent is actually able to secure his optimal liquidation rate if and only if $\lambda(A, w) \leq \pi$. Equivalently, the soft bankruptcy law constrains actual liquidation rates to be at most equal to π. We therefore obtain two distinct financing regimes, outlined in the following proposition.

Proposition 6 *Given a wage rate w, only agents with wealth $A \geq A(\pi, w)$ can obtain a loan. Out of the agents who demand a loan, those with wealth $A \geq A(0, w)$ are never liquidated in case of failure, while those with wealth $A(\pi, w) \leq A < A(0, w)$ are liquidated at a positive rate in case of failure.*

It should be noted that the actual liquidation rates for agents with wealth $A \geq A(\pi, w)$ remain the same as under a tough bankruptcy law. Thus the only impact of a soft bankruptcy law is to increase the minimum amount of wealth required to obtain a loan.

4.2. Competitive Equilibrium

Since the soft bankruptcy law constrains actual liquidation rates to be at most equal to π, the maximal pledgeable income is equal to:

$$p_H\left(R - \frac{e}{\Delta p}\right) + \pi[p_H B + (1 - p_H)L] - C'\left(\frac{1 - F(\hat{A})}{F(\hat{A})}\right).$$

This is lower than the maximum pledgeable income obtained for the tough law, reflecting the constraint on the liquidation rate. To characterize equilibrium in this context, we can proceed similarly to the tough law case. Define $\underline{A}(\pi)$ as the minimum amount of wealth for the marginal entrepreneur such that the maximal pledgeable income is larger than the required funding:[12]

$$p_H\left(R - \frac{e}{\Delta p}\right) + \pi[p_H B + (1 - p_H)L] - C'\left(\frac{1 - F(\underline{A}(\pi))}{F(\underline{A}(\pi))}\right) = I - \underline{A}(\pi).$$

Note that, reflecting the upper bound on the liquidation rate under the soft law, this cutoff level is higher than its tough law counterpart, $\underline{A}(\pi) > \underline{A}(1) = \underline{A}$. The utility of the marginal agent with wealth $\hat{A} \geq \underline{A}(\pi)$ is given by $U_E^{SB}(\hat{A})$ as before, since the actual liquidation rates for agents with initial wealth $\hat{A} \geq \underline{A}(\pi)$ are the same as under the tough bankruptcy law.[13] Hence the following proposition.

Proposition 7 *The following holds*:

(i) If $U_E^{SB}(\underline{A}(\pi)) > U_W(\underline{A}(\pi))$, there exists a unique competitive equilibrium in which the agents who become workers are those with initial wealth below $\underline{A}(\pi)$;

[12] Using the fact that the ex-wage minimum pledgeable income is positive, the existence of $\underline{A}(\pi)$ follows along similar lines as that of $\underline{A}$.

[13] Note in particular that, by construction, $\Lambda(\underline{A}(\pi)) = \pi$.

(ii) If $U_E^{SB}(\underline{A}(\pi)) \leq U_W(\underline{A}(\pi))$, there exists a unique competitive equilibrium in which the agents who become workers are those with initial wealth below A^T.

In Case (ii) there is no credit rationing. Thus, equilibrium and welfare are the same with a tough and with a soft law. This corresponds to the case where the maximum liquidation rate with a tough law is in equilibrium lower than π. Correspondingly, the constraint imposed by the soft law does not bind.

In Case (i) there is credit rationing. While the marginal entrepreneur with wealth $\underline{A}(\pi)$ obtains a strictly higher utility than workers, agents with initial wealth below $\underline{A}(\pi)$ cannot obtain a loan and thus are constrained to be wage earners. In that case, the maximal ex-post liquidation rate is π. Since $\underline{A}(\pi) > \underline{A}$, there is more credit rationing than under the tough law. In fact, a soft bankruptcy law can generate credit rationing in circumstances where none would be present with a tough law.

4.3. Empirical Implications

Our theoretical analysis generates a series of empirical implications for the variation of financial structures across countries with different bankruptcy laws.

First, soft bankruptcy laws reduce the scope for debt financing, consistently with the empirical results of La Porta et al. (1997).

Second, note that L can be interpreted as collateral. Pledging it to creditors, by committing to high liquidation rates, enhances access to credit. Soft laws, however, reduce the extent to which this can be achieved. Thus, our analysis implies that the positive impact of collateral for access to credit should be lower in countries with soft bankruptcy laws. It could be interesting to test this implication with firm level data from different countries, as that used by Giannetti (2000).

Third, soft laws depress investment, and thus labor demand and wages. In our simple model, aggregate profits before debt service are equal to:

$$[1 - F(\underline{A}(\pi))]\, p_H R,$$

while aggregate wage income is:

$$[1 - F(\underline{A}(\pi))]\, C'\left(\frac{1 - F(\underline{A}(\pi))}{F(\underline{A}(\pi))}\right).$$

Thus our theoretical analysis predicts that the ratio of aggregate profits to aggregate wages is higher in countries with soft laws.

Fourth, consider the situation where the law is soft and there is credit rationing. Given an equilibrium wage rate:

$$W(\pi) = \frac{1}{p_H}\, C'\left(\frac{1 - F(\underline{A}(\pi))}{F(\underline{A}(\pi))}\right),$$

the aggregate, economy-wide leverage ratio is:

$$\frac{\int_{\underline{A}(\pi)}^{A(0,W(\pi))} (I - A)\,\mathrm{d}F(A)}{\int_{A(0,W(\pi))}^{I} (I - A)\,\mathrm{d}F(A)}.$$

The numerator is the total value of debt in the economy. The denominator is the total value of outside equity. In this context, consider the effect of an increase in the toughness of the law. This increase in π yields a decrease in $\underline{A}(\pi)$, which tends to raise the numerator, reflecting greater access to debt financing. The increase in π also yields an increase in $A(0, W(\pi))$ through an increase in wages. This further contributes to increasing the numerator, and also reduces the denominator. Indeed, greater wages tend to reduce the pledgeable income, and thus make it more difficult to finance projects through equity. Overall, we obtain that an increase in π triggers an increase in the leverage ratio. Thus, our analysis yields the new empirical implication that, in a cross section of countries, the aggregate leverage ratio should be positively correlated with the toughness of the law.

4.4. Political Preferences

The goal of this subsection is to characterize the preferences of agents over the softness of the law. The space of possible policies is $[0, 1]$, and each element $\pi \in [0, 1]$ represents the probability with which the courts will enforce financial contracts when they call for liquidation. We shall focus on the case in which there is no credit rationing under the tough law, $U_E^{SB}(\underline{A}) \leq U_W(\underline{A})$, and the marginal entrepreneur is liquidated at a positive rate $\lambda^T = \underline{A}^{-1}(A^T)$ in case of failure, $A^T < \underline{A}(0)$. Then any law $\pi \geq \lambda^T$ is actually equivalent to the tough law, calling for strict enforcement of contract. Hence, in this case, there is no rationing in equilibrium, and the agents who become workers are those with wealth below A^T. Since all agents are indifferent between all policies $\pi \in [\lambda^T, 1]$, there is no loss of generality in restricting the policy space to $[0, \lambda^T]$. On the other hand, if the bankruptcy law involves a maximum liquidation rate $\pi < \lambda^T$, then strict enforcement of financial contracts is precluded. With such a law there will be credit rationing. Agents with wealth below $\underline{A}(\pi) > A^T$ are constrained to be wage earners. In this context, three different types of agents must be considered.

Poor Agents. Consider first the case of an agent with wealth $A \leq A^T$. Irrespective of the bankruptcy law, this agent has no other choice than to become a worker and obtain a utility $U_W(\underline{A}(\pi))$. This is is increasing in π, the toughness of the law. Indeed, wage earners benefit from tough laws, which facilitate firm creation and investment, and result in higher labor demand and higher wages. Thus poor agents favor the toughest bankruptcy law, $\pi = \lambda^T$, calling for full enforcement of contracts.

Rich Agents. Consider next the opposite case of an agent with wealth $A \geq \underline{A}(0)$. Irrespective of the bankruptcy law, this agent will become an entrepreneur, and will never be liquidated in equilibrium. (He does not want to become a wage earner, since his utility as an entrepreneur is greater than that of the marginal agent $U^{SB}(\underline{A}(\pi))$, which is greater than the utility $U_W(\underline{A}(\pi))$ of a worker for any $\pi \in [0, \lambda^T]$.) The payoff of this agent for a given bankruptcy law π is:

$$S^{FB} - p_H W(\pi),$$

which is decreasing in π. Intuitively, an agent who is never credit rationed always benefit from lower firm creation, as it reduces the competition for labor and lowers the wages. Thus rich agents do not favor a strict enforcement of financial contracts. They want the law to be as soft as possible, $\pi = 0$.

Intermediate Agents. Consider finally the intermediate case of an agent with wealth $A^T < A < \underline{A}(0)$. Then there exists a degree of toughness of the law, $\pi_A \in (0, \lambda^T)$, such that the agent is just rich enough to have access to credit, $A = \underline{A}(\pi_A)$. If a softer bankruptcy law $\pi < \pi_A$ is enforced, then in equilibrium, this agent will be forced to become a wage earner. In that case, his payoff is $U_W(\underline{A}(\pi))$, which increases on $[0, \pi_A)$. In contrast, if a tougher bankruptcy law $\pi \geq \pi_A$ is enforced, then in equilibrium, this agent will become an entrepreneur. In that case, his expected utility is:

$$S^{FB} - p_H W(\pi) - \lambda(A, W(\pi))(1 - p_H)(B - L),$$

which is decreasing in π. Note that, as $U_E^{SB}(\underline{A}(\pi_A)) > U_W(\underline{A}(\pi_A))$, there is an upward discontinuity in the payoff of the agent at the point π_A where he can become an entrepreneur. The fact that the payoff is decreasing on $[\pi_A, \lambda^T]$ simply reflects that, conditional on becoming an entrepreneur, this agent prefers that as few as possible other agents become entrepreneurs, in order to benefit from lower wages. His payoff is maximal whenever $\pi = \pi_A$, and all agents who are poorer than himself become workers. Thus agents with intermediate level of wealth A always favor an intermediate bankruptcy law, $\pi = \pi_A$.

These results are in line with Rajan and Zingales (2003), who argue that incumbent firms that do not rely much on external capital markets to finance their projects extract a rent from a financial system that is underdeveloped in the sense that it does not strictly enforce financial contracts. By enhancing competition over labor and by thus increasing wages, a tough bankruptcy law leads to lower profits for those agents that are rich enough to enjoy a privileged access to finance. This implies that rich agents have a vested interest in preventing the enactment of tough bankruptcy laws that would allow newcomers to enter.

A key observation is that, because of the conflict of interest between the rich and the poor, the different bankruptcy laws are not comparable in the Pareto sense. So there is no clear efficiency reason why any particular bankruptcy law should be enforced. In the remaining of this section, we shall consider two procedures by which a bankruptcy law could be decided upon, namely voting and maximization of ex-ante social welfare.

Remark. Of course, the fact that workers prefer a tough law hinges on the assumption that they do not incur costs from liquidation ex-post. As suggested by Pagano and Volpin (2001), such costs could arise because workers must invest in firm-specific human capital. Our model can be extended to accommodate a fixed liquidation cost κ for workers. Assume for simplicity that wages are set in the labor market under a veil of ignorance, i.e., before workers know the specific liquidation rates of the firms in which they work. Then, given a law $\pi \in [0, \lambda^T]$, a typical worker solves:

$$\max_l \left\{ p_H W(\pi) l - C(l) - (1 - p_H)\kappa \, \frac{\int_{\underline{A}(\pi)}^{A(0)} \lambda(A, W(\pi)) \, \mathrm{d}F(A)}{\int_{\underline{A}(\pi)}^{I} \mathrm{d}F(A)} \right\}.$$

The last term in this objective function is the expected liquidation cost for the worker. As it is independent of l, it does not affect labor supply, and thus equilibrium wages and investment. By contrast, it affects the workers' political preferences. Indeed, if κ is high enough, they will typically favor an intermediate law that trades off the ex-post liquidation costs and the positive wage impact of firm creation. If κ is low, they will still favor the tough bankruptcy law, and the analysis is unaffected. We focus on the case where the liquidation costs are entirely borne by entrepreneurs, and thus $\kappa = 0$, in order to abstract from any externality on third parties that would not be directly linked to financial contracting.

4.5. Voting on the Bankruptcy Law

The upshot of the previous discussion is that all agents have single-peaked preferences with respect to the toughness of the law, as measured by $\pi \in [0, \lambda^T]$. This implies that the Median Voter Theorem applies, and thus the policy π^{MV} favored by the median agent cannot be defeated under majority voting by any other alternative.[14] In particular, if the proportion of poor agents is high enough, $F(A^T) > 1/2$, the bankruptcy law that emerges from majority voting is tough, $\pi^{MV} = \lambda^T$. For instance, in the uniform-quadratic example, it is easy to check that this will occur if c is sufficiently large.

It is unclear, however, that majority voting adequately reflects the procedure by which laws are enacted in practice. As discussed by Benabou (2000), relatively poor citizens have less influence on the political process than relatively rich citizens. In line with empirical results from Rosenstone and Hansen (1993), Benabou notes that the poorest 16% account for only 12.2% of the votes and 4% of the number of campaign contributors. In contrast the richest 5% account for 6.4% of the votes and 16.3% of the contributors. As noted by Benabou (2000), for campaign contributions the figure understates the bias, since the data reflects only the number of contributions and not their amounts. It should also be emphasized that, regarding lobbying and political contributions, small entrepreneurs are in a particularly difficult position, as the limited financial resources they have must be used in order to pledge income to outside financiers and thus cannot be used for political contributions.

This discussion points at an empirical implication of our analysis: the greater the weight of the relatively rich agents in the political process, the softer the bankruptcy law is expected

[14] If workers incur a desutility in case of liquidation, the preferences of agents with intermediate levels of wealth are no longer single-peaked, and the Median Voter Theorem does not apply any more.

to be. To measure the degree of toughness of the law one could use the index of creditors' rights proposed by La Porta et al. (1998). To measure the weight of the rich in the political process, one could rely on the representation ratio discussed by Benabou (2000).

To model the link between wealth and political influence, we follow Benabou (2000). Given a weighting function g, let the proportion of votes cast by agents with wealth less than $\hat{A}$ be given by $G(\hat{A})/G(I)$, where:

$$G(\hat{A}) = \int_0^{\hat{A}} g(A)\,\mathrm{d}F(A).$$

Given the fact that preferences are single-peaked and that the preferred policy is monotonic in wealth, with wealthier agents preferring a lower level of π, it is easy to check that the agent with wealth A^P given by $G(A^P)/G(I) = 1/2$ is pivotal. For instance, suppose that F is uniform over $[0, I]$, $F(A) = A/I$, and consider a power weighting function $g_\gamma(A) = A^\gamma$, where $\gamma > -1$. The case $\gamma = 0$ corresponds to the standard median voter situation, whereas $\gamma > 0$ corresponds to a situation in which the rich have more political influence than the poor. In that case, the pivotal agent has wealth $A^P = I/2^{1/(\gamma+1)}$, which is higher than the median voter wealth $I/2$. Everything happens as if there were majority voting and the distribution of wealth were shifted toward $F_\gamma(A) = (A/I)^{\gamma+1}$, and thus in favor of the rich. In that case, a soft bankruptcy law may emerge, even if the proportion of the poor is greater than 1/2.

4.6. The Welfare Maximizing Bankruptcy Law

We now turn to the case where the bankruptcy law is chosen by a benevolent social planner so as to maximize ex-ante social welfare. A soft bankruptcy law typically generates more rationing than the tough law in which contracts are perfectly enforced. Therefore less investment takes place under a soft than under a tough bankruptcy law. This does not mean, however, that the tough bankruptcy law always maximizes social welfare. Indeed, a soft bankruptcy law reduces wages, and thus relaxes the pressure on entrepreneurs with intermediate levels of wealth by reducing their equilibrium rates of liquidation in case of failure. This in turn limits the efficiency losses from liquidation.

To see this, let us suppose as above that there is no rationing under a tough law, so that the wage earners are the agents with wealth below A^T, and that debt and equity coexist in equilibrium, so that the marginal entrepreneur is liquidated at a positive rate $\lambda^T = \underline{A}^{-1}(A^T)$ in case of failure. We evaluate the impact on social welfare of decreasing the maximum liquidation rate from its equilibrium value λ^T under the tough law. Social welfare under a soft law with maximum liquidation rate $\pi < \lambda^T$ is equal to:

$$SW(\underline{A}(\pi)) = [1 - F(\underline{A}(\pi))]S^{FB} - F(\underline{A}(\pi))\,C\left(\frac{1 - F(\underline{A}(\pi))}{F(\underline{A}(\pi))}\right) \\ - \int_{\underline{A}(\pi)}^{A(0,W(\pi))} \lambda(A, W(\pi))(1 - p_H)(B - L)\,\mathrm{d}F(A).$$

The first two terms in this expression reflect the first-best surplus corresponding to a marginal entrepreneur with wealth $\underline{A}(\pi)$. The last term corresponds to the average cost of liquidation supported by entrepreneurs with wealth between $\underline{A}(\pi)$ and $A(0, W(\pi))$ who finance their projects by issuing debt. Using the definitions of U_E^{SB}, U_W, and $\underline{A}(\pi)$, one can verify that:

$$
\begin{aligned}
SW'(\underline{A}(\pi)) &= -f(\underline{A}(\pi))\left[U_E^{SB}(\underline{A}(\pi)) - U_W(\underline{A}(\pi))\right] \\
&\quad + \left[F(A(0, W(\pi))) - F(\underline{A}(\pi))\right] \frac{(1-p_H)(B-L)}{p_H B + (1-p_H)L}\, C''\left(\frac{1 - F(\underline{A}(\pi))}{F(\underline{A}(\pi))}\right) \frac{f(\underline{A}(\pi))}{F^2(\underline{A}(\pi))}. \qquad (14)
\end{aligned}
$$

Recalling that an increase in $\underline{A}(\pi)$ corresponds to a reduction of π, this expression has a natural interpretation. The first term on the right-hand side of (14) represents the loss of surplus generated by a soft law. It is proportional to the difference between the utility of the marginal entrepreneur with wealth $\underline{A}(\pi)$ and that of a worker, which is positive as $\pi < \lambda^T$. Since C is strictly convex, the second term is positive and represents the gain in surplus generated by a soft law. It is proportional to $F(A(0, W(\pi))) - F(\underline{A}(\pi))$, the mass of entrepreneurs who are liquidated at a positive rate in case of failure. For these entrepreneurs, a decrease in π, and thus an increase in $\underline{A}(\pi)$, has a positive impact on their utility since it lowers the wage, and thus their liquidation rates. The corresponding effect on wages is:

$$
p_H \frac{\mathrm{d}W(\pi)}{\mathrm{d}\underline{A}(\pi)} = -C''\left(\frac{1 - F(\underline{A}(\pi))}{F(\underline{A}(\pi))}\right) \frac{f(\underline{A}(\pi))}{F^2(\underline{A}(\pi))}.
$$

In other terms, the marginal entrepreneur exerts an externality by increasing wages and thus the liquidation rates of the mass $F(A(0, W(\pi))) - F(\underline{A}(\pi))$ of entrepreneurs who finance their projects with debt.

We are now ready to characterize the welfare maximizing degree of softness of the law, π^*. From the expression for $SW'(\underline{A}(\pi))$, it is clear that slightly lowering the maximum liquidation rate from λ^T has only a negligible cost, as $U_E^{SB}(\underline{A}(\lambda^T)) = U_W(\underline{A}(\lambda^T))$ by construction. This reflects that the contribution to social welfare of the marginal entrepreneur is negligible, precisely because there is no rationing in the initial situation. However, the efficiency gains of lowering π from λ^T are strictly positive. It therefore follows that $SW'(\underline{A}(\lambda^T)) > 0$. Symmetrically, it is easy to see that $SW'(\underline{A}(0)) < 0$, which reflects the fact that if liquidation is completely prohibited, the positive impact of a soft law on social welfare vanishes as debt financing is no longer an option. (This last point remains true whatever the nature of equilibrium under the tough law.) Hence the following proposition.

Proposition 8 *If there is no rationing and debt and equity coexist in equilibrium under the tough law, the welfare maximizing bankruptcy law is soft and calls for some rationing in equilibrium,* $0 < \pi^* < \lambda^T$.

Thus some rationing may be welfare improving, and a soft bankruptcy law can be used as a means to achieve this objective. In particular, from a utilitarian viewpoint, freedom of contracting can be harmful, and interference with the enforcement of contracts beneficial. It should be noted that this result relies only on two ingredients: the existence of a moral hazard problem in the credit market, and the endogeneity of wages. The externality that is corrected by a soft bankruptcy law is endogenous, since it would not occur in the absence of moral hazard, and it does not follow from assuming that the lenders' liquidation rights stand in conflict with the public interest, as when liquidation implies costs for society as a whole. Note in particular that the positive impact of soft bankruptcy laws is even more pronounced if workers also incur a desutility ex-post in case the firm they are employed in is liquidated. By setting the workers' cost of liquidation to zero, we put ourselves in the worst possible scenario for the optimality of soft laws from a welfarist point of view.

The optimality of a soft law relies on the assumption that there is no rationing under the tough law. By continuity, this result remains true if there is little rationing under the tough law, i.e., if the difference $U_E^{SB}(\underline{A}) - U_W(\underline{A})$ is small. In the uniform-quadratic example, this holds whenever c is close to but smaller than $\underline{c}$. If this is not the case, then the comparison between the positive and negative impacts of a soft law becomes ambiguous, because the social welfare loss associated to making the marginal entrepreneur a worker is no longer negligible. It can be shown that the welfare maximizing law is tough whenever c is close enough to zero. In that case, the externality generated by the marginal entrepreneur on debt holders is of a small magnitude, because the cost of labor is low, and it is therefore optimal to perfectly enforce the contracts.

5. Investment Subsidies

We have so far focused on the economic consequences of bankruptcy laws. However, these laws are not the only means by which policy makers can affect investment and welfare. Taxation is an obvious alternative. Since entrepreneurs are financially constrained, a natural fiscal policy consists to tax workers in order to subsidize investment. We focus on the case where the bankruptcy law is tough, and a tax is imposed on labor and redistributed to entrepreneurs in the form of a uniform investment subsidy. We consider a lump-sum tax to minimize distortionary effects. The welfare implications of such a tax are not obvious a priori. To the extent that it stimulates investment, it induces job creation and thus higher wages. It turns out that while entrepreneurs benefit from a small investment subsidy, the increase in wages is not strong enough to compensate workers for the tax burden. Finally, we show that the welfare maximizing investment subsidy is strictly positive, and that the bankruptcy law may be a more effective instrument than investment subsidies from a welfarist point of view.

5.1. Financial Contracts with Investment Subsidies

The direct impact of an investment subsidy is to lower the cash outlay necessary for investment. Given an investment subsidy s and a wage rate w, an agent can obtain a loan with liquidation rate λ if and only if his initial wealth A is above the threshold level $\mathcal{A}(\lambda, w, s) =$

$A(\lambda, w) - s$. Proceeding as in Sections 3 and 4, we obtain two distinct financing regimes, outlined in the following proposition.

Proposition 9 *Given a wage rate w, and an investment subsidy s, only agents with wealth $A \geq \mathcal{A}(1, w, s)$ can obtain a loan. Out of the agents who obtain a loan, those with wealth $A \geq \mathcal{A}(0, w, s)$ are never liquidated in case of failure, while those with wealth $\mathcal{A}(1, w, s) \leq A < \mathcal{A}(0, w, s)$ are liquidated at a positive rate in case of failure.*

By analogy with (10), the optimal liquidation rate in case of failure for agents with wealth $\mathcal{A}(1, w, s) \leq A < \mathcal{A}(0, w, s)$ is $\ell(A, w, s) = \lambda(A, w) - s/[p_H B + (1 - p_H)L]$. Subsidies relax financial constraints and thus $\ell(A, w, s) < \lambda(A, w)$.

5.2. Competitive Equilibrium

Since the bankruptcy law is tough, the maximum ex-wages pledgeable income is the same as in Section 3. As in the previous sections, we first need to define the minimum level of wealth below which no agent can become an entrepreneur in equilibrium. Accordingly, let $\underline{\mathcal{A}}(s)$ be the minimum level of wealth for the marginal entrepreneur such that the maximal pledgeable income is larger than the required funding. This is computed like $\underline{A}$, with $I - s$ instead of I. It is easy to check that $\underline{\mathcal{A}}(s)$ is decreasing in s, reflecting that investment subsidies allow an easier access to external funding. To characterize the equilibrium, we need to compare a worker's utility with the utility that the marginal agent with wealth $\hat{A}$ would obtain if he became an entrepreneur. To compute the latter, define, for any $\hat{A} \geq \underline{\mathcal{A}}(s)$,

$$\mathcal{L}(\hat{A}, s) = \ell\left(\hat{A}, \frac{1}{p_H} C'\left(\frac{1 - F(\hat{A})}{F(\hat{A})}\right), s\right).$$

This is the optimal liquidation rate for a marginal entrepreneur with wealth $\hat{A}$, given the labor market clearing wage rate. Note that, by construction, $\mathcal{L}(\underline{\mathcal{A}}(s), s) = 1$. If he becomes an entrepreneur, the utility of the marginal agent is therefore given by:

$$\mathcal{U}_E^{SB}(\hat{A}, s) = U_E^{FB}(\hat{A}) + s - \mathcal{L}(\hat{A}, s)(1 - p_H)(B - L).$$

Note that, for an entrepreneur who finances his project with debt, the actual, or shadow value of an additional unit of subsidy is $1 + (1 - p_H)(B - L)/[p_H B + (1 - p_H)L] > 1$. Thus subsidies have a multiplicative effect. This reflects that they relax a firm's financial constraint by reducing its liquidation rate in case of failure. Budget balance requires that the lump-sum tax on labor be given by $s[1 - F(\hat{A})]/F(\hat{A})$. The utility of a worker is therefore:

$$\mathcal{U}_W(\hat{A}, s) = U_W(\hat{A}) - s\,\frac{1 - F(\hat{A})}{F(\hat{A})}. \tag{15}$$

Throughout this section, we assume that s is small enough, so that the individual rationality constraint of the workers is satisfied in equilibrium. Using the fact that $\mathcal{U}_W(\hat{A}, s) < 0$ for $\hat{A}$ close enough to one, we obtain the following proposition.

Proposition 10 *The following holds*:

(i) *If $\mathcal{U}_E^{SB}(\underline{\mathcal{A}}(s), s) > \mathcal{U}_W(\underline{\mathcal{A}}(s), s)$, there exists a unique competitive equilibrium in which the agents who become workers are those with initial wealth below $\underline{\mathcal{A}}(s)$;*

(ii) *If $\mathcal{U}_E^{SB}(\underline{\mathcal{A}}(s), s) \leq \mathcal{U}_W(\underline{\mathcal{A}}(s), s)$, there exists a unique competitive equilibrium in which the agents who become workers are those with initial wealth below $\mathcal{A}^T(s)$, where $\mathcal{A}^T(s) \geq \underline{\mathcal{A}}(s)$ is the unique value of $\hat{A}$ such that $\mathcal{U}_E^{SB}(\hat{A}, s) = \mathcal{U}_W(\hat{A}, s)$.*

An increase in s reduces both $\underline{\mathcal{A}}(s)$ and $\mathcal{A}^T(s)$ and thus increases the proportion of agents who become entrepreneurs. In particular, investment subsidies reduce the scope for credit rationing. This raises wages and thus lowers the ratio of aggregate profits to aggregate wages. It is more difficult to assess the impact of an investment subsidy on aggregate leverage. Poorer agents can obtain a loan, and rely on risky debt to finance their projects. For richer entrepreneurs, the impact of an investment subsidy on the financial structure is twofold. On one hand, it relaxes their financial constraint, which favors equity finance. On the other hand, the resulting increase in wages tightens the financial constraint, which favors debt finance. In the uniform-quadratic example, a small investment subsidy increases the proportion of projects that are financed by equity. As a result, the impact of an investment subsidy on aggregate leverage is ambiguous.

5.3. Political Preferences

We now study the preferences of agents over fiscal policies. These can take the form of an investment subsidy, $s > 0$, or an investment tax, $s < 0$. It is convenient to think of s as being small, although some of our results hold more generally. Also, for simplicity, we mainly focus on the uniform-quadratic example, as well as on parameter values such that there is no rationing and debt and equity coexist in equilibrium.

Workers. The impact of an investment subsidy on the utility of a worker is twofold. On one hand, there is a direct negative impact due to the lump-sum tax on labor. On the other hand, an investment subsidy raises investment and labor demand, and thus tends to increase wages. We have the following result.

Proposition 11 *Suppose that the cost of labor is quadratic, $C(l) = cl^2/2$, and the distribution of wealth is uniform over $[0, I]$. Then, if there is no rationing and debt and equity coexist in equilibrium under the tough law, workers always suffer from an investment subsidy.*

This result stands in stark contrast with those of Subsection 4.4. When workers have to decide on the bankruptcy law, they always favor a tough law, because it maximizes firm creation and thus labor demand, and increases wages. But whenever they have to decide on a fiscal policy, they would rather tax capital than labor, even if such a policy tends to reduce job creation and wages.

That workers suffer from investment subsidies remains true, independently of the specific form of the cost function and the distribution of wealth, when there is credit rationing. Recall that, by definition, $\underline{A}(s)$ is the wealth level such that the maximum pledgeable income is equal to the outside financing need. The corresponding investment subsidy is thus given by:

$$s = I - P_{\max} - \underline{A}(s) + C'\left(\frac{1 - F(\underline{A}(s))}{F(\underline{A}(s))}\right).$$

Inserting this in (15), one obtains that the utility of the workers in an equilibrium with rationing is given by:

$$[P_{\max} - I + \underline{A}(s)] \frac{1 - F(\underline{A}(s))}{F(\underline{A}(s))} - C\left(\frac{1 - F(\underline{A}(s))}{F(\underline{A}(s))}\right).$$

Note that this depends on s only through $\underline{A}(s)$. The derivative with respect to $\underline{A}(s)$ is:

$$\frac{1 - F(\underline{A}(s))}{F(\underline{A}(s))} + s\,\frac{f(\underline{A}(s))}{F^2(\underline{A}(s))}, \tag{16}$$

which is positive for any $s > 0$. As $\underline{A}(s)$ is decreasing in s, this implies that workers prefer taxing capital and thereby tightening financial constraints, rather than taxing labor and subsidizing investment. The first term in (16) is the gain for each worker from reducing the subsidy s by one dollar, holding the tax base constant. The second term is the gain for each worker from increasing the tax base, holding the subsidy s constant.

Entrepreneurs. As for workers, the impact of an investment subsidy on the utility of an entrepreneur is twofold. On one hand, there is a direct positive impact as a subsidy reduces the need for outside funds. On the other hand, a subsidy raises wages, which tightens the financial constraint. We have the following result.

Proposition 12 *Suppose that the cost of labor is quadratic, $C(l) = cl^2/2$, and the distribution of wealth is uniform over $[0, I]$. Then, if there is no rationing and debt and equity coexist in equilibrium under the tough law, entrepreneurs benefit from a small investment subsidy.*

Again, this result stands in stark contrast with those of Subsection 4.4. When entrepreneurs have to decide on the bankruptcy law, they always favor some form of soft law—although they disagree on its optimal degree of softness—because it reduces the competition for labor, and thus decreases wages. But when they have to decide on a fiscal policy, all entrepreneurs with wealth $A \geq A^T$ benefit from a small investment subsidy, and their objectives are perfectly aligned. It should be noted that an investment subsidy has a positive impact on entrepreneurs only if it is not too large. Otherwise, the negative wage impact may offset the positive impact of the subsidy.

As for bankruptcy laws, there is no Pareto improving way of redistributing wealth from workers to entrepreneurs, and thus no consensus among agents on the optimal fiscal policy. We shall now investigate the optimal financial policy from the perspective of a benevolent social planner who seeks to maximize ex-ante social welfare.

5.4. *The Welfare Maximizing Investment Subsidy*

The impact of an investment subsidy on ex-ante social welfare is complex, as it both relaxes the financial constraints and increases wages. Suppose as above that there is no rationing under a tough law and no subsidy, and that debt and equity coexist in equilibrium, so that the marginal entrepreneur is liquidated at a rate $\lambda^T = \underline{A}^{-1}(A^T) = \underline{A}^{-1}(\mathcal{A}^T(0))$ in case of failure. We want to evaluate the impact on welfare of a small investment subsidy $s > 0$. Let us denote by:

$$\mathcal{W}(s) = \frac{1}{p_H}\, C'\biggl(\frac{1 - F(\mathcal{A}^T(s))}{F(\mathcal{A}^T(s))}\biggr)$$

the equilibrium wage rate given the subsidy s. Social welfare is equal to:

$$\begin{aligned}\mathcal{SW}(\mathcal{A}^T(s)) = \bigl[1 - F(\mathcal{A}^T(s))\bigr] S^{FB} - F(\mathcal{A}^T(s))\, C\biggl(\frac{1 - F(\mathcal{A}^T(s))}{F(\mathcal{A}^T(s))}\biggr)& \\ - \int_{\mathcal{A}^T(s)}^{\mathcal{A}(0,\mathcal{W}(s),s)} \ell(A, \mathcal{W}(s), s)(1 - p_H)(B - L)\,\mathrm{d}F(A).&\end{aligned}$$

The first two terms in this expression reflect the first-best surplus corresponding to a marginal entrepreneur with wealth $\mathcal{A}^T(s)$. The last term corresponds to the average cost of liquidation supported by entrepreneurs with wealth between $\mathcal{A}^T(s)$ and $A(0, \mathcal{W}(s), s)$ who finance their projects by issuing debt. Using the definitions of $\mathcal{U}_E^{SB}$, $\mathcal{U}_W$, and $\mathcal{A}^T(s)$, one can verify that:

$$\begin{aligned}\mathcal{SW}'(\mathcal{A}^T(s)) = F(\mathcal{A}^T(s))\, s\, \frac{f(\mathcal{A}^T(s))}{F^2(\mathcal{A}^T(s))}& \\ + \bigl[F(\mathcal{A}(0, \mathcal{W}(s), s)) - F(\mathcal{A}^T(s))\bigr] \frac{(1 - p_H)(B - L)}{p_H B + (1 - p_H)L}& \\ \times \biggl[\mathcal{S}^{T\prime}(\mathcal{A}^T(s)) + C''\biggl(\frac{1 - F(\mathcal{A}^T(s))}{F(\mathcal{A}^T(s))}\biggr) \frac{f(\mathcal{A}^T(s))}{F^2(\mathcal{A}^T(s))}\biggr],&\end{aligned} \tag{17}$$

where $\mathcal{S}^T$ is the inverse of $\mathcal{A}^T$. Recalling that an increase in $\mathcal{A}^T(s)$ corresponds to a reduction of s, this expression has a natural interpretation. The first term on the right-hand side of (17) represents the gain in surplus from extending the tax base, holding the subsidy constant. The second is proportional to $F(\mathcal{A}(0, \mathcal{W}(s), s)) - F(\mathcal{A}^T(s))$, the mass of entrepreneurs who are liquidated at a positive rate in case of failure, and is composed of two parts. The first corresponds to the direct effect of reducing the investment subsidy on the financial constraint of the entrepreneurs. The second corresponds to the indirect effect of reducing wages on the liquidation rates of agents who finance their projects by issuing debt, as in (14).

We are now ready to characterize the welfare maximizing fiscal policy, s^*, for the uniform-quadratic example. In that case, $\mathcal{SW}'(\mathcal{A}^T(0))$ is proportional to:

$$\mathcal{S}^{T\prime}(\mathcal{A}^T(0)) + C''\biggl(\frac{1 - F(\mathcal{A}^T(s))}{F(\mathcal{A}^T(0))}\biggr) \frac{f(\mathcal{A}^T(0))}{F^2(\mathcal{A}^T(0))} = \mathcal{S}^{T\prime}(\mathcal{A}^T(0)) + \frac{cI}{\mathcal{A}^T(0)^2},$$

which is easily checked to be negative as in the proof of Proposition 12. As $\mathcal{A}^T(s)$ is decreasing in s, it follows that a small investment subsidy increases social welfare. More generally, it is not difficult to prove that $\mathcal{SW}'(\mathcal{A}^T(s)) < 0$ for any $s < 0$, which yields the following proposition.

Proposition 13 *Suppose that the cost of labor is quadratic,* $C(l) = cl^2/2$*, and the distribution of wealth is uniform over* $[0, I]$*. Then, if there is no rationing and debt and equity coexist in equilibrium under the tough law, the welfare maximizing investment subsidy is strictly positive,* $s^* > 0$.

Thus the welfare maximizing fiscal policy and the welfare maximizing bankruptcy law work in opposite directions. While the latter restricts access to credit in order to minimize ex-post liquidation costs, the former expands access to credit in order to maximize investment. Workers are negatively affected in both cases.

5.5. Bankruptcy Laws versus Investment Subsidies

A natural question is whether bankruptcy laws are more effective than investment investment subsidies when it comes to maximizing social welfare. While they correspond to different instruments, the consequences of both policies for social welfare run through their impact on the population of entrepreneurs, summarized by the wealth of the marginal entrepreneur. As a benchmark, consider the laissez-faire policy, without investment subsidies and with a tough law that perfectly enforces contracts, as in Section 3. If there is no rationing in equilibrium, agents with wealth above A^T become entrepreneurs, while the others become workers. A soft law π depresses investment, and the wealth of the marginal entrepreneur goes up to $\underline{A}(\pi) > A^T$. By contrast, an investment subsidy s stimulates investment, and the wealth of the marginal investor goes down to $\underline{A}(s) < A^T$. By Propositions 8 and 13, social welfare is increased by softening slightly the bankruptcy law or by introducing some subsidies. Our goal is to compare the maximum welfare levels achieved by each kind of policy.

As it is difficult to answer this question in general, we only perform a local analysis in the case where the ex-post inefficiency of liquidation is small. Specifically, consider again the uniform-quadratic example, and start from a situation where $B - L = 0$. Using the notation of Proposition 5, it is then easy to check that for c close enough to, but smaller than $\bar{c}$, there is no rationing under the tough law in equilibrium, and the wealth of the marginal entrepreneur is equal to its first-best level $A^T(0) = I\sqrt{c/(2S^{FB} + c)}$. Assuming that $c < \bar{c}$ ensures that the marginal entrepreneur is liquidated at a positive rate in equilibrium, even if this does not affect social welfare as there is no ex-post cost of liquidation.

Now consider increasing $B - L$ while keeping $p_H B + (1 - p_H)L$ and thus $\underline{A}$ constant. Specifically, increase B by $(1 - p_H)\delta$ and decrease L by $p_H\delta$, so that $B - L = \delta > 0$. Under the tough law, the impact of this change in equilibrium is to lower the wealth of the marginal agent to $A^T(\delta) < A^T(0)$. Intuitively, this is because, at the margin, the increase in the surplus from investment is larger than the increase in the expected cost of liquidation. Moreover, for δ small enough, no credit rationing occurs. We then have the following result.

Proposition 14 *Suppose that the cost of labor is quadratic, $C(l) = cl^2/2$, and the distribution of wealth is uniform over $[0, I]$. Then, if there is no rationing and debt and equity coexist under the tough law for $B - L = 0$, the welfare maximizing bankruptcy law dominates the welfare maximizing fiscal policy for small values of $B - L$.*

This result is striking because it shows that, even if the ex-post costs from liquidation are small, a well-chosen bankruptcy law may dominate any fiscal policy that subsidizes investment by taxing labor. Investment subsidies, while they reduce the outside funding need, also reduce the pledgeable income by raising wages. When δ is small, the marginal effect of the subsidy on the financial constraint of entrepreneurs is almost entirely offset by the wage externality effect. Thus the positive impact of investment subsidies on welfare is lower than the positive impact on welfare of a soft bankruptcy law.

The intuition for these effects can be grasped by considering the benchmark situation in which $\delta = 0$. In this case, both soft bankruptcy laws and investment subsidies are detrimental to social welfare, since the first-best prevails under the laissez-faire policy. However, bankruptcy laws are less detrimental than investment subsidies in a first-order sense. That is, welfare decreases faster when the wealth of the marginal investor is lowered by some amount $h > 0$ by introducing investment subsidies, than when it is increased by the same amount by softening the law. Formally, denoting respectively by $SW(A, \delta)$ and $\mathcal{SW}(A, \delta)$ the expected social welfare with a soft bankruptcy law and with investment subsidies when the wealth of the marginal entrepreneur is A and the ex-post cost from liquidation is δ, one has:

$$\mathcal{SW}_1(A^T(0) - h, 0) + SW_1(A^T(0) + h, 0) > 0 \tag{18}$$

for any $h > 0$. As depicted on Figure 3, the slope of the compound welfare function obtained by pasting $\mathcal{SW}(A, 0)$ for $A < A^T(0)$ and $SW(A, 0)$ for $A > A^T(0)$ is thus larger in absolute value on the left of its maximum $A^T(0)$ than on its right.[15]

[15] To see this, note first that since we are by assumption in the first-best when $\delta = 0$, U_E^{SB} coincides with U_E^{FB} around $A^T(0)$. Thus the subsidy required to lower the wealth of the marginal entrepreneur to $A^T(0) - h$ is $[U_W(A^T(0) - h) - U_E^{FB}(A^T(0) - h)]F(A^T(0) - h)$. Using (14) and (17), and assuming that the distribution of wealth is uniform over $[0, I]$, one can check that $\mathcal{SW}_1(A^T(0) - h, 0) + SW_1(A^T(0) + h, 0)$ is given by:

$$\frac{1}{I}\Big[U_W(A^T(0) + h) - U_E^{FB}(A^T(0) + h) + U_W(A^T(0) - h) - U_E^{SB}(A^T(0) - h)\Big].$$

In the quadratic specification, the mapping $U_W - U_E^{FB}$ is strictly convex. (This holds more generally if C' is convex.) Hence we have:

$$\mathcal{SW}_1(A^T(0) - h, 0) + SW_1(A^T(0) + h, 0) > \frac{2}{I}\Big[U_W(A^T(0)) - U_E^{FB}(A^T(0))\Big] = 0,$$

where the last equality follows from the fact that the equilibrium allocation when $\delta = 0$ is first-best.

While (18) implies that investment subsidies are more damaging than soft laws when $\delta = 0$, what we want to prove is that the latter dominate the former for small but positive values of δ, i.e., that the maximum of $SW(A^T(\delta)+h,\delta)$ with respect to h is greater than the maximum of $\mathcal{SW}(A^T(\delta)-h,\delta)$ with respect to h. To establish this result, it is enough to prove that for δ close enough to zero, $SW_1(A^T(\delta)+h,\delta)+\mathcal{SW}_1(A^T(\delta)-h,\delta) > 0$ uniformly in h. As shown in the Appendix, this follows from (18) and an appropriate continuity argument.[16] The geometric intuition underlying the proof of Proposition 14 is illustrated on Figure 3.

—Insert Figure 3 Here—

6. Conclusion

This paper studies the impact of bankruptcy laws on investment and welfare when the credit market is imperfect, due to entrepreneurial moral hazard. Our analysis reveals a two-way link between the labor and the credit markets. On one hand, the credit market influences the labor market: more efficient credit markets increase investment, and thus labor demand and wages. On the other hand, the labor market influences the credit market: higher wages reduce the revenue that entrepreneurs can pledge to outside investors, which makes higher liquidation rates necessary, and thus increases the incidence of ex-post inefficient liquidations.

The results of our model are in line with the country level evidence offered by La Porta et al. (1997) and the firm level evidence offered by Giannetti (2000), suggesting that access to debt finance is reduced in countries with soft bankruptcy codes. Our theoretical analysis also delivers some new testable implications on the links between the softness of the law and (i) the consequences of collateral for access to credit, (ii) the average leverage in the economy, (iii) the ratio of total wage income to total profits, (iv) the amplification of business cycle fluctuations due to credit market imperfections. Our results also suggest that positive labor productivity shocks should lead to an increase in investment, associated with a shift of the average financial structure of the economy towards risky debt.

A key insight of the paper is that while soft bankruptcy laws that interfere with the enforcement of financial contracts typically worsen credit rationing, a tough law that merely enforces financial contracts does not necessarily maximize ex-ante social welfare. The reason is that, due to moral hazard, the contracts between certain parties exert externalities on other parties, reflecting general equilibrium effects. Specifically, switching to a somewhat soft law excludes some relatively poor entrepreneurs from the credit market, which lowers investment and thus wages. For richer agents, who still have access to credit, this decrease in wages increases pledgeable income, which in turn lowers the liquidation rates and the associated ex-post inefficiencies. As we have shown, investment subsidies are also welfare improving in our setup. However, by increasing investment and thus wages, they also exacerbate the wage

[16]The result does not follow immediately from (18), as $SW_1(A^T(0),0) = \mathcal{SW}_1(A^T(0),0) = 0$ and thus the first-order domination of bankruptcy laws vanishes as h goes to zero. One must therefore carefully analyze the second-order effects of both policies in the neighborhood of $h = 0$.

externality on entrepreneurs who finance their projects by issuing risky debt. As a result, even if the ex-post costs of liquidation are small, bankruptcy laws may be a more effective instrument than investment subsidies in terms of social welfare.

While our analysis sheds some light on the socially optimal bankruptcy law in an utilitarian sense, it also emphasizes that a soft law does not lead to a Pareto improvement compared to a tough law. Agents with different initial resources typically have different preferences towards the bankruptcy law. Hence different laws can be chosen in different countries, reflecting the political influence of the different social classes, and possibly at odds with social welfare. Rich agents who issue equity prefer soft laws, as they do not affect their ability to finance their projects, and lower the wage bill. Agents with intermediate levels of initial wealth who issue debt also prefer laws that exclude poorer agents from the credit market, as this reduces their liquidation rates in case of default. By contrast, workers should favor tough laws that stimulate investment, job creation, and wages.

While we have abstracted from worker-specific liquidation costs, such costs are likely to be significant in practice, because of the lack of mobility of the work force, or the necessity of firm-specific investment. In that case, workers will typically favor an intermediate law that protects them from inefficient liquidations while not lowering excessively investment and wages. In any case, taking these costs into account would tilt even more the balance in favor of soft laws and a certain degree of credit rationing. By contrast, an investment subsidy policy would become even less effective as it would increase substantially the social cost of liquidation. Our analysis shows that these effects are present even if workers are not affected by firms' financial distress, and the liquidation costs are entirely borne by entrepreneurs.

From a policy perspective, the fact that a tough bankruptcy laws does not necessarily maximize social welfare provides some justification for the adoption of soft laws. It should be noted, however, that this result hinges on our assumption that the courts that implement the law are efficient and honest. Corrupt judges could take advantage of the discretion granted by soft laws to demand bribes, e.g., by demanding a share of the liquidation proceeds in exchange for rulings in favor of liquidation. Such bribes would reduce the pledgeable income of the project, which would undermine the positive effect of soft laws. Thus, with corrupt judges, soft laws may be associated with low investment, low wages and larger inefficiencies (Biais and Recasens (2000)).

Appendix

Proof of Proposition 1. Let (W, l) be an optimal allocation. Suppose that l is not constant, and let $\hat{l} = [1 - \mu(W)]/\mu(W)$. The strict convexity of C together with Jensen's inequality implies that:

$$
\begin{aligned}
-\int_W C(l(a))\,\mathrm{d}\mu(a) \; &< \; -\mu\,(W)\,C\Big(\frac{1}{\mu(W)}\int_W l(a)\,\mathrm{d}\mu(a)\Big) \\
&= \; -\mu(W)\,C(\hat{l}),
\end{aligned}
$$

so the allocation $(W, \hat{l})$ would strictly dominate the allocation (W, l), a contradiction. Hence, in an optimal allocation, all workers supply the same amount of labor, $(1 - \mu)/\mu$, where μ is the total mass of workers. The optimal work force is obtained by solving:

$$
\max_{\mu} \Big\{ (1-\mu) S^{FB} - \mu C\Big(\frac{1-\mu}{\mu}\Big) \Big\}.
$$

Equation (3) is simply the first-order condition for this problem. ■

Proof of Proposition 4. Consider the cutoffs $\underline{A}_1$ and $\underline{A}_2$ corresponding respectively to F_1 and F_2. We first prove that $\underline{A}_1 \geq \underline{A}_2$ and $F_1(\underline{A}_1) \leq F_2(\underline{A}_2)$. As for the first point, simply observe that, for each $i = 1, 2$, $\underline{A}_i$ is obtained as the solution to:

$$
C'(F_i(A)^{-1} - 1) - A = \kappa,
$$

where κ is a constant independent from i. Since C is convex, the left-hand side of this equation is decreasing in A. Moreover, by first-order stochastic dominance, $C'\big(F_1(A)^{-1} - 1\big) \geq C'\big(F_2(A)^{-1} - 1\big)$ for each $A \in [0, I]$. Hence $\underline{A}_1 \geq \underline{A}_2$, as claimed. As for the second point, note that:

$$
C'(F_1(\underline{A}_1)^{-1} - 1) - C'(F_2(\underline{A}_2)^{-1} - 1) = \underline{A}_1 - \underline{A}_2.
$$

Since this difference is positive as $\underline{A}_1 \geq \underline{A}_2$, and C is convex, $F_1(\underline{A}_1) \leq F_2(\underline{A}_2)$, as claimed. To prove that if there is rationing under F_1, there is rationing under F_2, it is enough to show that $U^{SB}_{E,2}(\underline{A}_2) - U_{W,2}(\underline{A}_2) \geq U^{SB}_{E,1}(\underline{A}_1) - U_{W,1}(\underline{A}_1)$, or:

$$
\Phi(F_1(\underline{A}_1)^{-1}) \geq \Phi(F_2(\underline{A}_2)^{-1}),
$$

where $\Phi(x) = C'(x-1)\,x - C(x-1)$ for each $x \in [1, \infty)$. From the convexity of C, Φ is increasing, and the result follows immediately from the fact that $F_1(\underline{A}_1) \leq F_2(\underline{A}_2)$. It remains to prove that the proportion of workers in equilibrium is higher under F_2 than under F_1, and that the minimal amount of wealth required to become an entrepreneur is higher under F_1 than under F_2. From the above argument, there are three cases to consider.

If there is rationing both under F_1 and F_2, then the proportions of workers in equilibrium are respectively $F_1(\underline{A}_1)$ and $F_2(\underline{A}_2)$, and the result follows directly from the fact that $F_1(\underline{A}_1) \leq F_2(\underline{A}_2)$ and $\underline{A}_1 \geq \underline{A}_2$.

If there is rationing under F_2 but not under F_1, then $U^{SB}_{E,2}(\underline{A}_2) > U_{W,2}(\underline{A}_2)$ but $U^{SB}_{E,1}(A^{SB}_1) = U_{W,1}(A^{SB}_1)$ for some $A^{SB}_1 \geq \underline{A}_1$. The first relation can be rewritten as:

$$
S^{FB} - (1 - p_H)(B - L) > \Phi(F_2(\underline{A}_2)^{-1}),
$$

and the second as:

$$
\Phi(F_1(A^{SB}_1)^{-1}) = S^{FB} - \Lambda_1(A^{SB}_1)(1 - p_H)(B - L).
$$

Since $\Lambda_1(A^{SB}_1) \in [0, 1]$, it follows that $\Phi(F_1(A^{SB}_1)^{-1}) > \Phi(F_2(\underline{A}_2)^{-1})$ and, since Φ is increasing, $F_1(A^{SB}_1) < F_2(\underline{A}_2)$. As $A^{SB}_1 \geq \underline{A}_1 \geq \underline{A}_2$, the result follows.

If there is no rationing both under F_1 and F_2, then $U^{SB}_{E,1}(A^{SB}_1) = U_{W,1}(A^{SB}_1)$ and $U^{SB}_{E,2}(A^{SB}_2) = U_{W,2}(A^{SB}_2)$ for some $A^{SB}_1 \geq \underline{A}_1$ and $A^{SB}_2 \geq \underline{A}_2$. We first prove that $A^{SB}_1 \geq A^{SB}_2$. One can check that, for each $i = 1, 2$, A^{SB}_i is obtained as the solution to:

$$
\Psi(F_i(A)^{-1}) - \kappa' A = \kappa'',
$$

where $\kappa' = (1-p_H)(B-L)/[p_H B + (1-p_H)L]$ is positive, κ'' is a constant independent from i, and $\Psi(x) = \Phi(x) + \kappa' C'(x-1)$ for each $x \in [1,\infty)$. Since Φ is increasing and C is convex, Ψ is increasing, and thus the left-hand side of this equation is decreasing in A. Moreover, by first-order stochastic dominance, $\Psi(F_1(A)^{-1}) \geq \Psi(F_2(A)^{-1})$ for each $A \in [0, I]$. Hence $A_1^{SB} \geq A_2^{SB}$, as claimed. Last, note that:

$$\Psi(F_1(A_1^{SB})^{-1}) - \Psi(F_2(A_2^{SB})^{-1}) = \kappa'(A_1^{SB} - A_2^{SB}).$$

Since this difference is positive as $\kappa' > 0$ and $A_1^{SB} \geq A_2^{SB}$, and Ψ is increasing, $F_1(A_1^{SB}) \leq F_2(A_2^{SB})$. As $A_1^{SB} \geq A_2^{SB}$, the result follows. ∎

Proof of Proposition 5. The cutoff $\underline{c}$ below which there is rationing is determined by the condition that (13) holds as an equality. If $c > \underline{c}$, there is no rationing, and the wealth $A^T(c)$ of the marginal entrepreneur is obtained as the solution to $U_E^{SB}(\hat{A}) = U_W(\hat{A})$. In the quadratic specification, this holds whenever S^{FB} is equal to:

$$c\,\frac{I - A^T(c)}{A^T(c)} + \left[I - A^T(c) - P_{\min} + c\,\frac{I - A^T(c)}{A^T(c)}\right]^+ \frac{(1-p_H)(B-L)}{p_H B + (1-p_H)L} + \frac{c}{2}\left[\frac{I - A^T(c)}{A^T(c)}\right]^2,$$

where $P_{\min}$ is the minimum pledgeable income and x^+ the positive part of x. We shall first investigate whether, for some value of c, it is the case that the liquidation rate of the marginal entrepreneur is just zero, i.e.,

$$c = \frac{A^T(c)\left[P_{\min} - I + A^T(c)\right]}{I - A^T(c)}.$$

Then $A^T(c)$ is equal to the first-best level:

$$A^T(c) = I\sqrt{\frac{c}{c + 2S^{FB}}}.$$

Eliminating the solution $A^T(c) = I$ which corresponds to $c = +\infty$, we obtain that $A^T(c)$ satisfies a quadratic equation:

$$Q(A^T(c)) = \left[P_{\min} - I + A^T(c)\right]\left[I + A^T(c)\right] - 2S^{FB}A^T(c) = 0.$$

The relevant set of values for $A^T(c)$ is $(I - P_{\min}, I)$. Clearly $Q(I - P_{\min})$ is negative, while $Q(I)$ is positive only whenever $P_{\min} > S^{FB}$, or equivalently $I > B + p_L e/\Delta p$, which is the only relevant case. Then Q has a unique root in the interval $(I - P_{\min}, I)$, and we denote by $\bar{c}$ the corresponding value of c. It follows that for $c > \bar{c}$, the liquidation rate of the marginal entrepreneur is zero, and thus only equity finance is possible.

We now check that the liquidation rate $\lambda^T(c)$ of the marginal entrepreneur is decreasing on $[\underline{c}, \bar{c}]$. By the equilibrium condition:

$$\begin{aligned}
\lambda^T(c)(1-p_H)(B-L) &= S^{FB} - c\,\frac{I - A^T(c)}{A^T(c)} - \frac{c}{2}\left[\frac{I - A^T(c)}{A^T(c)}\right]^2 \\
&= S^{FB} - \left\{P_{\min} + \lambda^T(c)[p_H B + (1-p_H)L] - I + A^T(c)\right\}\frac{I + A^T(c)}{2A^T(c)} \\
&= S^{FB} - \Omega(\lambda^T(c), A^T(c)),
\end{aligned}$$

where $\Omega(x,y) = \{P_{\min} + x[p_H B + (1-p_H)L] - I + y)\}\,(I+y)/2y$ for each $(x,y) \in [0,1] \times (0, I]$ and the second equality follows from the definition of $\lambda^T(c)$. The equilibrium condition implies that $A^T(c)$ is increasing in c. Suppose that $\lambda^T(c)$ is increasing in c. As $\Omega_1(\lambda^T(c), A^T(c)) > 0$, we get a contradiction if $\Omega_2(\lambda^T(c), A^T(c)) \geq 0$. It is easy to check $\Omega_2(\lambda^T(c), A^T(c))$ has the same sign as $A^T(c)^2 + I^2 - \{P_{\min} + \lambda^T(c)[p_H B + (1-p_H)L]\}I$, which is positive as $P_{\min} + \lambda^T(c)[p_H B + (1-p_H)L] \leq P_{\max} < I$. Hence the result. ∎

Proof of Proposition 11. Whenever there is no rationing, the wealth $\mathcal{A}^T(s)$ of the marginal entrepreneur is obtained as the solution to $\mathcal{U}_E^{SB}(\hat{A}, s) = \mathcal{U}_W(\hat{A}, s)$. In the quadratic specification, and if debt and equity coexist in equilibrium, this holds whenever $S^{FB} + s$ is equal to:

$$(c-s)\,\frac{I-\mathcal{A}^T(s)}{\mathcal{A}^T(s)} + \left[I - s - \mathcal{A}^T(s) - P_{\min} + c\,\frac{I-\mathcal{A}^T(s)}{\mathcal{A}^T(s)}\right]\frac{(1-p_H)(B-L)}{p_H B + (1-p_H)L} + \frac{c}{2}\left[\frac{I-\mathcal{A}^T(s)}{\mathcal{A}^T(s)}\right]^2.$$

One can check directly that:

$$\frac{\mathrm{d}\mathcal{U}_W(\mathcal{A}^T(s),s)}{\mathrm{d}s} \propto \left\{-\frac{cI}{\mathcal{A}^T(s)^2} + \frac{sI}{\mathcal{A}^T(s)[I-\mathcal{A}^T(s)]}\right\}\frac{\mathrm{d}\mathcal{A}^T(s)}{\mathrm{d}s} - 1.$$

Using the Implicit Function Theorem, one can verify that:

$$\frac{\mathrm{d}\mathcal{A}^T(s)}{\mathrm{d}s} = -\mathcal{A}^T(s)^2\,\frac{\dfrac{I-\mathcal{A}^T(s)}{\mathcal{A}^T(s)} + \dfrac{(1-p_H)(B-L)}{p_H B + (1-p_H)L} + 1}{\dfrac{cI^2}{\mathcal{A}^T(s)} + \dfrac{(1-p_H)(B-L)}{p_H B + (1-p_H)L}\left[\mathcal{A}^T(s)^2 + cI\right] - sI}.$$

The denominator in this expression is positive, as $\mathcal{U}_W(\mathcal{A}^T(s),s) \geq 0$ implies that $cI/\mathcal{A}^T(s) > s$. Combining these two formulas and rearranging yields that $\mathrm{d}\mathcal{U}_W(\mathcal{A}^T(s),s)/\mathrm{d}s < 0$. ■

Proof of Proposition 12. Given a small investment subsidy s, the utility of an entrepreneur with wealth $A \geq A^T = \mathcal{A}^T(0)$ is an increasing affine function of $s - C'((1-F(\mathcal{A}^T(s)))/F(\mathcal{A}^T(s)))$. Let $\mathcal{S}^T$ be the inverse of $\mathcal{A}^T$. Using the Implicit Function Theorem and rearranging, one can verify that:

$$\begin{aligned}
\mathcal{S}^{T\prime}(\mathcal{A}^T(0)) &= -\frac{1}{\mathcal{A}^T(0)^2}\,\frac{\dfrac{cI^2}{\mathcal{A}^T(0)} + \dfrac{(1-p_H)(B-L)}{p_H B + (1-p_H)L}\left[\mathcal{A}^T(0)^2 + cI\right]}{\dfrac{I-\mathcal{A}^T(0)}{\mathcal{A}^T(0)} + \dfrac{(1-p_H)(B-L)}{p_H B + (1-p_H)L} + 1} \\
&< -\frac{cI}{\mathcal{A}^T(0)^2} \\
&= \frac{\mathrm{d}}{\mathrm{d}\mathcal{A}^T(s)}\,C'\!\left(\frac{1-F(\mathcal{A}^T(s))}{F(\mathcal{A}^T(s))}\right)\Bigg|_{\mathcal{A}^T(s)=\mathcal{A}^T(0)},
\end{aligned}$$

and the result follows immediately from the fact that $\mathcal{A}^T(s)$ is decreasing in s. ■

Proof of Proposition 14. By assumption, there is no rationing under the tough law whenever $\delta = 0$, so that $A^T(0) > \underline{A}$. By continuity, there will be no rationing for $\delta > 0$ close enough to zero, and the wealth $A^T(\delta)$ of the marginal entrepreneur is obtained as the solution to $U_E^{SB}(\hat{A},\delta) = U_W(\hat{A})$. In the quadratic specification, this holds whenever $S^{FB} + (1-p_H)\delta$ is equal to:

$$c\,\frac{I-A^T(\delta)}{A^T(\delta)} + \Lambda(A^T(\delta))(1-p_H)\delta + \frac{c}{2}\left[\frac{I-A^T(\delta)}{A^T(\delta)}\right]^2.$$

Using the Implicit Function Theorem and rearranging, one can verify that:

$$\frac{\mathrm{d}A^T(\delta)}{\mathrm{d}\delta}\bigg|_{\delta=0^+} = -\frac{(1-p_H)A^T(0)^3}{cI^2}\left[1 - \Lambda(A^T(0))\right] < 0,$$

and thus $A^T(\delta) < A^T(0)$ for δ close enough to zero. Fix one such δ. Then, for any $A \in [A^T(\delta), \underline{A}(0)]$, we have:

$$SW_1(A,\delta) = -\frac{1}{I}\left[U_E^{SB}(A,\delta) - U_W(A)\right] + \frac{1}{I}\,\Lambda(A)(1-p_H)\,\delta\,\frac{cI}{A^2}.$$

Similarly, for any $A \in [\underline{A}^-(\delta), A^T(\delta)]$, we have:

$$\mathcal{SW}_1(A,\delta) = \frac{\mathcal{S}^T(A,\delta)}{A} + \frac{1}{I}\,\mathcal{L}(A,\mathcal{S}^T(A,\delta))(1-p_H)\,\delta\left[\mathcal{S}_1^T(A,\delta) + \frac{cI}{A^2}\right],$$

where by definition $\underline{\mathcal{A}}^{-}(\delta)$ is such that $\underline{\mathcal{A}}(\delta) = \underline{\mathcal{A}}(S^T(\underline{\mathcal{A}}^{-}(\delta),\delta))$. We now prove that for δ close enough to zero, $SW_1(A^T(\delta)+h,\delta)+\mathcal{SW}_1(A^T(\delta)-h,\delta)>0$ for any $h\in[0,\min\{\underline{A}(0)-A^T(\delta),A^T(\delta)-\underline{\mathcal{A}}^{-}(\delta)\}]$. To do so, we perform a Taylor expansion in a right neighborhood of $\delta=0$. Note first that:

$$SW_1(A^T(0)+h,0)+\mathcal{SW}_1(A^T(0)-h,0)=\frac{1}{I}\Big[\Theta(A^T(0)+h)+\Theta(A^T(0)-h)-2S^{FB}\Big],$$

where $\Theta(A)=c\,(I-A)/A+c/2\,[(I-A)/A]^2$ for each $A\in(0,I]$. Observe that Θ is strictly convex and that $\Theta(A^T(0))=S^{FB}$ as there is no rationing under the tough law whenever $B-L=0$. It follows that $SW_1(A^T(0)+h,0)+\mathcal{SW}_1(A^T(0)-h,0)>0$ for each h in the relevant range. Now consider the first-order terms. Tedious but straightforward computations yields that:

$$\left.\frac{\mathrm{d}SW_1(A^T(\delta)+h,\delta)}{\mathrm{d}\delta}\right|_{\delta=0^+}=\frac{1-p_H}{I}\left\{\Lambda(A^T(0)+h)+\Big[1-\Lambda(A^T(0))\Big]\frac{A^T(0)^3}{[A^T(0)+h]^3}-1\right.$$
$$\left.+\Lambda(A^T(0)+h)\,\frac{cI}{[A^T(0)+h]^2}\right\}.$$

Similarly, we have:

$$\left.\frac{\mathrm{d}\mathcal{SW}_1(A^T(\delta)-h,\delta)}{\mathrm{d}\delta}\right|_{\delta=0^+}=\frac{1-p_H}{I}\left\{\Lambda(A^T(0)-h)+\Big[1-\Lambda(A^T(0))\Big]\frac{A^T(0)^3}{[A^T(0)-h]^3}-1\right.$$
$$\left.+\frac{1}{I}\Big[\Theta(A^T(0)-h)-S^{FB}\Big]\left[\mathcal{L}(A^T(0)-h,\mathcal{S}^T(A^T(0)-h,0))-\frac{A^T(0)}{p_HB+(1-p_H)L}\right]\right\},$$

where we have used the fact that:

$$\mathcal{S}_1^T(A^T(0)-h,0)+\frac{cI}{[A^T(0)-h]^2}=\frac{1}{I}\Big[\Theta(A^T(0)-h)-S^{FB}\Big].$$

Using the fact that Λ is convex, we obtain that:

$$\left.\frac{\mathrm{d}SW_1(A^T(\delta)+h,\delta)}{\mathrm{d}\delta}\right|_{\delta=0^+}+\left.\frac{\mathrm{d}\mathcal{SW}_1(A^T(\delta)-h,\delta)}{\mathrm{d}\delta}\right|_{\delta=0^+}\geq\frac{1-p_H}{I}\left\{\Lambda(A^T(0)+h)\,\frac{cI}{[A^T(0)+h]^2}\right.$$
$$\left.+\frac{1}{I}\Big[\Theta(A^T(0)-h)-S^{FB}\Big]\left[\mathcal{L}(A^T(0)-h,\mathcal{S}^T(A^T(0)-h,0))-\frac{A^T(0)}{p_HB+(1-p_H)L}\right]\right\}.$$

For h close enough to zero, the first term on the right-hand side of this inequality is bounded away from zero, while the second term is proportional to $\Theta(A^T(0)-h)-S^{FB}$, which goes to zero as h goes to zero. It follows that there exists positive constants η and ε such that for each $(\delta,h)\in[0,\varepsilon]^2$,

$$\left.\frac{\mathrm{d}SW_1(A^T(\delta)+h,\delta)}{\mathrm{d}\delta}\right|_{\delta=0^+}+\left.\frac{\mathrm{d}\mathcal{SW}_1(A^T(\delta)-h,\delta)}{\mathrm{d}\delta}\right|_{\delta=0^+}\geq\eta.$$

Since $SW_1(A^T(0)+h,0)+\mathcal{SW}_1(A^T(0)-h,0)>0$ is positive for any h in the relevant range, it follows that, for each $(\delta,h)\in[0,\varepsilon]^2$, $SW'(A^T(\delta)+h,\delta)+\mathcal{SW}'(A^T(\delta)-h,\delta)>\eta\delta$. Consider now $h\geq\varepsilon$ in the relevant range. By the Theorem of the Maximum and the convexity of Θ,

$$\begin{aligned}&\lim_{\delta\to0^+}\min_{h\in[\varepsilon,\min\{\underline{A}(0)-A^T(\delta),A^T(\delta)-\underline{\mathcal{A}}(\delta)\}]}\Big\{SW_1(A^T(\delta)+h,\delta)+\mathcal{SW}_1(A^T(\delta)-h,\delta)\Big\}\\&=\min_{h\in[\varepsilon,\min\{\underline{A}(0)-A^T(\delta),A^T(0)-\underline{\mathcal{A}}(0)\}]}\Big\{SW_1(A^T(0)+h,0)+\mathcal{SW}_1(A^T(0)-h,0)\Big\}\\&=SW_1(A^T(0)+\varepsilon,0)+\mathcal{SW}_1(A^T(0)-\varepsilon,0),\end{aligned}$$

which is strictly positive. Thus, when δ is small, $SW_1(A^T(\delta)+h,\delta)+\mathcal{SW}_1(A^T(\delta)-h,\delta)>0$ for each $h\in[0,\min\{\underline{A}(0)-A^T(\delta),A^T(\delta)-\underline{\mathcal{A}}^{-}(\delta)\}]$, as claimed. If $\underline{A}(0)-A^T(\delta)\geq A^T(\delta)-\underline{\mathcal{A}}^{-}(\delta)$, the result follows. In the opposite case, a simple continuity argument shows that the maximum of $\mathcal{SW}(A^T(\delta)-h,\delta)$ is attained for h close to zero when δ is close to zero, hence the maximum of $SW(A^T(\delta)+h,\delta)$ is still greater than the maximum of $\mathcal{SW}(A^T(\delta)-h,\delta)$ by the same argument. ∎

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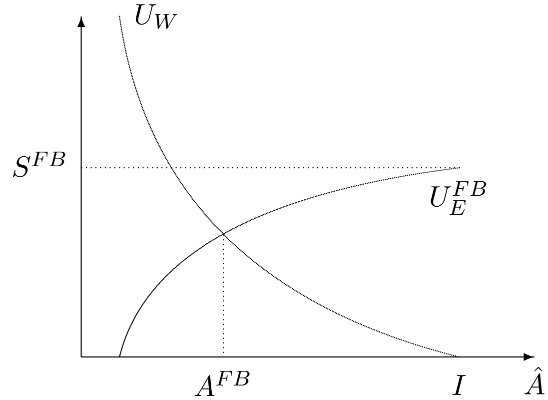

Figure 1

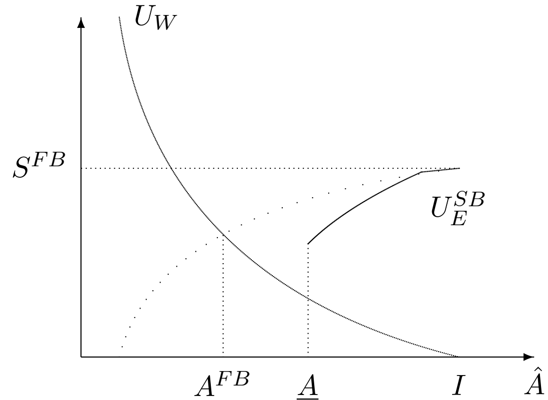

Figure 2

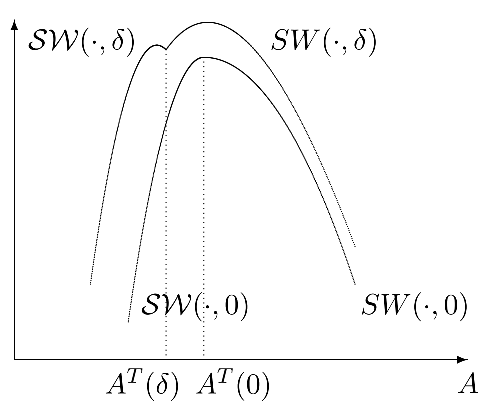

Figure 3