Bank Competition, Job Security, and Economic Growth

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Abstract

We identify a new channel through which banks affect economic activity, namely, bank's monopolistic power over job security. We develop a simple theory, extending the hold-up problem associated with firm-specific investment to banks' influence over worker layoffs at distressed firms, to show how banks' power, depending on the industry, can enhance or reduce the productivity of firms. We test and confirm our predictions using quasi-natural experiments that increased employment protection and bank competition in the U.S. between the 1970s and 1990s. We find that greater employment protection increases industry output in knowledge-intensive industries, with this effect increasing with greater bank competition.

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I. INTRODUCTION

We identify a new channel through which bank competition affects economic activity: less banks' monopolistic power together with higher employment protection enhances job security, which in turn boosts the outputs of knowledge-intensive industries. This prediction, not found in existing theories, is derived from a micro-founded macro model, which incorporates a standard hold-up problem associated with firm-specific human capital investment. In the model, optimal contracts are debt contracts with partial repayments in situations of financial distress and fixed wage contracts with layoffs in cases of distress. The relative bargaining power of banks and workers then determines the layoff probability along with the equilibrium interest rate and wage. Higher job security induces greater firm-specific human capital investment. Hence, the degree of banks' monopolistic power interacted with the degree of formal employment protection influences the level of human capital, with the importance of this effect to depend on the knowledge intensity of the industry. We then test and confirm our predictions using natural experiments in the U.S. between the 1970s and 1990s, a period when bank branch deregulation and employment protection were adopted at various times across states.

Although a too rigid labor market is likely harmful to economic growth, some basic job security can in theory enhance the productivity of a firm when output optimally requires some firm-specific investment by workers. The possibility of financial distress, however, may prevent the firm from credibly offering longer-term job security. In particular, powerful banks (and creditors in general) can force management to lay off some of its workers to ensure the firm repays (some of) its loans when financially distressed. This consequently undermines the credibility of the firm in assuring its workers of long-term job security. We show in a theoretical model how the bargaining powers of banks and workers, absolute and relative to each other, then determine the degree of de-facto job security, which in turn affects the firm-specific human capital investments workers are willing to make, making these powers thereby influence firms' overall productivity.

The costly state verification framework (Townsend, 1979) can justify the usage of debt-type contracts in financial markets. We apply the same logic to derive fixed wage contracts as being optimal in the market for workers who can opt to invest in firm-specific human capital before receiving a higher wage in return. Our model also endogenizes the layoff decisions in a situation of financial distress. Repayments to the creditor bank and layoffs of workers are then jointly determined through bargaining between the workers and firm management, with the latter under the influence of the firm's creditors.

With these ingredients, our model features the standard hold-up problem associated with firm-specific investment, i.e., a time inconsistency problem. The possibility of financial distress means a firm cannot credibly commit to keeping all workers always fully employed, even though this would benefit the firm and workers. With promises not fully credible, workers have less incentives to make firm-specific investments. The degree to which the firm can make credible promises will depend on the bargaining powers of the two key stakeholders. These are affected in turn by the bank's monopolistic power and the degree of employment protection: the degree of financial liberalization determines the bank's power; and legal restrictions on layoffs can make it more difficult for a firm to fire workers (and thus act as a commitment mechanism). By altering (relative) bargaining powers, financial liberalization and changes in employment protection will then influence workers' firm-specific investments and productivity, and thereby overall output.

Our model predicts the following three patterns. First, for industries not (much) dependent on firm-specific human capital, employment protection is always distortionary and lowers output. This is the standard prediction in neoclassical models and much of the labor literature, and is obtained in our model as well. Second, in those industries using human capital more intensively, productivity gains should be observed when basic employment protection is put in place. While theoretically not new, this prediction has empirically, to the best of our knowledge, not yet been cleanly tested. Third, and our most important new analytical finding, the productivity gains arising from enhanced legal employment protection are influenced by banks' monopolistic powers, since the level of workers' bargaining power relative to banks' de factor powers matters for de facto job security. This prediction is both theoretically new and has not been tested.

We test these three predictions using natural experiments in the U.S. Between the early-1970s and the mid-1990s, the US banking sector was deregulated, but in ways varying over time across states. Over the same period, but not exactly identical over time and across states either, workers also gained more statutory protections, albeit still basic. The effects of these two reforms—on financial intermediation, productive activity, wages, employment and other aspects—have been empirically studied, but largely separately in two literatures. Indeed, in a classical theory of production, the two reforms have separable impacts on outputs and can thus empirically be studied independently. Our richer theoretical model of the firm, however, shows that studying financial liberalization and increases in employment protection separately is not correct: it does not only produce biased estimates of their independent impacts, but it also ignores the interactions between the two reforms. The latter is because creditors and workers through their negotiations determine the degree of job security, which in turn affects firm productivity.

To empirically analyze the interactions between these two reforms, we study their combined effect using value added data between 1970s and 1990s at both the US state and state-industry levels. The U.S. over this period provides a good natural experiment of institutional changes, in particular for basic worker protection, given the time- and state- varying levels of financial and employment protections. Using the U.S. data at the state level, we confirm previous results: financial deregulation leads to higher output growth, while stronger employment protection has ambiguous effects on output growth. At the state-industry level, our findings are also consistent with previous studies on the benefits of increased bank competition, with lower monopolistic powers of banks leading to higher overall output growth.

Results differ, however, from previous findings regarding basic employment protection. For industries with low-skilled workers, we confirm that protecting workers more hinders growth, as predicted in typical neo-classical or simple labor search models, and often found in the empirical literature. However, for high-skilled industries, employment protection promotes growth, consistent with our model as well as with labor search models with firm-specific investment.

Our most important new result is that we find, as our model predicts, a positive interaction effect between bank branch deregulation and changes in employment protection, particularly for those industries highly dependent on knowledge workers and external finance. This finding confirms our theoretical model that greater bank competition makes banks less powerful in determining workers' compensations and employment, especially in financially vulnerable firms. This in turn

contributes to job security and hence explains the higher growth of knowledge-intensive industries at the aggregate level.

Our theoretical and empirical analyses suggest a more subtle view of employment protection and provide some general lessons as well. While the protection of workers in the U.S is still at a basic level, it has increased over the past decades, a period in which the U.S. experienced generally favorable economic growth and increases in productivity. Such protection of basic workers' rights is now increasingly being called for in developing countries as well by economists, policy makers and the general public (as in the campaigns against "sweat shops," which by the way historically also existed in currently advanced countries). Employment protection in the U.S. remains though much less elaborate than in continental Western Europe or Japan, where labor market rigidities are often thought to be major barriers for economic growth. This contrast in economic impacts between basic and elaborative worker protections is consistent with our theory as it predicts an inverse-U shape effect, i.e., basic protection enhances productivity due to greater firm-specific knowledge investment, but generous protection reduces productivity. Besides providing support for at least a basic level of employment protection, our findings also support a more stakeholders' oriented view of corporate governance, where investor, creditor and worker rights are considered jointly.

The rest of the paper is organized as follows. In Section II we review the related literature. We develop our theoretical model in Section III. In Section IV we explain the data and in Section V we discuss the empirical methodology and report the main results. Section VI provides various robustness checks. The last Section concludes.

II. LITERATURE REVIEW

We first review the empirical literature on respectively financial deregulation and employment protection, covering both domestic (mostly U.S.) and international, cross-country studies. We next review relevant existing theoretical models on how financial deregulation and employment protection can interact and affect firm productivity. We highlight that, in spite of some models suggesting interaction effects, none of the US-specific and international financial deregulation and employment protection empirical studies takes into account the contemporaneous changes in the relative bargaining powers of other stakeholders. Our viewpoint is thus new to the literature as we identify an additional channel of (changes in) bank competition on economic growth.

The effect of greater bank competition on the economic growth can be expected to be positive and has been found to be so, in particular, in the US context based on the evidence of bank branch deregulation between 1970s and 1990s (Jayaratne and Strahan,1996). Theoretically, several channels can be considered and some have been empirically tested. The first one is the enhancement of efficiency in the banking sector: Stiroh and Strahan (2003) for example show evidence for a competitive shake-out of inefficient banks. Moreover, Black and Strahan (2001) show that the female share of managerial position increased after deregulation, suggesting that bank owners and employees might have enjoyed rents that dissipated after deregulation. The second channel is through a more efficient allocation of credit among firms, identified in many theoretical and empirical studies using US as well international data (e.g., Abiad, Oomes, and

Ueda, 2008; Acharya, Imbs, and Sturgess, 2011; Ueda 2013). A related channel is through better forms of risk taking by borrower firms (Boyd and De Nicolo, 2005).[1]

In terms of labor markets, most existing theories typically predict negative effects of greater employment protection.[2] With greater protection, employers are less willing to hire workers, thereby lowering output (e.g., Hopenhayn and Rogerson, 1993, and Bertola, 1994). Stronger worker protection may also lead to rent-seeking behaviors by (inside) workers—Parente and Prescott (2000) provide an example for India. Predictions of the effects of employment protection in richer labor search models, however, are more nuanced. Given a need to invest in firm-specific skills, greater employment protection can help increase firm value for knowledge-intensive industries (Murphy, 1986; Saint-Paul, 1996; and Takizawa, 2003).[3]

In the US context, contemporaneously with bank branch deregulation, employment protection changed at the state level. Historically, employers in the U.S. could freely fire workers, but from the early 1970s on states gradually restricted such practices by establishing exceptions for wrongful discharges (Autor, Donohue and Schwab, 2006). The literature has found negligible, if not negative, effects of employment protection on economic activity, wages and employment in the U.S. Early work (Dertouzos and Karoly, 1992, 1993) found large negative effects of these type of protections on the number of people employed. Later work, however, found no effects on employment (Miles, 2000) or a negative, albeit small effect on employment and little effect on wages (Autor, Donohue and Schwab, 2006). In subsequent work, Autor, Kerr, and Kugler (2007) find the wrongful discharge protection to negatively affect firm-level productivity by reducing employment flows and firm entry rates.[4]

On the empirical side, our paper also fits in the cross-country literature on the impacts of financial liberalization and employment protection. Empirical studies are mostly supportive of the benefits of financial deregulation, using cross-country and other evidence (Bekaert, Harvey, and Lundblad, 2005; and Townsend and Ueda, 2010). In terms of labor markets, cross-country empirical studies for OECD countries (e.g., Scarpetta and Tressel, 2004, using industry level data; and Cingano, et al., 2010, using firm level data) support the view of largely inefficient employment protection. And, Botero et al. (2004) shows that heavier labor regulation is associated with lower labor force participation and higher unemployment. Other cross-country evidence also generally finds negative effects of employment protection.

Related as well is the empirical law and finance literature, again mainly cross-country in nature, which has focused on creditors' and minority shareholders' rights and largely considered these individual stakeholders rights one-by-one. An extensive literature has investigated the role of

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[1] This is debated since theoretically in a second-best world, less bank competition could reduce bank excess risk taking (Allen and Gale, 2004) and lead banks to expand lending and enhance overall output (Hellmann, et al., 1996).
[2] See a standard macro-labor textbook, e.g., Pissarides (2000). A specific study is Blanchard and Portugal (2001).
[3] Using a more macroeconomic approach, Blanchard and Tirole (2008) shows that given the dead-weight losses associated with unemployment (e.g., loss of skills when unemployed), some protection can be socially optimal—and induce higher aggregate growth—since it makes firms internalize such costs.
[4] See also Besley and Burgess (2004) who find that state-level pro-worker amendments in the relevant law lead to lower state outputs in India.

these rights using aggregate data or data on individual firm behavior and characteristics (La Porta, Lopez-de-Silanes, Shleifer and Vishny, 1997 and 1998; Djankov, McLiesh and Shleifer, 2007; De Nicolo, Laeven and Ueda, 2008; Acharya, Amihud and Litov, 2011; Claessens, Ueda, and Yafeh, 2014). Studies generally document positive effects of stronger property rights, consistent with the value of securing claims, protecting (minority) investors against abuse by insiders (management or controlling shareholders), and overcoming principal agent problems. But none considered or controlled for workers' rights at the same time.

While many studies cover the direct effects of financial deregulation and employment protection, only some theoretical models recognize the importance of analyzing jointly the roles and effects of various stakeholders' claims. Such scarce analyses (e.g., Allen 2005, Allen, Carletti and Marquez, 2007; see also Tirole, 2006) argue that in a second-best world, with information asymmetries, agency issues, incomplete contracting, and other deviations from perfect factor markets, a proper configuration of various stakeholders' rights can lead to greater overall firm value maximization. Conversely, these theories suggest that firm performance varies with the legal rights and relative bargaining powers of multiple stakeholders. A particular implication of the incomplete-contract theory (e.g., Hart, 1995) is that workers with greater bargaining powers will have more incentives to invest in firm-specific skills.[5] Such positive effects may also show up at the economy-wide level (e.g., Caballero and Hammour, 1998; and Gervais, Livshits, and Meh, 2008). Again, however, a specific channel whereby bank regulation influences the balance of bargaining powers of stakeholders has not been articulated.

Only a few papers have investigated empirically how variations in multiple stakeholders' powers affect economic performance across countries or firms. Using country-level analysis, Fonseca and Utrero (2007) investigate the effects of labor regulation and barriers to entrepreneurship in the presence of credit market frictions. They show that stricter employment protection laws and more barriers to entry negatively affect firms that are more dependent on external financing. Taking a cross-country perspective as well, but from a political economy point of view, Pagano and Volpin (2005) explain the observed negative correlation between shareholder protection and employment protection across OECD countries as the outcome of a combination of incumbent workers and inside owners/managers erecting barriers against minority shareholders.[6]

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[5] A related corporate finance literature considers the joint effects of financial and labor conditions using firm-level data. Garmaise (2008), for example, finds that financially constrained small firms have greater difficulty in hiring new employees, and therefore provide greater de facto employment protection, thereby inducing more firm-specific investment. Perversely, Cronqvist, et al. (2009) find that entrenched CEOs pay more to employees to enjoy greater private benefits (e.g., less CEO efforts in wage bargaining and improved relations with employees).

[6] Some papers have analyzed the joint effects of creditor and labor rights using firm-level data. Atanassov and Kim (2009) investigate cross-country differences in firm-level restructuring and find that the firm's reaction to financial distress—asset sales or layoffs—depends on both the degree of investor protection and employment protection. The specific effect of stronger employment protection depends on the degree of investor protection but in all cases economic outcomes appear inefficient. Kim and Ouimet (2014), investigating the productivity effects of employee ownership plans, find some benefits for small firms, but not for firms with many employees due to free-riding. Moreover, such firm-level studies have difficulty in documenting economy- or industry-wide effects, such effects on extensive margin, i.e., increased levels of entrepreneurship and business closures, which have been found in other studies of US banking deregulation, e.g., by Kerr and Nanda (2009).

Besides changes in banks' and workers' powers, changes in shareholder protection can impact firm performance through affecting the availability of external financing and improving governance. Although well documented in cross-country studies, the effects of shareholder protection have been hard to detect within a US context. This is in part because most securities laws are federal and there is little state variation in equity rights.[7] Moreover, firms subject to shareholder rules typically list on national stock exchanges, and are thus subject to the rules of the respective exchanges and not (just) state rules. Furthermore, such firms often establish their headquarters in states with laws most conducive to shareholders' (or firm's management) interests. Together this makes firms' state headquarter location and local shareholders laws less relevant for analyses of state- or state-industry level value added data. We therefore do not include shareholder rights in our empirical investigation.[8]

III. THEORY

A. Model Set-Up

We develop a simple one-period model to show how bank monopolistic power and worker protection interact with each other to determine the productivity of a firm.[9] There are a representative firm and a bank, and both are assumed to be risk neutral and profit maximizing. There is a continuum of workers with measure one. We assume a conventional production function: $y = \theta k^{1-\alpha}(hl)^{\alpha}$, where y denotes output, k capital, h firm-specific human capital per worker, l number of workers, and α a scaler taking a value between 0 and 1.We assume indivisible labor so that every worker provides either one unit of labor or zero. We also assume that without any training the firm specific human capital, $h=0$. The firm's productivity shock is denoted by θ, whose probability density function is f and cumulative distribution function is F with mean $E[\theta]=1$. The households' utility function is assumed to be $u(c)-v(h)$, that is, households have positive utility from consumption but disutility from investing in human capital, while supplying (one unit of) labor inelastically.

The time line is divided into subperiods as follows:

I. A (representative) firm hires $\hat{l}$ number of workers for efficiency wage w (i.e., performance pay) for one efficiency unit of labor hl, and borrows capital at interest rate r

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[7] Some papers find a decrease in market values for firms in jurisdictions that enact anti-takeover statutes (Karpoff and Malatesta, 1989, 1995; Szewczyk and Tsetsekos, 1992). Also, Bebchuk and Cohen (2003) find that states that offer stronger anti-takeover protections are substantially more successful in both retaining in-state firms and attracting out-of-state incorporations. But, again, these papers do not study the overall economic impact or take into account the bargaining powers of other stakeholders.

[8] Data for state level shareholder protection is also only available from 1986 on. In a working paper version, we analyzed a shareholder protection measure based on Bebchuk and Cohen (2003), but did not find significant effects.

[9] We focus on implications of ex post bargaining for repayment of loans and layoff of workers, which are influenced by the monopolistic power of banks and employment protection. We abstract from any monopolistic market markups or credit rationing when loan contracts are made as well as any non-market wage clearing or unemployment in the initial job market. These possibilities are discussed in the empirical section.

from a (representative) bank, which has fixed capital supply k. The risk free rate r_F is given. The capital k is immediately invested in the production facility.

II. Workers invest in firm-specific human capital h.

III. A firm (manager) observes signal ρ about the productivity shock θ, to be realized in the last subperiod, and reports it to its bank and workers. The signal is the best predictor of the shock, $E[\rho]=\theta$. For simplicity, we assume that the signal is exact, i.e., $\rho=\theta$.

IV. A firm may fire $\hat{l}-l$ workers so that the number of workers who engage in production becomes l. Cost τ unit of goods is incurred to verify state à la Townsend (1979) and to negotiate with the firm, which needs to pay this cost per worker in negotiations. This means that negotiating with all workers on a wage cut is much costlier than negotiating with subset of workers on layoffs. Hence, layoff is selected as the preferred way to lower labor costs, rather than a wage cut.[10] Note that, as production requires some level of firm-specific human capital investment, the firm cannot hire additional productive workers at this stage.

V. Production takes place with a realization of the productivity shock θ drawn from probability density function f and cumulative density function F, which have bounded support $[\underline{\theta},\overline{\theta}]$. Each worker receives wh as promised, if kept employed; and b otherwise, by engaging in traditional productive activities that do not require high skills (assuming b is lower than the expected marginal product of labor in high skill sector under full employment with the optimally chosen h in subperiod II). In aggregate, the representative firm pays whl to workers. The representative bank receives rk, if the firm does not default; and otherwise the residual after wage payments, $y - whl$.[11]

VI. Each household consumes using labor income, either wh or b.[12]

Note that the wage and interest rate are assumed to be set at the beginning of period. As for the interest rate, this assumption follows the tradition of costly state verification (Townsend, 1979). With some costs τ to verify the size of productivity shock and negotiate on layoffs, it is not optimal for a lender to verify all cases. Instead, the lender cares about only when the report from the borrower suggests a very low realization of productivity. Otherwise, it is optimal for the lender not to verify the state, and thus a debt contract becomes optimal with a prefixed interest rate. Although the interest rate r is the contracted one, all agents understand that there can be a distress situation, in which interest and principal are only partially repaid.

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[10] This is consistent with anecdotal evidence for US firms.

[11] For the sake of simplicity, unless otherwise noted, the analysis deals only with the case in which productivity is high enough so that firm earnings after wage payments are always positive.

[12] Profits, if any, can be considered as firm manager's income. Or it can be considered household income with equal ownership, but households ignore this income in their decision making since each household's ownership is tiny.

Workers are stakeholders because they invest in firm specific human capital h and need to wait the return on investment until production takes place. Hence, a fixed wage contract becomes the optimal contract when a worker has to pay some costs, here also assumed to be τ, to assess the overall true earnings of the firm and to negotiate on layoffs in a distress situation. Workers would verify firm earnings and negotiate only when their employment and promised income become insecure. Again, a wage cut would be another way of lowering the labor cost, but the firm also needs to pay the cost per worker in the negotiations. Again, negotiating with all workers on a wage cut is more costly than negotiating with subset of workers on layoffs. Hence, the firm choses layoffs to lower labor costs, rather than an across-the-board wage cuts.

Since firm-specific skilled labor is necessary for production, employing workers with no training ($h=0$) after seeing a good signal is not possible. Labor input will be adjusted downward in case of a bad signal, by laying off workers in subperiod IV. Even with layoffs, however, the firm might not earn enough profits to repay the interest r in full. It would then default and repay the residual to the bank in subperiod V.

B. Market Equilibrium

The firm is assumed to maximize expected earnings after wage payments. This maximization thus covers value accruing to creditors (interest repayments) and shareholders (after subtracting interest payments). It is consistent with most theoretical models and balances the at times varying interests of creditors and shareholders. With a weak signal of the firm's productivity, for example, banks as creditors have greater incentives to influence firm management, given the shape of their state-contingent debt contract. Shareholder incentives to influence firm managers on the other hand increase with the strength of the productivity signal.

We assume that the level of employment is determined in part by bargaining between a worker and the (representative) firm, where the position of the firm is influenced by its creditors and shareholders. If a bad signal is revealed, it is well known that creditors will have greater interests to boost profits than shareholders because of the asymmetry in the shapes of their payoff functions near the default threshold. Hence, with a bad signal, the firm under creditors' influence tries to lay off workers to boost profits and assure the full repayment of interest and principal. At that point, there will be bargaining between the creditor-shareholders and workers. If banks have little monopolistic power or workers are well protected, or both, then the firm will be less inclined or able to lay off workers and de facto employment protection will be higher. Conversely de facto protection will be less with stronger banks and weaker labor rules.

A time inconsistency problem arises here. The firm needs skilled workers. The shareholders, creditors, and workers themselves all want workers to invest more in human capital to raise overall productivity and income. However, once a bad signal is revealed, ex post, the bank prefers to lay off some workers from the firm. The shareholders have fewer incentives to counter this as their residual profits are negligible anyhow given the bad signal (and the firm manager is still assumed to maximize the profits by cutting jobs). Hence, the relative bargaining power of workers in the layoff decision depends on bank's monopolistic power.

The equilibrium decisions and outcomes can be found by solving the model backwardly, starting with Subperiod V.

Subperiod V

Given the number of initial workers $\hat{l}$, capital input *k*, wage *w,* and promised gross interest rate *r*, and human capital *h* determined in subperiod II, there is a unique threshold of productivity θ^*, below which the firm defaults (i.e., cannot repay the promised wage and interest in full) and above which it does not.

$$\theta^* = \frac{rk + wh\hat{l}}{k^{1-\alpha}(hl)^{\alpha}}. \tag{1}$$

Subperiod IV

Since the signal ρ (received in Subperiod III) is the best predictor for future productivity θ, the firm lays off workers if default is expected and otherwise not. That is, if the signal is good enough, $\rho \geq \rho^* = \theta^*$, then no worker will be laid off, $l = \hat{l}$. At this threshold, the firm is just able to payout both interest rate and wage in full, that is,

$$rk + wh\hat{l} = \hat{y}^*, \tag{2}$$

where $\hat{y}^*$ denotes the output with $l = \hat{l}$ and $\rho=\rho^*$.

Assumption 1.

Risk free rate r_F is defined as the expected Walrasian equilibrium return with full employment,

$$r_F = E[MPK] = \int_{\underline{\theta}}^{\bar{\theta}} (1-\alpha)\theta k^{-\alpha}(h\hat{l})^{\alpha} f(\theta)d\theta. \tag{3}$$

Because the bank charges the same interest rate *r* at and above the default threshold of productivity shock, and receives less than *r* below the default threshold, the bank needs to charge a rate higher than the marginal product of capital at the default threshold to compensate for the lower return than the marginal product when a higher productivity shock realizes. Therefore, under Assumption 1,

$$rk > (1-\alpha)\rho^* k^{1-\alpha}(h\hat{l})^{\alpha} = (1-\alpha)\hat{y}^* \text{ and hence } wh\hat{l} < \alpha\hat{y}^*. \tag{4}$$

If a bad signal is revealed (i.e., $\rho < \rho^*$), the firm (under the bank's influence) tries to lay off workers to the level $l^*(\rho)$ defined as the level of labor inputs maximizing the earnings before interest payments. That is, given *k, h,* and *w*,

$$l^*(\rho) = \arg\max \rho k^{1-\alpha}(hl)^{\alpha} - whl. \tag{5}$$

The usual first order condition gives that, ex post, the optimal amount of labor is adjusted to equalize the marginal product of labor given the specific signal realization and the fixed wage. That is,

$$l^*(\rho) = \frac{k}{h}\left(\frac{\alpha\rho}{w}\right)^{\frac{1}{1-\alpha}}. \tag{6}$$

This also means that, given prefixed wage, and human capital level determined in subperiod II, the marginal product of effiicient labor *hl** is equalized to the wage, while repayment to capital holders *rk* becomes equal to the residual of output after the verification and negotiation costs,

$$w = \left.\frac{\partial y}{\partial(hl)}\right|_{l=l^*,\rho=\rho^*} = \alpha\frac{y^*}{hl^*} \text{ and } (rk)|_{l=l^*,\rho=\rho^*} = (1-\alpha)y^* - \tau, \tag{7}$$

where y^* is the output with reduced labor $l=l^*$ and at default threshold $\rho=\rho^*$.

Note that, at ρ^*, the bank gets repaid less by asking to lay off workers,

$$(rk)|_{l=\hat{l},\rho=\rho^*} > (1-\alpha)\hat{y}^* > (rk)|_{l=l^*,\rho=\rho^*} = (1-\alpha)y^* - \tau. \tag{8}$$

Yet, even just below ρ^*, it needs to do so because the firm manager is reporting less than the threshold signal, which implies no full repayments. Then, the bank needs to verify the situation and to negotiate (indirectly) with workers. Note that all returns in (8) could be equal if the cost of negotiating τ is zero (but then there will be no longer a debt contract).

As workers want to remain employed, the number of jobs is determined by bargaining in the range $[l^*(\rho),\hat{l}]$.

Assumption 2.
The bargaining is assumed to result in retaining more than the number of profit-maximizing workers:

$$l_\lambda \equiv (1-\lambda)l^*(\rho^*;k,h,w) + \lambda\hat{l}, \tag{9}$$

where $\lambda \in [0,1]$ *represents de facto bargaining power of workers.*

Here, we can explain clearer about why layoff is preferred to across-the-board wage cut. Because the worker power λ is defined as a reduced form, we can define $\lambda > 0$ gives the same profits of the firm (i.e., shareholders and the bank) after verification and negotiation costs are paid, regardless of layoff or wage-cut. Then, the only difference that affects firm profits is the total costs of verification and negotiation, which is, by construction, lower for the layoff case.[13]

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[13] For the case of $\lambda = 0$, profits by layoff and by wage cut do not coincide, and shareholders and the bank would have a conflict. At $\lambda = 0$, either layoff or wage cut would make the marginal product of effective labor equal to wage in case the signal is lower than the threshold. The remaining capital income, without considering verficiation

(continued…)

Subperiod III

Signal ρ is revealed. At least any bad signal (lower than ρ^*) is truthfully reported by a firm manager to a bank and workers at the negotiations because it induces a firm to renege on its full repayments to the bank and workers and thus it will be verified by them.

Subperiod II

Each worker decides to invest in firm-specific human capital, taking into account the probability of layoff in the next subperiod. Assuming that fired workers are chosen randomly, the probability of a worker to remain employed is $e = l_\lambda / \hat{l}$. Then, the human capital investment decision is[14]

$$\max_h \left(1 - F(\rho^*)\right) u(wh) + \left(\int_{\underline{\rho}}^{\rho^*} ef(\rho) d\rho \right) u(wh - \tau) + \left(\int_{\underline{\rho}}^{\rho^*} (1-e) f(\rho) d\rho \right) u(b - \tau) - v(h), \quad (10)$$

where l_λ inside e is evaluated at $\bar{h}$, which is the other workers' choice of human capital on average and, in equilibrium, it must be equal to the individually optimal h^*. Note that we assume the utility function to be twice-continuously differentiable and $u>0$ for $c>0$ and $u=0$ for $c=0$ with $u'>0$ and $u''<0$. The disutility of human capital investment is assumed to be increasing and convex, as is typical for investment adjustment cost (i.e., $v'>0$, $v''>0$).[15]

The first order condition, assuming small τ, is approximately

$$v'(h) = B(\bar{h}) u'(wh) w, \quad (11)$$

where

$$B(\bar{h}) \equiv 1 - F(\rho^*) + \int_{\underline{\rho}}^{\rho^*} ef(\rho) d\rho. \quad (12)$$

Here, both ρ^* and e are evaluated at $\bar{h}$, the average level of (other workers') human capital investment. In equilibrium, the personally optimally chosen human capital investment h^* must be the same as the average level (i.e., a typical fixed point condition):

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and negotiation costs, would be $rk = (1-\alpha)y$, which is all distributed to the bank. However, the output y with full employment is higher than otherwise, and hence the bank prefers wage cut with full employment. But, shareholders, facing zero profits after wage and interest payments, would like to minimize the verification and negotiantion costs by adopting layoff, rather than wage cut.

[14] An implicit assumption here is that firms do not know the level of human capital investment of each person before they engage in production, which occurs only after the firing decision. And, related, the firm is assumed to fire workers randomly as it is unable to distinguish the human capital levels among workers before production.

[15] Note that firm and bank profits can be considered to be allocated equally to each household. The profits, positive when the firm is solvent, are omitted here because the large number (continuum of agents) assumption makes the ownership share of each household (almost) zero.

$$h^* = \overline{h}. \tag{13}$$

Given such (average) human capital investment, firms decide how many workers they retain. Then $B(\overline{h})$ represents the extensive margin of benefits from human capital investment. It consists of a change in the default threshold in the optimal loan contract due to increase in the level of human capital.

If *B'(h)* is not zero, then there is an externality. In this case, the decentralized decision for the optimal human capital investment is not necessarily unique or (constrained) socially optimal. For a social planner, a similar first order condition can be written, but since she internalizes the externality, she solves the following first order condition,

$$v'(h) = B(h)u'(wh)w + B'(h)u(wh). \tag{14}$$

The left hand side of (14) is increasing in human capital investment *h* as *v'>0* and *v"">0*. The first term in the right hand side of (14), given all things equal, is decreasing in *h* as *u'*>0 but *u''*<0. The second term does not appear in the decentralized version (11). If *B'(h)* is negative or zero, then, the socially optimal firm-specific human capital level *h** is still uniquely determined. If it is positive, uniqueness of the social optimum is not guaranteed. As for the decentralized decision, in general, if *B'(h)* is not zero, there can exist multiple equilibria that satisfy the fixed point condition (13). For the sake of simplicity, we assume the following:

Assumption 3.
There is no externality, $B'(h) = 0$.

Lemma 1.
The no externality condition $B'(h) = 0$ *is achieved when either λ =1 or, for λ<1, when*

$$\frac{\alpha \hat{y}^* - wh\hat{l}}{E[\hat{y}]} = \frac{\int_{\underline{\rho}}^{\rho^*} l^* f(\rho) d\rho}{(\hat{l} - l^{**}) f(\rho^*)}, \tag{15}$$

*where l** is l* evaluated at ρ* and* $\hat{y}$ *is output with full employment at ρ*.*

The proof is provided in Appendix I. Note that the left-hand-side of (15) is the extra pay to capital holders at the default threshold as a ratio to the expected output with full employment. As for the right-hand-side, the numerator is the expected employment conditional on signals less than the default threshold, and the denominator is the number of fired workers, again at the default threshold.

Proposition 1.
Given w, r, $\hat{l}$*, k, and λ, the workers determine their optimal human capital investment level h* uniquely under Assumptions 1 – 3..*

The proof is provided in Appendix II. Note that, because of Assumption 3, workers' optimal choice on human capital investment h^* coincides with the constrained social optimum given w, r, $\hat{l}$, k, and λ.

The equilibrium firm-specific investment h^* increases with higher capital inputs k since the right-hand-side of the first order condition (11) is higher with higher k through higher l^* (and l_λ inside e). Higher λ also increase l_λ and thus h^* obviously, while higher $\hat{l}$ (near full employment) reduces e and h^*.[16]

The effect of a higher wage is not so clear. Higher wage lowers l^* (and thus l_λ) because a firm would like to lay off more workers. Moreover, there is an additional effect through $u'(wh)w$, the marginal utility gain by additional human capital investment. If this increases with higher wage, human capital investment could increase; otherwise, it could decrease. This relation turns out to depend on the wealth effect, for which we assume the following.

Assumption 4.
The relative risk aversion is higher than or equal to one.

Proposition 2.
Under Assumptions 1 – 4, higher wage reduces the human capital investment under small verification and negotiation costs τ.

The proof is provided in Appendix III.

Subperiod I:

Labor demand is determined by a (representative) firm, while labor supply is assumed to be inelastic, one unit, and indivisible. The shareholder's problem is, given it pays interest r and wage w, to choose the capital and initial labor inputs:

$$\max_{k,\hat{l}} \int_{\rho^*}^{\bar{\rho}} \left(\rho k^{1-\alpha} (h^* \hat{l})^{\alpha} - w h^* \hat{l} - rk \right) f(\rho) d\rho, \tag{16}$$

subject to the arbitrage free condition for the banks regarding risky return r, given risk free rate r_F:

$$r_F k = \int_{\rho^*}^{\bar{\rho}} rkf(\rho) d\rho + \int_{\underline{\rho}}^{\rho^*} \left(\rho k^{1-\alpha} (h l_\lambda)^{\alpha} - w h^* l_\lambda - \tau \right) f(\rho) d\rho. \tag{17}$$

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[16] $\frac{\partial e}{\partial \hat{l}} = \frac{1}{\hat{l}^2} \left(\lambda(1-\hat{l}) - (1-\lambda) l^* \right) < 0$ in equilibrium near full employment, $\hat{l} = 1$.

Note that this is also the bank's participation constraint. Given available funding from the rest of the world (e.g., other towns, states, or the interbank market), each bank is assumed to provide funding until the arbitrage condition is met. In equilibrium then in our model, capital demanded is equal to initial capital. Note that we can allow for some markups on the left hand side of (17), i.e., some ex-ante monopolistic power, and still preserve all our comparative results. Since the presence of such a markup and its changes have been extensively studied, including how they affect capital allocation and growth, and our model provides no specific new insights, however, we focus on bank's ex-post power, i.e., when negotiating a distressed firm's repayment plan that can involve worker layoffs.

We then solve this firm value maximization problem by substituting the arbitrage free condition for banks into the shareholders' value maximization problem:

$$\max_{k,\hat{l}} \int_{\rho^*}^{\bar{\rho}} \left(\rho k^{1-\alpha}(h^*\hat{l})^{\alpha} - wh^*\hat{l}\right) f(\rho)d\rho + \int_{\underline{\rho}}^{\rho^*} \left(\rho k^{1-\alpha}(hl_{\lambda})^{\alpha} - wh^*l_{\lambda} - \tau\right) f(\rho)d\rho - r_F k. \quad (18)$$

The arbitrage condition can be also written as $r = r_F + risk\ premium$. The firm is assumed to know the feedback effects of its own labor and capital input decisions on the risk premium. The first order condition with respect to capital then provides the capital demand function for a given risk-free interest rate. In an open economy, the risk free rate is given; in closed economy the intersection of capital demand function and inelastic capital supply (i.e., initial endowment) determines the equilibrium rate.

Note that the level of production is affected by the realization of the shock θ itself, but that the layoff decision is made right after the realization of signal ρ, so that the probability weights are calculated based on the distribution $f(\rho)$ (as ρ is the best predictor for θ, the expected output can be written with ρ replacing θ).

The firm initially employs more workers on average in the first stage than strictly needed in production as there will be no more skilled labor available even if it receives the good shock. It is better to hire some extra workers at the first stage, train them, and fire them if the productivity shock is low. Technically, the firm has to take into account that the firing threshold ρ^* depends on the number of initial workers $\hat{l}$. The first order condition with respect to hiring $\hat{l}$ is

$$\Psi_1 \int_{\rho^*(\hat{l})}^{\bar{\rho}} (MPL_1 - w) f(\rho)d\rho + \int_{\underline{\rho}}^{\rho^*(\hat{l})} \Psi_2 (MPL_2 - w) f(\rho)d\rho = 0, \quad (19)$$

where

$\psi_1 = h^* + \hat{l}\frac{\partial h^*}{\partial \hat{l}}$, $\psi_2 = h^*\frac{\partial l_{\lambda}}{\partial \hat{l}} + l_{\lambda}\frac{\partial h^*}{\partial \hat{l}}$, $MPL_1 = \rho\alpha k^{1-\alpha}(h^*\hat{l})^{\alpha-1}$, and $MPL_2 = \rho\alpha k^{1-\alpha}(h^*l_{\lambda})^{\alpha-1}$.

More precisely, there is an additional term to (19) representing the extensive margin,

$$-\left(\rho^* k^{1-\alpha}(h^*\hat{l})^{\alpha} - wh^*\hat{l}\right) f(\rho^*)\frac{\partial \rho^*}{\partial \hat{l}} + \left(\rho^* k^{1-\alpha}(h^*l_{\lambda})^{\alpha} - wh^*l_{\lambda} - \tau\right) f(\rho^*)\frac{\partial \rho^*}{\partial \hat{l}} < 0. \quad (20)$$

The first term is the cost to keeping all the initial workers at the default threshold, while the second term is the benefit of firing workers at the same threshold. As discussed earlier, in the context of equation (8), this sum is negative, approaching zero, with smaller verification and negotiation cost τ. By assuming small τ, we can thus ignore this term.

If a firm can fully commit not to lay off any workers, or if workers possess high bargaining power, then the condition (19) above can be represented as the limit of $\lambda \to 1$. In this case, $\rho^* \to \underline{\rho}$ and $l_\lambda \to \hat{l}$ (i.e., $\psi_2 \to \psi_1$ and $MPL_2 \to MPL_1$). Then (19) becomes simply $\psi_1\left(E[MPL_1] - w\right) = 0$, i.e., the expected profit becomes zero, if $\lambda=1$,

$$\int_{\underline{\rho}}^{\bar{\rho}} MPL_1 f(\rho) d\rho = E[MPL_1] = w. \tag{21}$$

A similar equation is satisfied if $\lambda=0$. In this case, by definition, the ex post marginal product of labor in distress (MPL_2) becomes equal to wage w for every realization of ρ below threshold ρ^*. Therefore, the second term in (19) is zero and hence the first term, the expected returns for only good states of world, should be equal to wage, that is,

$$\int_{\rho^*}^{\bar{\rho}} MPL_1 f(\rho) d\rho = w. \tag{22}$$

Between the two cases, i.e., $0<\lambda<1$, even with low realization of ρ, the firm by construction cannot fire workers as much as it wants. Note again that, given the fixed capital endowment k, full employment in the initial period $\hat{l} = 1$ determines the equilibrium wage, which we denote w_1 for $\lambda=1$ case, w_0 for $\lambda=0$ case, and w_λ in general.

Proposition 3.
Given the relative bargaining power λ of workers, banks' initial capital endowment k, inelastic labor supply at one, and the financial contract represented by (r, ρ^*), the equilibrium wage, w_λ, is uniquely determined.

Proof is provided in Appendix IV.

The unemployment rate for initial labor hiring might not be zero if the prevailed wage is higher than the equilibrium wage w_λ. This could happen due to minimum wage laws or collective bargaining on wage with labor unions. Non-equilibrium high wage is clearly detrimental for macroeconomic outcomes. We do not explicitly analyze this theoretically, but note that the negative effects from ex ante bargaining on wage is different from ex post bargaining on employment.

Lastly, we can also characterize the optimal capital input decision and equilibrium in the capital market. Recall that capital is provided by the bank under the arbitrage condition (17), given r_F.

Proposition 4.

Given the risk free rate r_F, relative bargaining power λ of workers, banks' initial capital endowment k, and inelastic labor supply of one, the equilibrium interest rate, r, and the default threshold, ρ^*, are uniquely determined.

Proof is provided in Appendix V.

Note that the results holds even in a case in which Assumption 1 is slightly violated, that is, the risk free rate can differ from the unconditional expected return described in Assumption 1. If the risk free rate is low, then there will be more excess profits for the firm owners. In standard neoclassical models, the sum of the interest paid to banks and this excess return constitute the return to capital, which, given an initial capital amount, is endogenously determined. In this paper, the bank, as an outside investor, is arbitraging with the world's risk free rate, while the firm owners receive any excess returns without being able to arbitrage with the outside world. Therefore, the risk free rate becomes the free parameter that divides the expected return between the bank and the firm owners. Consequently, Assumption 1 implies that with small cost τ, all the expected capital returns essentially go to the bank.

C. Time Inconsistency Problem

As noted, there is a time inconsistency problem: the firm (shareholders and banks) cannot commit ex ante not to lay off some workers. That is, the subgame perfect equilibrium of worker power is $\lambda=0$. Then, knowing that they could be laid off easily, workers choose to invest less than the socially optimal human capital. Hence, a public intervention can be useful: legal restrictions on firing can be the commitment device for firms not to lay off workers at their free wills in case of a bad shock. For now though, we assume that the firm can choose and commit to its bargaining power optimally, and we next examine if its choice is different from zero.

Lemma 2.
Under Assumptions 1 – 4, given wage w and interest rate r, higher worker power, λ, induces higher human capital investment, h, in equilibrium.

The proof is provided in Appendix VI.

Proposition 5.
If the firm can commit a specific worker power, under Assumptions 1 – 4, then in general there exists a worker power λ^*, $0<\lambda^*<1$, which maximizes the firm profits, at least locally. It satisfies the following condition with equilibrium wage w and interest rate r (as determined in Propositions 3 and 4):

$$0 = \int_{\underline{\rho}}^{\rho^*} \left(MPL_2 - w\right) l^* f(\rho) d\rho. \tag{23}$$

The proof is provided in Appendix VII.

Corollary 5.
In general, multiple λ can be equilibria. In particular, both $\lambda=0$ and $\lambda=1$ *are equilibria.*

The proof is provided in Appendix VIII.

Note that for any r and w, several λ may satisfy condition (23). However, for a set of (r, w, λ) to be an equilibrium, condition (23) needs to be simultaneously satisfied with the conditions for equilibrium wage and interest as defined in Propositions 3 and 4. And, even then, multiple equilibria can exist. Which equilibrium is most desirable for the firm depends on the trade-off between human capital accumulation and the flexibility of firing workers. An analytical solution is difficult to obtain.

However, as long as this trade-off is important, some internal solution, $0<\lambda^*<1$, that is the best for the firm (i.e., shareholders and creditors) should arise. This implies inverse-U shape relationship between workers' bargaining power λ and firm profits as shown in Figure 1. Moreover, by construction, the profit-maximizing level of worker power depends positively on the degree to which high skills are demanded in the firm or industry.[17]

Proposition 5 therefore states that there is a worker's power λ^* that maximizes firm profits. The firm obviously prefers this level of bargaining power. However, without legal restrictions, $\lambda=0$ will prevail as the subgame perfect equilibrium: ex post, the firm, facing demands by its creditors, does not want to honor its promise to keep all workers employed if a firm gets a bad shock and cannot repay its debt in full. This time consistency problem makes $\lambda=0$ prevail.

D. Social Optimum

A question arises whether the bargaining power privately optimal for the firm, λ^*, is also (constrained) social optimum. To compare with the social planner's problem, we slightly modify the institutional setup of the economy. That is, we now explicitly assume that the firm and bank's profits are shared among households. Moreover, we assume that household consumption is realized after households obtain labor income, either wh or b, and all profit income. It is easy to show that these modifications do not alter the competitive equilibrium results, except that consumption is now equalized across states thanks to risk sharing.

Given λ, the competitive equilibrium is the (constrained) social optimum. The (constrained) social planner maximizes the representative household utility, $u(c) - v(l)$, subject to the firm profit maximization (16), the bank participation constraint (17), the worker participation constraint, $w \geq b$, and the resource constraint, $c = y$. Without risk-sharing concerns, the socially optimal choice of worker power is to maximize output. All the first order conditions are equal to those in the market equilibrium when the social planner are also constrained by the informational

[17] We focus on how the time inconsistency problems can be mitigated by laws and regulations. Obviously, if there are (other) externalities present, there will be additional scope for laws and regulations to improve social welfare. However, such arguments are quite standard and we do not include such externality-based arguments here. Besides, the sign of the externality in this paper, if any, is not well determined (as discussed in reference to Assumption 3).

problem with the same costs to verify the sate and negotiate the contracts. Therefore, the constrained socially optimal allocation coincides with the competitive equilibrium outcome (following similar arguments by Townsend, 1979).

However, when the worker power λ is also chosen by firms in the competitive equilibrium and by the social planner in the social planning problem, the choices of λ by firms who cannot commit, by firms who can commit, and by the social planner (who can commit) are all different. The difference of the former two cases are already discussed as the result of the time inconsistent problem in the previous section. Now, we explain the different choice of λ by firms who can commit and the social planner (who can commit).

The difference stems from the fact that the social planner maximizes the overall output while a firm maximizes its profits only. Hence, only the social planner care about the best utilization of , the fired workers in the low-skill sector with the linear production function bl.[18] From the social planner's point of view, there can thus be socially wasteful firing. In this case, workers with high skill can produce more if they work in the high-skill sector than in the low-skill sector. On the other hand, there can be socially wasteful retention with excessive employment protection. With higher λ, workers try to keep their high paid job even when things turns bad and the firm faces difficulties to pay the promised wage without defaulting on its creditors. In this case, it would be the first best if workers change jobs to the one that offer certain, albeit lower income.

Because worker power λ is chosen before the productivy shock arises (or indicated by the signal), the same level of λ may ex post mean either socially wasteful firing or retention. Let $\hat{\rho}$ denote the threshold of the realization of the productivity shock when neither wasteful firing nor retention occurs. Socially destructive firing occurs when the ex post marginal productivity of labor is higher than the low skill sector return b. Note that this threshold is likely equal to the lower bound of ρ for λ close to zero because the safe, low return b is assumed to be less than the expected marginal product of labor in the high skill sector under full employment.

The expected loss from socially destructive firing is,

$$\int_{\hat{\rho}}^{\rho^*} (\hat{l} - l_\lambda)(h^* MPL_2 - b) f(\rho) d\rho. \qquad (24)$$

The opposite case is socially destructive retention, which has an expected loss

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[18] Note that, if λ is fixed, the same argument might cause a disparity between the competitive equilibrium and the constrained social optimum. However, this disparity does not exist in our model because in the competitive equilibrium $w \geq b$ is taken care of as the participation constraint, which always hold in equilibrium with layoff that support the equilibrium wage always higher than b. And, the constrained social planner cannot improve any ex post inefficiency with $\lambda>0$ since it also needs to obey the institutional setup represented by λ, if given. Therefore, the disparity between the competitive equilibrium and the constrained social optimum could exist only when the worker power λ is also a choice variable by the firm and by the social planner.

$$\int_{\underline{\rho}}^{\hat{\rho}} l_\lambda (b - h^* MPL_2) f(\rho) d\rho. \qquad (25)$$

The net expected social loss from sub-optimal firing-retention decisions by the firm is the sum of the two.

Proposition 6.
The socially optimal level of worker power λ^{SP} is neither zero nor one. Also, in general it is not equal to the internal solution λ^* for firms that can commit. However, the committed firm's optimal λ^* coincides with the socially optimal λ^{SP} when the following condition is met:

$$\int_{\hat{\rho}}^{\rho^*} \hat{l}(h^* MPL_2 - b) f(\rho) d\rho = \int_{\underline{\rho}}^{\rho^*} l_\lambda (h^* MPL_2 - b) f(\rho) d\rho. \qquad (26)$$

with $\hat{l} = 1$.

The proof is provided in Appendix IX.

Proposition 6 states the following. Basic labor protection can boost the output of industries that require specific human capital investments compared to no protection ($\lambda=0$). However, a too rigid labor market ($\lambda=1$) is detrimental for the economy as workers are not utilized well across firms. As such, there is an internal solution for the socially optimal level of labor protection. It could differ from the decentralized equilibrium and the disparity could serve as an additional argument for government intervention. The direction of this disparity is not obvious in general and we would like to refrain further investigations in this paper. However, in case of $b=0$, only socially destructive firing (24) can occur without much destructive retention (25). Therefore, when b is small, socially optimal worker power λ is likely larger than the optimal choice in the competitive equilibrium by the firms who can commit (i.e., without the time inconsistency problem).[19]

IV. DATA

The empirical literature generally finds a negative relation between the degree of employment protection and employment, i.e., there are costs of a rigid labor market. Our model's key finding, however, is that there can be positive effects of changes in (basic) labor protection on employment and overall economic output because of interactions between creditors and workers. This also contrasts with most other theories which do not suggest (positive) effects on economic performance from the interactions between the employment protection and financial reforms. To test our prediction empirically and reconcile it with this evidence, we next study the interactions

[19] Note that b, which is the income outside of firms, could be considered as the unemployment benefits, rather than the low-skill work income. In this case, because the unemployment benefits need to be funded by tax, which may be distortionary, there would be additional reasons to avoid firing from the social planner's point of view. This is the same argument as in Blanchard and Tirole (2008), though explained in a quite different model.

between basic employment protection and financial liberalization using the quasi-natural experiments that occurred in the U.S.

We explain in detail in this section the sources and characteristics of the data we use. First, we identify the regulatory and legal changes at the US state level regarding banking sector competition and employment protection. For this, we rely on indexes commonly used in the literature. Second, to evaluate the economic impact of these reforms, we collect data on growth in state-level and state-industry-level value added. Third, to help with identification, we exploit industry-specific characteristics. In particular, we focus on the natural tendency of firms to depend to varying degrees on external finance and high skilled labor. Since these tendencies can be represented by several measures, we use several existing indexes based on firm-level data but also construct new measures. Table 1a provides descriptive statistics for all the variables we use.

Since reforms happen at the state-level, we focus on their overall consequences, i.e., their impact on aggregate state-level or state-industry-level growth. By focusing on aggregate effects, we can be less concerned about reverse causality. This is more likely a problem for studies at the firm level, since job security at a firm is likely determined in part by the profitability and other characteristics (e.g. indebtedness) of the firm (e.g., Bae, Kang, and Wang, 2011). Studying financial and employment protection reforms using US state- and state-industry-level data also overcomes some of the problems prevalent in cross-country studies where results can be driven by various country characteristics and other factors hard to control for. Nevertheless, as some concerns may remain, we show that our findings are robust to using additional institutional measures as well as using various output measures, sample periods, and econometric specifications.

A. Bank Branch Deregulation

Jayaratne and Strahan (1996) describe the history of bank branch deregulation in the U.S. Before deregulation unit banking was the rule: a bank could not open any branch and could operate at the headquarters' location only. Starting in the early 1970s (except for some states), banks were allowed to operate multiple branches within each state (intrastate banking), first through mergers and acquisitions of other banks, and then by establishing new branches (*de novo* branching). This deregulation took place at different times in each state, with large variations. Finally, in 1994, the federal government permitted banks to operate branches in different states (interstate banking). The degree of banks' monopoly power, as analysis has shown, is conversely negatively associated with the degree of this deregulation.[20]

The data we use on bank branch deregulation comes from Jayaratne and Strahan (1996). Specifically, the financial deregulation index we use defines deregulation in one of two ways: *FinLib = M&A*, which is a dummy equal to 0 when bank branch through M&A is restricted, and 1 if it is deregulated; or *FinLib = de novo* which is a dummy equal to 0 when bank branch is restricted, and 1 if it is deregulated. For robustness, we investigate the effects of both measures,

[20] See Strahan (2003) for a review on the economic effects of US banking deregulation.

but since M&A bank deregulation always precedes de novo deregulation, we find not surprisingly most impact from M&A bank deregulation and only report those results.

B. Employment Protection

Autor, Donohue and Schwab (2006) document how, using initial precedent-setting case law, states adopted *de facto* wrongful discharge protection for employees.[21] They classify these forms of employment protection into three categories: public policy, good faith, and implied contract. Under the public policy exemption, employers cannot fire employees just because they follow public policy, such as performing jury duty, filing worker's compensation, reporting employer's wrongdoing, and so forth. Under the good faith exemption, employers cannot fire workers for "bad cause," primarily applied to "bad timing" cases, such as firing just before a salary due or pension threshold date. The implied contract exemption is somewhat vague, but has generally be interpreted as follows: without clearly stating in the employment contract that a company can fire a worker at will, workers should be kept employed according to their length of service, history of promotion, general company policy, industry practice, and so forth. Still, this exemption does not make it very prohibitive for U.S. firms to fire workers, unlike the more rigid labor laws in some European countries and Japan.

Considering which cases they protect workers, these rights can be considered as "basic" labor standards. While some labor rights can be secured contractually, our theory suggests that it is beneficial to standardize and secure some rights by law or court, in the presence of the time inconsistency problem (and possible externalities) in designing and enforcing privately-negotiated contracts.[22] In particular, the basic employment protection becomes more relevant when there are firm- or sector-specific human capital investment needs. Protecting workers from firing without good reason can promote workers to acquire more specialized skills and thereby enhance firm performance in those industries that demand greater firm-specific investments.[23]

For our empirical analyses, we create four employment protection indexes, depending on which, if any, of the three protections is adopted. If a protection is recognized by the specified state court, the following binary variables have a value of 1 and otherwise 0: *WorkRight = public policy*; *good faith*; *implied contract*; or *earliest* (i.e., any of the three is introduced).

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[21] Since these are precedent or case-based actions, they may not necessarily take effect in a uniform manner across the whole state immediately. While the dating consequently cannot be done unambiguously, many papers have used the same dates we use. Obviously, imprecision in dating biases our analyses towards finding no results. Note that there are some reversals where earlier recognized doctrines were overturned by the courts, which we account for.

[22] Moreover, there are costs incurred in designing optimal labor contracts individually for every job, making standards protections useful. And there can be inefficiencies in the absence of public labor rights.

[23] For example, good faith laws prevent firms from firing workers just before their pay day. Without such a law, fearing it could happen workers may demand premiums, leading to failure in labor markets, hurting especially those newly created firms that cannot pre-commit credibly to good practices. A basic employment protection can avoid such inefficiencies.

C. Patterns of the Legal Changes

We start our sample in 1972, when state level bank deregulation starts, and end it in 1993, before inter-state branch deregulation starts. Altogether we have 1056 state-year, balanced panel observations covering periods of both financial deregulation and employment protection reforms. Figure 2a depicts the number of states that have allowed M&A or *de novo* branches. Figure 2b depicts the number of states that have adopted the three forms of employment protection.

These figures show the accelerating trends of financial deregulation and greater employment protection between the 1970s and the 1990s. Changes did not occur at the same time, though, in each state. Figures 3a and 3b depict the number of years between financial deregulation and changes in employment protection at the individual state level. It makes clear that policy changes occurred in some states at quite different points in time as the number of years in between financial deregulation and changes in employment protection varies from minus 20 to plus 20.

Table 1b provides some further indication of the (lack of) overlaps in stakeholders' protection by showing the raw correlations between the various indexes. It shows a strong correlation between the two financial deregulation indexes (*M&A* and *de novo*), a correlation of 0.79. Similarly, there is some correlation among the three employment protection indexes, with the highest between contract and public policy, 0.54. Still, the other two correlations among the employment protection indexes are quite low, 0.25 and 0.12. Importantly, most correlations between financial deregulation and employment protection indexes are low, between 0.14 and 0.29, reflecting the substantial variation when these two types of reforms were adopted in each state.

D. State and State-Industry Growth

We use growth in state-level value added and in state-industry level value added to analyze the effects of changes in financial regulation and employment protection. The output growth data come from the US Bureau of Economic Analysis (BEA). Data cover the value-added produced in each state and state-industry combination. The industry breakdown is at the 2-digit SIC level with 63 industries at most per state, based on US SIC (rev. 2). We include all industries, including financial services, but also analyze separately non-financial industries. We use real growth rates, adjusted for national price (CPI) changes.[24]

Data are available for all 50 US states and the District of Colombia, but following a convention in the literature, Delaware and South Dakota are dropped, as they allowed much more open financial systems early on in attempts to serve as specialized financial centers. Altogether we have some 1,000 state level observations and 50,000 state-industry level observations. Table 1b shows that the average growth in value added is 2.4 percent, with a large variation though. Note

[24] We use national prices for several reasons. For one, we want to be comparable with what Jayaratne and Strahan (1996) and other such studies do. Second, state-specific price indexes are available only from 1978 and using those would make our sample shorter and miss some important reforms. Also, reforms can affect the prices of non-tradable goods (e.g., land rents) because of productivity gains. Such state-specific price changes should be considered as part of the overall gains from reforms (see also Johnson et al. (2009) regarding PPP adjustments in cross-country growth studies).

that, also as we observe some errors in the raw data, we take out observations with growth rates that are higher or lower than three standard deviations.

E. Industry Characteristics

To identify the channels by which judicial changes may affect firm performance, while avoiding potential simultaneity biases, we use the methodology of Rajan-Zingales (1998). We create variables that measure the *natural* characteristics of each industry in the U.S. using data from a different period. Specifically, we use firm level data to create industry-specific measures for external finance and knowledge dependency. The external finance tendency is defined in the Rajan and Zingales (1998) way as the ratio of investment minus internal cash-flows from operations to capital investments.

The industry's knowledge dependency is defined similarly as the average use of intangible assets to fixed assets. This measure, like the external finance dependency, is constructed by taking the period mean of the median values for all firms in a specific industry for each of the years 1991-2006.[25] To check the robustness of our results to using this specific knowledge-intensity measure, we create two additional industry measures, the sales-to-fixed-asset ratio, similarly constructed from firm level data, and the fraction of college graduates in the workforce in that sector.[26] Note that, according to our theory, we need a measure of firm-specific human capital, but such data do not exist. Instead, we use proxies for the general human capital at the industry level. They can be also proxies for the use of firm-specific human capital as it is likely that the general and the firm-specific human capital needs are positively correlated. This is the case for example when the firm-specific human capital is not meant as specialized crafting skills of factory workers but as procedural knowledge and social networks important for white-collar workers.

The correlations among these industry-level characteristics are as expected (Table 1c). The two knowledge dependence ratios, sales-to-fixed-asset ratio and intangible-to-fixed-asset ratio, are highly correlated, 0.71, suggesting that these two variables capture similar industry characteristics. The correlation between the external finance dependence and intangible-to-fixed-asset ratio is a negative 0.44, that is, more external financial dependent firms use more fixed assets to produce their output. Similarly, the external finance dependence and sales-to-fixed-asset ratios have a negative correlation of 0.52. Schooling has a correlation of 0.54 with the intangible asset ratio and 0.38 with the sales-to-fixed-asset ratio, but an insignificant correlation with

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[25] The balance sheet variables are originally from the Worldscope firm level database, commercially provided by Thomson Reuters. While the values of external finance dependency are not exactly the same as Rajan and Zingales (1998)—they use a different period and Compustat data, the industry ranking is virtually the same. We use the 1991-2006 period, since by 1991 the financial markets and labor reforms had largely been completed and the firm-level dependency on external financing and knowledge can be expected to be near steady state (i.e., "natural" tendency).

[26] This measure is as of 2005 from Buera and Kaboski (2012), which also reports 1940 data that is highly correlated (more than 0.7) with 2005 data. The industry classifications are different from and often more detailed than those of US SIC (rev. 2). When there is an exact overlap with the SIC industry classification, we take the data as is. Otherwise we aggregate, using as weights the income share in the more detailed industry classifications for the period 1994-2000. We construct other variables similarly whenever necessary.

external financing dependence, suggesting that it captures a characteristic of industries different from the other two.

V. Empirical Methodology and Regressions Results

We start with state-level regressions. Here we find, consistent with the existing literature, a large positive effect of bank branch deregulation and ambiguous effects of changes in employment protection. We then investigate the effects of legal changes at the state-industry level. Here we find that bank branch deregulation is beneficial for overall growth and document an industry-specific effect of employment protection, especially for knowledge-intensive industries. Moreover, we find industry-specific interaction effects for the two institutional changes, in particular for industries with greater external finance dependence and higher knowledge use.

A. State-Level Regressions

We start with state-level regressions, as they are comparable to Jayaratne and Strahan (1996) and Autor, Donohue and Schwab (2006). We provide only the basic results for these regressions since they largely confirm existing findings, and quickly proceed to the state-industry level regressions which shed more light on the role of multiple stakeholders in corporate governance.

The state-level regressions use state- and year-fixed effects to control for state-specific factors, including initial levels of GDP per capita that may affect state-specific growth trend and nation-wide business cycles. Job security in a specific year for a specific firm, for example, becomes de facto higher if the firm experiences a positive cash flow shock. Since this can obscure the structural relation between job security and firm profitability we are investigating, we control for business cycle component by including year fixed effects. We report robust t-statistics corrected for clustering at the state level. The exact specification is then:

$$g_{s,t} = \alpha_s + \alpha_t + \beta FinLib_{s,t-1} + \gamma WorkRight_{s,t-1} + \varepsilon_{s,t}. \qquad (27)$$

The first column of Table 2a shows the regression results with only the financial deregulation variable. The statistically significant positive effect of financial deregulation on state-wide growth is consistent with the hypothesis that curtailing the local monopolistic power of banks leads to more efficient intermediation. Using the M&A deregulation dummy, the effect of bank branch deregulation is about a 1.6 percent increase in state level growth rates, somewhat larger than Jayaratne and Strahan (1996). This larger effect may be because we use state fixed effects. If we run the regression without state fixed effects, the coefficient is about 1.06 percent (regression results omitted), which is almost identical to that found by Jayaratne and Strahan (1996). The effect is always lower for *de novo* branch deregulation (not reported), again in line with Jayaratne and Strahan (1996), likely reflecting that *de novo* branch deregulation always came after M&A deregulation, though highly correlated with it.

Columns 2, 5, and 8 show the effects of the three types of wrongful discharge protection measures. None of the three measures are significant. Using the earliest of the three as an employment protection index, column 11, does not show significant results either.

When we include both the bank branch deregulation and the wrongful discharge protection index, the effects of financial deregulation become somewhat stronger (columns 3, 6, 9 and 12). Given the correlation between the two institutional changes, controlling for the degree of employment protection apparently produces stronger estimates for the effect of financial deregulation. The effects of employment protection do not change much.

The results for employment protection are in line with Miles (2000) who finds little effect on unemployment rates, but somewhat different from Autor, Donohue and Schwab (2006) who find uniform negative effects on unemployment. One reason for this difference may be omitted variable biases in other studies: while we control for contemporaneous, correlated changes in financial sector deregulation, previous labor studies do not. Moreover, GDP and unemployment can differ. For example, while unemployment may increase due to greater employment protection, a rise in firm-specific human capital investment could offset the negative effects of higher unemployment in terms of overall GDP.

Since the financial sector itself was very much affected by its own deregulation, with much consolidation in the number of banks but also expansion in banking systems' size following reforms, our results may be biased by including the financial services industry in the data. Nevertheless, when we use non-financial sector state GDP growth as our dependent variable (Table 2b), all key regression results hold.[27] The effect of financial deregulation actually becomes stronger, while the effect of employment protection stays insignificant.

B. Indirect Effects

Our model suggests that ex ante rules on the relative bargaining power of workers regarding their ex post job security can indirectly increase outputs and welfare, because they overcome the time inconsistency problem and achieve a better alignment of incentives to invest in human capital. The model also indicates that there can be interactions between financial deregulation and changes in *de facto* job security. Particularly, a lowering of banks' monopolistic powers can indirectly make firing or corporate bankruptcy less likely. Jobs are likely to become safer if better external financing provision enhances the survival probability of firms with temporary liquidity problems. Or if more competitive banks have less bargaining power over workers, e.g., if they cannot determine as much compensations and firing in cases of (near) bankruptcy, jobs becomes more secure.[28] As workers invest more in firms-specific skills, output would be higher.

To test our additional theoretical predictions, we now include the interaction term between the bank branch deregulation and employment protection indexes for all industries in the state-level regressions. This means the specification becomes:

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[27] To derive non-financial sector state level GDP we use the state-industry output data and subtract financial sector output from state level GDP.

[28] For example, less powerful creditors may extend loans or agree to reschedule repayments so that workers can keep their wage or job (Perotti and Spier, 1993). Since these contingencies cannot be written in labor contracts in a very precise way, it is the ex post bargaining power of the various stakeholders that determines the final outcome. Since stakeholders realize this possibility ex ante, the relative strengths of ex post bargaining powers influence their decisions, including their willingness to make firm-specific human capital investment.

$$g_{s,t} = \alpha_s + \alpha_t + \beta FinLib_{s,t-1} + \gamma WorkRight_{s,t-1} + \delta FinLib_{s,t-1} * WorkRight_{s,t-1} + \varepsilon_{s,t}. \quad (28)$$

Table 2a and 2b (columns 4, 7, 10, and 13) show these regressions, using all industries and only non-financial industries respectively. There are few significant effects for the simple cross term coefficient δ at the state level. Consistent with our model, which suggests that such interaction effects are likely to be industry specific, we explore next state-industry level data.

Note that other theories on monopolistic banks are difficult to show interaction effects of financial liberalization and employment protection. First, the bank deregulation literature has so far, explicitly or implicitly, focused on the effects of banks' ex ante monopolistic behavior on credit allocations. Without monopolistic rents, more loans would be extended and better allocated among firms, resulting in higher economic growth. But, this would not have any implications for the interactions with employment protection. Second, job security may be higher before financial deregulation if less competitive banks kept inefficient firms afloat (e.g., Zombie firms). In this theory, however, with more inefficient firms, the overall return on firm-specific human capital investment before deregulation would presumably be lower and aggregate value-added would not grow as fast.

C. State-Industry Level Benchmark Regressions

Using state-industry level regressions, we are more likely to detect the channels through which financial deregulation and changes in employment protection affect output growth. Specifically, we can now use our two benchmark characteristics for each industry, dependence on external finance and intensity of knowledge use, and interact these characteristics with our financial deregulation and employment protection indexes. We include state-industry fixed effects $\alpha_{s,j}$ to capture any state-specific industry growth trends. And we include state-year fixed effects $\alpha_{s,t}$ to control for other factors, such as state-specific business cycles and other policy changes. This use of dummies also means we only need to include interaction terms because the simple effects from financial deregulation or employment protection are already absorbed in the state-year fixed effects. The full specification is then:

$$\begin{aligned} g_{j,s,t} = {} & \alpha_{s,j} + \alpha_{s,t} + \beta FinLib_{s,t-1} * ExtFinDep \\ & + \gamma WorkRight_{s,t-1} * KnowledgeDep_j + \varepsilon_{j,s,t}. \end{aligned} \quad (29)$$

where *ExtFinDep* denotes the industry's dependency on external finance and *KnowledgeDep* the industry's knowledge dependency, defined as the use of intangible assets relative to fixed assets. Since the earliest of the three different labor reforms is often the public policy based protection, which signals further coming employment protection, we use this index for these investigations (regressions with the other employment protection measures show similar results). We use only the non-financial sectors in the state-industry level regressions and we report robust t-statistics corrected for clustering at the state level.[29]

[29] We use the `reg2hdfe` STATA command to estimate correctly regressions with two-dimensional fixed effects.

The effects of financial deregulation do not vary with industry's external financing when deregulation is the only regressor other than the fixed effects (Table 3, column 1). However, it becomes significant when the interaction term between workers right is also included as a regressor (Table 3, column 3). The latter result is consistent with findings in the literature, but the former result suggests that there are interactions between the two institutional changes that need to be controlled for to properly assess impacts.

The coefficient on the interaction term between the employment protection index and knowledge dependency is positive and statistically significant with or without controlling for financial deregulation (Table 3, columns 2 and 3). We thus find support for our prediction that increased employment protection adds to growth in value added through an industry-specific, knowledge intensity related channel. Although greater employment protection has little effect on overall economic activity, as suggested by the state-level regressions, it helps growth of those industries that are more knowledge dependent.[30]

Next we look at the relative bargaining power of labor, which should be indirectly strengthened by financial liberalization, in particular in those industries that rely more on external financing and also in those industries that rely more on workers' knowledge. To investigate these two, we add a triple interaction term between the financial deregulation and employment protection indexes, and the industries' knowledge use index. We add as well the triple interaction term between the financial deregulation and employment protection indexes and the industries' external financing dependence. The regression specification becomes then:[31]

$$\begin{aligned} g_{j,s,t} = {} & \alpha_{s,j} + \alpha_{s,t} + \beta FinLib_{s,t-1} * ExtFinDep_j \\ & + \gamma WorkRight_{s,t-1} * KnowledgeDep_j \\ & + \delta_1 FinLib_{s,t-1} * WorkRight_{s,t-1} * ExtFinDep_j \\ & + \delta_2 FinLib_{s,t-1} * WorkRight_{s,t-1} * KnowledgeDep_j + \varepsilon_{j,s,t}. \end{aligned} \tag{30}$$

Table 3 (columns 4) reports the regression with these triple interaction terms. Both triple interaction terms are significantly positive, albeit only at 10 percent significance level for knowledge intensity, suggestive evidence of the importance of relative bargaining power. As for the double interaction terms, there is little change compared to column 3 for employment protection interacted with knowledge dependency. However, financial deregulation interacted with external finance dependency becomes now insignificant. This suggests that the positive effects of financial deregulation for external finance dependent industries may arise primarily through the relative bargaining power channel, supportive of our model.

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[30] This also suggests greater employment protection adversely affects low knowledge intensive industries.

[31] When we include two additional interaction terms (i.e., *FinLib*KnowledgeDep* and *WorkRight*ExtFinDep*), we find that the coefficient estimates for other variables are more or less the same as in the regressions without these two terms and that the coefficient estimates for these two terms are often insignificant.

VI. Robustness Check

A. Alternative Knowledge Measures

As our first robustness test, we use two alternative sectoral measures. The first one is the sales-to-fixed-asset ratio, the reciprocal of conventional capital intensity, calculated at the industry level (Table 3, columns 5 – 7). The second is the industry-specific fraction of college graduates (Table 3, columns 8 – 10). Both confirm that greater employment protection increases value added growth in knowledge-intensive industries. The results with the first alternative are similar or even somewhat stronger, while the results for the second measure are somewhat weaker for the triple interaction terms, perhaps as the proxy is poorer.

B. Alternative Periods

Interstate branching was officially permitted across all states after 1994, which is why we used data only until 1993. However, some states are reported to have allowed interstate banking, especially at the borders, already before 1993. We therefore also run the benchmark regression using data up to only 1990. This does not show any qualitative difference of the effects of financial deregulation and employment protection reforms on value added growth (reports omitted).

C. Minimum Wage and Labor Union

In this section, we examine whether minimum wage and labor union have effects similar to the exemption for wrongful discharges. Note that any other state-level policy changes are already absorbed in the state-year fixed effects and state-industry trends in the state-industry fixed effects.

Minimum wages vary across US states and over time. Also, the federal minimum wage can be a state's effective minimum wage if the federal minimum wage is higher or if the state does not have a minimum wage. The federal minimum wage varies also over time. We obtain from the US Department of Labor each state's minimum wage for all years and replace the state minimum wages by the federal minimum wage when it is higher or when there is no state minimum wage. We deflate these wages by the national CPI and use the real values in the regressions. The union coverage ratio (i.e., the portion of workforce that are covered by union collective bargaining) can best be seen as another index for keeping wages higher than they otherwise would be, with resulting reduced levels of employment. Union coverage is also state dependent and time varying. We obtain data (either state-level or industry level) from Hirsh and MacPherson (2003) from 1983 onwards. In our regressions, we use specifically the coverage of labor force under collective bargaining of the labor union in each state each year.

Figure 4 depicts the evolution of the averages of the state-specific minimum wages (the solid line) and the union coverages (the dotted line). Both are on a declining trend, although the minimum wages show a zigzag pattern in 1970s, in part as corrections for inflation, which was high in that decade, were imperfect. Correlations between these two variables and the exemption for wrongful discharges are reported in Table 1b. Union coverage is negatively correlated with the public policy based employment protection, about -0.5. However, the minimum wage is slightly positively correlated with the employment protection index.

We expect that both minimum wages and union coverage do not protect employment but rather negatively affect job security and growth as they are likely to raise the wages because out theory suggests so in the context of Propositions 2 and 3. There can, however, also be interactions with knowledge intensity. A high minimum wage is likely to reduce employment especially in low-skill industries (Partridge and Partridge, 1999). A minimum wage could, in other theories, be an incentive for workers to invest in human capital, although, our theoretical result suggests the overall effects on human capital investment could be negative with higher wages. Unions in the U.S. typically call for higher wages too, but are less effective in protecting employment, in part as firms migrate to other states. Indeed, it is well documented that states with stronger unions have been losing jobs over time. Even though unions tend to be stronger in some industries than in others (see Hirsh and MacPherson 2003), such industry effects, with their slow movements over time, are likely absorbed in the state-industry effects in the benchmark regressions.

Tale 4 shows the regression results replacing the exemption for wrongful discharge as the *WorkRight* variable with either the minimum wage or union coverage. The results are otherwise based on the benchmark specifications, using the intangible to fixed asset ratio as the knowledge proxy. Since the union coverage is available only from 1983, the regressions are conducted using data from 1983 to 1993. Columns (1)-(3) therefore first confirm the robustness of the benchmark regression results for this specific period, using the earliest of the exemption for wrongful discharge. It confirms the result of Table 3, with actually stronger interaction effects.

Columns (4)-(6) show that union coverage negatively affects the growth of knowledge intensive industries, confirming findings in the literature. However, this negative effect does not arise from the relative bargaining power channel with creditors, as none of the triple interactions terms are significant. Columns (7)-(9) show that the effects of the minimum wage are similar to those of union coverage. The minimum wage has detrimental effects on the growth of knowledge-intensive industries. Because the minimum wage data is available from 1972 on, columns (10)-(12) show that results using the longer data series. Still, the result holds. Note that, although one triple interaction term is significantly positive in this regression using the full sample from 1972, this term is not significant for the period 1983-1993 (Column 9). Altogether, these regression results confirm that artificially high wage has negative effects, possible through lowering job security, on growth.

D. Reverse Causality and Endogenous Policy Changes

Our results could be due to reverse causality when differences in growth prospects in industries with varying external financing dependence or knowledge intensity drive changes in financial deregulation or employment protection. For example, firms may exercise more political pressure towards financial deregulation in states where they have more to gain. Or lobbying for employment protection may be more intense in states where knowledge-based industries have more opportunities to prosper. If this were the case, our regression results would have an upward bias and the wrong interpretation may follow.

One simple, but very rough check for this is to conduct the state-industry level regressions excluding some states. We already excluded the states Delaware and South Dakota as they had more liberal financial systems for most of the period, maybe exactly because they had greater

growth opportunities in financial services. We next also exclude the states of California and Massachusetts that arguably had the most knowledge-intensity industry growth over the sample period and therefore may have adopted greater employment protection. Also, we exclude the state of New York from our sample, as the financial industry seems exceptionally important for the state growth. The regression results without these three states (Table 5) are, however, virtually the same as in Table 3.[32]

To control more generally for possible bias due to reverse causality and for various other types of economic and policy spillovers that may create endogeneity, we next employ the dynamic panel estimation technique of Blundell and Bond (1998) with autoregressive order one or two terms in the difference equations.[33] Note that, using the first difference model means we cannot include any more state-year and state-industry fixed effects and therefore need to re-introduce the financial deregulation and changes in the employment protection as stand-alone regressors.[34]

Table 6 shows that the key results broadly hold. When using the intangible to fixed assets as the knowledge variable, the triple interaction term for knowledge dependence becomes insignificant but the triple interaction term for the external finance dependence remains significant (columns 2 and 3). When using the sales to fixed capital ratio, both triple interaction terms remain significant (columns 5 and 6).When using the college graduate share, the triple interaction term for external finance dependence becomes significant (columns 8 and 9), unlike the result in Table 3. [35]

VII. CONCLUSIONS

We develop a simple novel model that shed lights on the ex post bargaining problem between creditors and workers when a firm runs into financial distress. In essence, our theory endogenizes the severity of the hold-up problem between workers, which can invest in firm-specific human capital, and the firm, which, in distress, largely represents creditor interests. The model extends the costly state verification (Townsend, 1979) to justify not only a debt-type bank loan contract, but also a fixed wage contract with possible layoff. We then develop predictions on the effects of financial liberalization and basic labor protections. We show that, while too rigid labor

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[32] Another potential source of bias may be spillovers. We have largely focused on within-state and time-series variations, including by using standard errors clustered at the state-level. Doing so, however, we risk ignoring cross-state variations that can arise from growth and policy spillovers. Growth spillovers may arise if other (say, neighboring) states adopt policies which leads to higher growth in the state itself, even though it did not yet adopt any policy changes. Policy spillovers may arise if due to political pressures or learning effects, states mimic changes in neighboring or other states. However, both would lead to downward bias in our regressions, especially if people predicted future policy changes and started to change behavior in anticipation.

[33] Given relatively large samples we have, we report two step estimation results with GMM standard errors, which take into account cross-state correlations.

[34] Following Blundell and Bond (1998), we also use the level equation as additional information in the GMM estimation. We include year dummies as exogenous instruments.

[35] The *m1* tests (for the first-order serial correlation) are met for all specifications while *m2* tests (for the second-order serial correlation) are not met at 5 percent level for AR(1) specifications when using the intangible to fixed asset as the knowledge variable (column 1 and 2) but *m2* test for AR(2) specification is good (column 3) as well as for all other specifications. The results, however, needs to be interpreted with caution as the Sargan tests generally reject the null that the over-identifying restrictions are valid (i.e., the "goodness of fit" is low).

protection is detrimental to growth, basic protection can boost the output of industries requiring firm-specific human capital.

We then test our model by investigating if its predictions are consistent with empirical patterns found following natural experiments in the U.S. Using state and state-industry level value added data, we document the important roles of bank branch deregulation and employment protection for economic growth, using institutional changes in both financial and labor markets in the U.S. over the period 1972 to 1993. In terms of state-level aggregate impact, we confirm previous studies conducted separately in the banking and labor literature. Specifically, we find that financial deregulation is beneficial for average state-level growth and also for state-industry level, but that the overall effect of employment protection on state-level output is insignificant. These regression results are consistent with previous studies.

However, unlike previous results, we find that employment protection promotes growth at the state-industry level in those industries that are more knowledge-intensive. Importantly, and consistent with our novel theory with firm-specific investment, we find that this effect is stronger with bank branch deregulation. These results show that the presence of financial frictions can influence economic activity through its effects on job security and related incentives to invest in human-capital. Note that theories based on monopolistic behavior of banks in terms of ex ante loan provision do not say anything about this (empirically confirmed) indirect effect.

It may surprise some to find positive effects of higher bargaining power for workers due to regulatory changes in the U.S. The U.S. is after all a very market-based economy with good institutions and near complete contracting environment, where the scope for market failures including in labor contracting, could be considered low. Still, our results seem consistent with the history of the U.S., which has transformed itself over the sample period to a more knowledge-based economy, with higher specialization and more firm-specific human capital accumulation, accompanied over the same period by improved formal labor standards.

Our results also speak to a broader corporate governance debate in countries other than the U.S. In particular, it suggest that basic labor standards, such as in the U.S., can create a better alignment of bargaining powers between workers, creditors, and shareholders. This kind of employment protection could be especially important for emerging markets, also given the typical dominance of banks in financial intermediation.[36] This is not to say that higher rigid labor standards are always good for output. Indeed, theoretically we find the relationship between employment protection and economic outcomes to be inverse-U shaped. That is, very generous labor protection brings about inefficiencies, as often shown in the literature, in particular for continental Europe and Japan. We also remark that the perverse effect of labor standards has most often been documented in isolation, without considering the de-jure and de-facto powers of creditors. Here, we see a fruitful research area to analyze empirically the best combination of

[36] For a general review of the general literature on the role of institutions on development, see Acemoglu, Johnson and Robinson (2005) and of the law and finance literature specifically, see Levine (2005). Also see Johnson and others (2000), Mitton (2002), Joh (2003) for shareholder protection.

creditor and employment protections and, more generally, the optimal relative bargaining power allocation among key stakeholders.

References

Abiad, Abdul, Nienke Oomes and Kenichi Ueda, 2008. The Quality Effect: Does Financial Liberalization Improve the Allocation of Capital? *Journal of Development Economics* Vol. 87, 270-282.

Acemoglu, Daron, Simon Johnson and James Robinson, 2005, Institutions as a Fundamental Cause Of Long-Run Growth, in Philippe Aghion and Steven Durlauf, eds. *Handbook of Economic Growth*. The Netherlands: Elsevier Science.

Acharya, Viral V., Jean Imbs and Jason Sturgess, 2011, Finance and Efficiency: Do Bank Regulations Matter? *Review of Finance,* Vol. 15, No. 1, 135-172.

Acharya, Viral V., Yakov Amihud, and Lubomir P. Litov, 2011, Creditor Rights and Corporate Risk-Taking, *Journal of Financial Economics,* Vol. 102, No. 1, 150-166.

Allen, Franklin, 2005, Corporate Governance in Emerging Economies, *Oxford Review of Economic Policy,* Vol. 21, No. 2, 164-177.

Allen, Franklin, and Douglas Gale, 2004, Competition and Financial Stability, *Journal of Money, Credit and Banking,* Vol. 36, No. 3, 453-480.

Allen, Franklin, Elena Carletti and Robert Marquez, 2007, Stakeholder Capitalism, Corporate Governance and Firm Value, CFS Working Paper Series 2007/26, Center for Financial Studies (CFS).

Atanassov, Julian, and E. Han Kim, 2009, Labor Laws and Corporate Governance: Evidence from Restructuring Decisions around the World, *Journal of Finance*, Vol. 64, No. 1, 341-374.

Autor, David H., John J. Donohue, III and Stewart J. Schwab, 2006, The Costs of Wrongful-Discharge Laws, *Review of Economics and Statistics*, Vol. 88, No. 2, 211-231.

Autor, David H., William R. Kerr and Adriana D. Kugler, 2007, Do Employment Protections Reduce Productivity? Evidence from U.S. States, *Economic Journal*, Vol. 117, 189-219.

Bae, Kee-Hong, Jun-Koo Kang, and Jin Wang, 2011, Employee Treatment and Firm Leverage: A Test of the Stakeholder Theory of Capital Structure, *Journal of Financial Economics*, Vol. 100, 130-153.

Bebchuk, Lucian Arye and Alma Cohen, 2003. Firms' Decisions Where to Incorporate. *Journal of Law and Economics*, Vol. 46, 383-425.

Bekaert, Geert, Campbell Harvey, and Christian Lundblad, 2005, Does Financial Liberalization Spur Growth? *Journal of Financial Economics*, Vol. 77, 3–55.

Bertola, Giuseppe, 1994, Flexibility, Investment, and Growth, *Journal of Monetary Economics*, Vol. 34, 215-238.

Besley, Timothy, and Robin Burgess, 2004, Can Labor Regulation Hinder Economic Performance? Evidence from India, *Quarterly Journal of Economics*, Vol. 119, No. 1, 91-134.

Black, Sandra E. and Philip E. Strahan, 2001, The Division of Spoils: Rent-Sharing and Discrimination in a Regulated Industry, *American Economic Review*, Vol. 91, No. 4, 814-831.

Blanchard, Olivier J., and Pedro Portugal, 2001, What Hides Behind an Unemployment Rate: Comparing Portuguese and U.S. Labor Markets, *American Economic Review*, Vol. 91, 187-207.

Blanchard, Olivier J., and Jean Tirole, 2008, The Joint Design of Unemployment Insurance and Employment Protection: A First Pass, *Journal of European Economic Association*, Vol. 6, No. 1, 45-77.

Blundell, Richard and Stephen Bond, 1998, Initial Conditions and Moment Restrictions in Dynamic Panel Data Models, *Journal of Econometrics*, Vol. 87, 115-143.

Botero, Juan, Simeon Djankov, Rafael La Porta, Florencio Lopez-de-Silanes and Andrei Shleifer, 2004, The Regulation of Labor, *Quarterly Journal of Economics*, Vol. 119:4, 1339-1382.

Boyd, John H., and Gianni De Nicolo, 2005, The Theory of Bank Risk Taking and Competition Revisited, *Journal of Finance,* Vol. 60, No. 3, 1329-1343.

Buera, Francisco J., and Joseph P. Kaboski, 2012, The Rise of the Service Economy, *American Economic Review,* Vol. 102, No. 6, 2540-2569.

Caballero, Ricardo J. and Mohamad L. Hammour, 1998, The Macroeconomics of Specificity, *Journal of Political Economy*, Vol. 106, No. 4, 724-767.

Cingano, Federico, Marco Leonardi, Julian Messina, and Giovanni Pica, 2010, The Effects of Employment Protection Legislation and Financial Market Imperfections on Investment: Evidence from a Firm-Level Panel of EU Countries, *Economic Policy,* 61, 117-163.

Cronqvist, Henrik, Fredrik Heyman, Mattias Nilsson, Helena Svaleryd, and Jonas Vlachos, 2009. Do Entrenched Mangers Pay Their Workers More? *Journal of Finance*, Vol. 64, No. 1, 309-339.

De Nicolo, Gianni, Luc Laeven and Kenichi Ueda, 2008, Corporate Governance Quality: Trends and Real Effects, *Journal of Financial Intermediation*, Vol. 17, 198-228.

Dertouzos, James N. and Lynn A. Karoly, 1992, *Labor-Market Reponses to Employer Liability* (Santa Monica: Rand).

———, 1993, Employment Effects of Worker Protection: Evidence from the United States, in Christoph F. Buechtemann (ed.), *Employment Security and Labor Market Behavior: Interdisciplinary Approaches and International Evidence* (Ithaca: ILR Press).

Djankov, Simeon, Caralee McLiesh and Andrei Shleifer, 2007. Private Credit in 129 Countries, *Journal of Financial Economics*, Vol. 84, No. 2, 299-329.

Fonseca, Raquel and Natalia Utrero, 2007, Employment Protection Laws, Barriers to Entrepreneurship, Financial Markets, and Firm Size, mimeo, RAND corporation.

Garmaise, Mark J., 2008, Production in Entrepreneurial Firms: The Effects of Financial Constraints on Labor and Capital, *The Review of Financial Studies*, Vol. 21, No. 2, 543-577.

Gervais, Martin, Igor Livshits, and Césaire Meh, 2008, Uncertainty and the Specificity of Human Capital, *Journal of Economic Theo*ry, Vol. 143, 469–498.

Hart, Oliver. 1995. *Firms, Contracts, and Financial Structure.* Oxford: Oxford U. Press.

Hellmann, Thomas, Kevin Murdock, and Joseph Stiglitz, 1996, Financial Restraint, Chapter 6, *The Role of Government in East Asian Economic Development*, edited by Masahiko Aoki, Hyung-Ki Kim, and Masahiro Okuno-Fujiwara (New York: Oxford University Press).

Hirsch, Barry T., and David A. MacPherson, 2003, Union Membership and Coverage Database from the Current Population Survey: Note, *Industrial and Labor Relations Review*, Vol. 56, No. 2, 349-54.

Hopenhayn, Hugo, and Richard Rogerson, 1993, Job Turnover and Policy Evaluation: A General Equilibrium Analysis, *Journal of Political Economy*, Vol. 101, No. 5, 915-938.

Jayaratne, Jith and Philip E. Strahan, 1996, The Finance-Growth Nexus: Evidence from Bank Branch Liberalization, *Quarterly Journal of Economics*, Vol. 111, No. 3, 639-70.

Joh, Sung Wook, 2003, Corporate Governance and Firm Profitability: Evidence from Korea before the Economic Crisis, *Journal of Financial Economics*, Vol. 68, No. 2, 287-322.

Johnson, Simon, Peter Boone, Alasdair Breach and Eric Friedman, 2000, Corporate Governance in the Asian Financial Crisis, *Journal of Financial Economics,* Vol. 58, No. 1-2, 141-186.

Johnson, Simon, William Larson, Chris Papageorgiou, and Arvind Subramanian, 2009, Is Newer Better? The Penn World Table Revisions and the Cross-Country Growth Literature, manuscript, Peterson Institute of International Economics.

Karpoff, Jonathan and Paul Malatesta, 1989, The Wealth Effects of Second-Generation State Takeover Legislation. *Journal of Financial Economics,* Vol. 25, 291–322

———, 1995. State Takeover Legislation and Share Values: The Wealth Effects of Pennsylvania's Act 36. *Journal of Corporate Finance,* Vol. 1, 367–382.

Kerr, William R., and Ramana Nanda, 2009, Democratizing Entry: Banking Deregulations, Financing Constraints, and Entrepreneurship, *Journal of Financial Economics*, Vol. 94, 124-149.

Kim, E. Han and Paige Ouimet, 2014. Broad-Based Employee Stock Ownership, Motives and Outcomes, *Journal of Finance*, Vol. 69, No. 3, 1275-1319.

La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer and Robert Vishny, 1997, Legal Determinants of External Finance, *Journal of Finance,* Vol. 52, No. 3, 1131-1150.

———, 1998, Law and Finance, *Journal of Political Economy,* Vol. 106, No. 6, 1113-1155.

Levine, Ross, 2005, Finance and Growth: Theory and Evidence, in Philippe Aghion and Steven Durlauf, eds. *Handbook of Economic Growth*. The Netherlands: Elsevier Science.

Miles, Thomas J., 2000, Common Law Exceptions to Employment at Will and US Labor Markets, *Journal of Law, Economics, and Organizations*, Vol. 16, No. 1, 74-101.

Mitton, Todd, 2002, A Cross-Firm Analysis of the Impact of Corporate Governance on the East Asian Financial Crisis, *Journal of Financial Economics*, Vol. 64, No. 2, 215-241.

Murphy, Kevin M., 1986, *Specialization and Human Capital*, Ph.D. dissertation, University of Chicago.

Pagano, Marco and Paolo F. Volpin, 2005, The Political Economy of Corporate Governance, *American Economic Review*, Vol. 95, No. 4, 1005-1005.

Parente, Stephen L. and Edward C. Prescott, 2000, *Barriers to Riches* (Cambridge: MIT Press).

Partridge, Mark D., and Jamie S. Partridge, 1999, Do Minimum Wage Hikes Reduce Employment? State-Level Evidence from the Low-Wage Retail Sector, *Journal of Labor Research*, Vol. XX, No. 3, 393-413.

Perotti, Enrico C., and Kathryn E. Spier, 1993, Capital Structure as a Bargaining Tool: The Role of Leverage in Contract Renegotiation, *American Economic Review*, Vol. 83, No. 5, 1131-1141.

Pissarides, Christopher A., 2000, *Equilibrium Unemployment Theory* (Cambridge: MIT Press).

Rajan, Raghuram and Luigi Zingales, 1998, Financial Dependence and Growth, *American Economic Review,* Vol. 88, No. 3, 559–86.

Saint-Paul, Gilles, 1996, *Dual Labor Markets: A Macroeconomic Perspective*, Cambridge: The MIT Press.

Scarpetta, Stefano, and Thierry Tressel, 2004, Boosting Productivity via Innovation and Adoption of New Technologies: Any Role for Labor Market Institutions? *World Bank Policy Research Working Paper* 3273.

Stiroh, Kevin J. and Philip E. Strahan, 2003, Competitive Dynamics of Liberalization: Evidence from US Banking, *Journal of Money, Credit, and Banking*, Vol. 35, No. 5, 801-828.

Strahan, Philip E., 2003, The Real Effects of US Banking Deregulation, *Federal Reserve Bank of St. Louis Review*, Vol. 85, 111-128.

Szewczyk, Samuel H. and George T. Tsetsekos, 1992, State Intervention in the Market for Corporate Control: The Case of the Pennsylvania Senate Bill 1310, *Journal of Financial Economics*, Vol. 31, 3-24.

Takizawa, Hajime, 2003, Job-Specific Investment and the Cost of Dismissal Restrictions—The Case of Portugal, *IMF Working Paper* 03/75 (Washington: IMF).

Tirole, Jean, 2006, *The Theory of Corporate Finance.* Princeton: Princeton University Press.

Townsend, Robert M., 1979, Optimal Contracts and Competitive Markets with Costly State Verification, *Journal of Economic Theory, V*ol. 21 No. 2, 265–293.

Townsend, Robert M. and Kenichi Ueda, 2010, Welfare Gains from Financial Liberalization, *International Economic Review*, Vol. 51, No. 3, 553-597.

Ueda, Kenichi, 2013, Banks as Coordinators of Economic Growth: Microfoundation for Macroeconomy with Externality, *Journal of Economic Theory*, Vol. 148, No. 1, 322-352.

Appendix

I. PROOF FOR LEMMA 1.

Before proving Lemma 1, we would like to show the following lemma.

Lemma A1.
For $\lambda<1$, given wage and risk free rate, with higher effective labor, the default threshold is lower,

$$\frac{\partial \rho^*}{\partial(hl)} = \frac{wh\hat{l} - \alpha \hat{y}^*}{k^{1-\alpha}(h\hat{l})^{\alpha+1}} < 0. \tag{A1}$$

Proof.

$$\frac{\partial \rho^*}{\partial(hl)} = \frac{w}{k^{1-\alpha}(h\hat{l})^{\alpha}} - \alpha \frac{rk + wh\hat{l}}{k^{1-\alpha}(h\hat{l})^{\alpha+1}} = \frac{wh\hat{l} - \alpha(rk + wh\hat{l})}{k^{1-\alpha}(h\hat{l})^{\alpha+1}}. \tag{A2}$$

At the default threshold, $rk + wh\hat{l}$ is equal to the whole output $\hat{y}^*$ as shown in (2). Then, by (4), (A1) is true.

Q.E.D.

Note that this Lemma A1 immediately implies that either higher human capital or higher labor input lowers the default threshold,

$$\frac{\partial \rho^*}{\partial h} < 0 \text{ and } \frac{\partial \rho^*}{\partial l} < 0. \tag{A3}$$

Now, we prove Lemma 1. The derivative of *B(h)* can be written as

$$B'(h) = -f(\rho^*)\frac{\partial \rho^*}{\partial h} + e^* f(\rho^*)\frac{\partial \rho^*}{\partial h} + \int_{\underline{\rho}}^{\rho^*} \frac{\partial e}{\partial h} f(\rho) d\rho, \tag{A4}$$

where e^* is evaluated at ρ^*, and (A4) can be expressed as

$$\begin{aligned}
&= (e^* - 1) f(\rho^*)\frac{\partial \rho^*}{\partial h} + \int_{\underline{\rho}}^{\rho^*} -\frac{1-\lambda}{\hat{l}}\frac{k}{h^2}\left(\frac{\alpha\rho}{w}\right)^{\frac{1}{1-\alpha}} f(\rho) d\rho \\
&= \frac{\left((1-\lambda)l^{**} + \lambda\hat{l}\right) - \hat{l}}{\hat{l}} f(\rho^*)\frac{wh\hat{l} - \alpha\hat{y}^*}{k^{1-\alpha}(h\hat{l})^{\alpha+1}}\hat{l} - \int_{\underline{\rho}}^{\rho^*}\frac{1-\lambda}{h}\frac{l^*}{\hat{l}} f(\rho) d\rho \\
&= \frac{1-\lambda}{h\hat{l}}\left((l^{**} - \hat{l})\frac{wh\hat{l} - \alpha\hat{y}^*}{k^{1-\alpha}(h\hat{l})^{\alpha}} f(\rho^*) - \int_{\underline{\rho}}^{\rho^*} l^* f(\rho) d\rho\right) \\
&= \frac{1-\lambda}{h\hat{l}}\left((\hat{l} - l^{**})\frac{\alpha\hat{y}^* - wh\hat{l}}{E[\hat{y}]} f(\rho^*) - \int_{\underline{\rho}}^{\rho^*} l^* f(\rho) d\rho\right).
\end{aligned} \tag{A5}$$

In the last line, note that $E[\theta]=E[\rho]=1$ by assumption..

If $\lambda=1$, the last line in (A5) is zero. Otherwise, the first term in the parenthesis is positive (see A1) but the second term is apparently negative. Therefore, in general, $B'(h)$ can be positive or negative depending on the relative value of the first term against the second term in the final line in (A5). However, (15) is the necessary and sufficient condition to make the parenthesis term to be zero and then $B'(h)=0$.

II. PROOF FOR PROPOSITION 1.

Assuming no one can commit the future plan, the constrained socially optimal choice of human capital investment by (14) coincides with the decentralized decision by (11) when the extensive margin change $B'(h) = 0$ at the decentralized optimal decision $h=h^*$. And, because u' is decreasing ($u''<0$) and v' is increasing ($v''>0$), without external effect through $B(h)$, condition (11) (and (14)) must have the unique solution for h.

III. PROOF FOR PROPOSITION 2.

Given $\bar{h}$, the derivative of right hand side of the first order condition (11) with respect to wage w is given by

$$\frac{\partial B(\bar{h})}{\partial w}u'(wh)w + B(\bar{h})\frac{\partial u'(wh)w}{\partial w} \tag{A6}$$

but Assumption 4 implies that

$$\frac{\partial}{\partial w}u'(wh)w = u'(wh) + u''(wh)wh \le 0. \tag{A7}$$

As for the first term

$$\frac{\partial B(\bar{h})}{\partial w} = (e^* - 1)f(\rho^*)\frac{\partial \rho^*}{\partial w} + e^* f(\rho^*)\frac{\partial e^*}{\partial w} + \int_{\underline{\rho}}^{\rho^*}\frac{\partial e}{\partial w}f(\rho)d\rho, \tag{A8}$$

where

$$\frac{\partial e}{\partial w} = \frac{1-\lambda}{\hat{l}}\frac{\partial l^*}{\partial w} = \frac{(1-\lambda)}{\hat{l}}\frac{l^*}{(1-\alpha)w} \tag{A9}$$

and

$$\frac{\partial \rho^*}{\partial w} = \frac{h\hat{l}}{E[\hat{y}]}. \tag{A10}$$

Here, also consider $B'(h)$, which is zero by Assumption 3,

$$\frac{\partial B(h)}{\partial h} = (e^* - 1) f(\rho^*) \frac{\partial \rho^*}{\partial h} + e^* f(\rho^*) \frac{\partial e^*}{\partial h} + \int_{\underline{\rho}}^{\rho^*} \frac{\partial e}{\partial h} f(\rho) d\rho, \tag{A11}$$

where

$$\frac{\partial e}{\partial h} = -\frac{(1-\lambda) l^*}{h\hat{l}} \tag{A12}$$

and

$$\frac{\partial \rho^*}{\partial h} = \frac{w\hat{l}}{k^{1-\alpha}(h\hat{l})^{\alpha}} - \alpha\hat{l}\,\frac{rk + wh\hat{l}}{k^{1-\alpha}(h\hat{l})^{\alpha+1}} = \frac{wh\hat{l} - \alpha\hat{y}^*}{E[\hat{y}]h}. \tag{A13}$$

Comparing (A8) – (A10) and (A11) – (A13),

$$\frac{\partial B(\bar{h})}{\partial w} = -B'(\bar{h}) \frac{\bar{h}}{w(1-\alpha)} + \frac{(e^* - 1)}{E[\hat{y}]} f(\rho^*) \left\{ \frac{wh\hat{l} - \alpha\hat{y}^*}{w(1-\alpha)} + h\hat{l} \right\} < 0. \tag{A14}$$

While the first term is zero by Assumption 3, the sign of the second term depends on (the opposite of) the sign of the parenthesis term. Although $wh\hat{l} < \alpha\hat{y}^*$ as shown in (4), the difference becomes small for small τ as discussed below (8). Then, for small τ, which we assume here, the parenthesis term is positive. Overall, (A14) becomes negative and so does (A6).

IV. PROOF FOR PROPOSITION 3.

By assumption, the labor supply is inelastically supplied at one. The equation (19) provides the labor demand function. Let *J* denote the left-hand-side of (19). Then, the labor demand curve is decreasing as usual,

$$\frac{dw}{d\hat{l}} = -\frac{\partial J / \partial \hat{l}}{\partial J / \partial w} < 0, \tag{A15}$$

because it is easy to see $\partial J / \partial w < 0$ and $\partial J / \partial \hat{l} < 0$. Apparently, the demand and the supply functions crosses once.

V. PROOF FOR PROPOSITION 4.

Because firm's capital demand is constrained by the bank participation condition (17), the relation between *r* and *k* dictated by (17) constitutes the capital demand function. Let *G* denote the right-hand-side minus the left-hand-side of (17). Given ρ^*,

$$\frac{dr}{dk} = -\frac{\partial G / \partial k}{\partial G / \partial r} < 0, \tag{A16}$$

where

$$\frac{\partial G}{\partial r} = \int_{\rho^*}^{\bar{\rho}} kf(\rho) d\rho - k + \left(\rho^* k^{1-\alpha} (h^* l_\lambda)^{\alpha} - wh^* l_\lambda - \tau - rk \right) f(\rho^*) \frac{k}{k^{1-\alpha}(h\hat{l})^{\alpha}} < 0 \tag{A17}$$

and

$$\frac{\partial G}{\partial k} = \int_{\rho^*}^{\bar{\rho}} rf(\rho)d\rho + \int_{\underline{\rho}}^{\rho^*} (1-\alpha)k^{-\alpha}(h^* l_\lambda)^\alpha f(\rho)d\rho - r_F$$
$$+\left(\rho^* k^{1-\alpha}(h^* l_\lambda)^\alpha - wh^* l_\lambda - \tau - rk\right) f(\rho^*)\left(\frac{rk-(1-\alpha)\hat{y}^*}{kE[\hat{y}]}\right) \qquad \text{(A18)}$$
$$< 0.$$

Then, (A16) means that the capital demand is negatively sloping. On the other hand, the capital supply is fixed at *k* assuming all capital is used domestically as the arbitrage condition (17) is satisfied. Therefore, the equilibrium interest *r* is determined, given ρ^*. Here, apparently, *r* and ρ^* are negatively related. However, the default threshold condition (1) implies that *r* and ρ^* are positively related. Therefore, the financial contract represented by (r, ρ^*) is uniquely determined, together with the equilibrium wage and labor.

VI. PROOF FOR LEMMA 2.

Let χ denote the right-hand-side minus the left-hand-side of (11), the first order condition regarding the human capital investment. Then,

$$\frac{dh^*}{d\lambda} = -\left.\frac{\partial\chi/\partial\lambda}{\partial\chi/\partial h}\right|_{h=h^*}. \qquad \text{(A19)}$$

The denominator is negative,

$$\frac{\partial\chi}{\partial h} = B'(h)u'(wh)w + B(h)u''(wh)w^2 - v''(h) < 0. \qquad \text{(A20)}$$

The first term is zero under Assumption 3 (i.e., *B'(h)=0*). The second term is negative by assumption of concave utility of consumption. The third term is also negative by assumption of convex disutility of human capital investment, *v*.

The numerator is

$$\frac{\partial\chi}{\partial\lambda} = \frac{\partial B(h)}{\partial\lambda}u'(wh)w. \qquad \text{(A21)}$$

And, noting that partial derivative of ρ^* with respect to λ is zero as there is no direct relation,

$$\frac{\partial B(h)}{\partial\lambda} = \int_{\underline{\rho}}^{\rho^*} \frac{\partial e}{\partial\lambda} f(\rho)d\rho > 0, \qquad \text{(A22)}$$

where

$$\frac{\partial e}{\partial\lambda} = \frac{\hat{l} - l^*}{\hat{l}}. \qquad \text{(A23)}$$

Overall, in equilibrium,

$$\frac{dh^*}{d\lambda} > 0. \tag{A24}$$

VII. PROOF FOR PROPOSITION 5.

The worker power λ^* is defined to maximize firm profit (18). Note that some variables are endogenous in the equilibrium but we can solve the firm maximization problem with respect to worker power λ, given wage w and risk free rate r_F for this proposition. The first order condition to maximize the firm profits (18) with respect to the worker power λ, given wage and risk free rate, is

$$\begin{aligned} 0 = & -\left(\rho^* k^{1-\alpha}(h^*\hat{l})^{\alpha} - wh^*\hat{l}\right)\frac{\partial \rho^*}{\partial \lambda} \\ & + \left(\rho^* k^{1-\alpha}(h^* l_\lambda)^{\alpha} - wh^* l_\lambda - \tau\right)\frac{\partial \rho^*}{\partial \lambda} \\ & + \int_{\rho^*}^{\bar{\rho}} \left(\alpha \rho k^{1-\alpha}(h^*\hat{l})^{\alpha-1}\hat{l} - w\hat{l}\right)\frac{\partial h^*}{\partial \lambda} f(\rho)d\rho \\ & + \int_{\rho^*}^{\bar{\rho}} \left(\alpha \rho k^{1-\alpha}(h^* l_\lambda)^{\alpha-1} l_\lambda - w l_\lambda\right)\frac{\partial h^*}{\partial \lambda} f(\rho)d\rho. \end{aligned} \tag{A25}$$

Here, the first and second terms cancel out each other. The first term is the output with initial labor inputs minus the wage payments at the default threshold. By (1), this is equal to the repayments to banks, rk, without any extra profits to shareholders. The second term is the output with restructured labor inputs minus the wage payments (and the verification and negotiation costs) at the default threshold. By construction, this is equal to the repayments to banks, rk. By arbitrage, these two repayments to banks must be equal at the default threshold.

Therefore, the first order condition with respect to λ consists of remaining two terms only,

$$0 = \hat{l}\frac{\partial h^*}{\partial \lambda}\int_{\rho^*}^{\bar{\rho}} \left(MPL_1 - w\right) f(\rho)d\rho + \frac{\partial h^*}{\partial \lambda}\int_{\underline{\rho}}^{\rho^*} \left(MPL_2 - w\right) l_\lambda f(\rho)d\rho\,. \tag{A26}$$

We use (19), the first order condition to determine the initial workforce $\hat{l}$, as the equilibrium relationship between MPL_1 and MPL_2. Then, (A26) becomes

$$0 = \frac{\partial h^*}{\partial \lambda}\int_{\underline{\rho}}^{\rho^*} \left(MPL_2 - w\right)\left(l_\lambda - \frac{\Psi_2}{\Psi_1}\hat{l}\right) f(\rho)d\rho. \tag{A27}$$

As already discussed, MPL_2 is always equal to w for any realization of ρ in case $\lambda=0$. In case of $\lambda \to 1$, then $\rho^* \to \underline{\rho}$ and $l_\lambda \to \hat{l}$ (i.e., $\psi_2 \to \psi_1$ and $MPL_2 \to MPL_1$), and hence the expected MPL_1 becomes equal to w. Therefore, (A27) is equal to zero in these two cases.

Moreover,

$$l_\lambda - \frac{\Psi_2}{\Psi_1}\hat{l} = (1-\lambda)l^* + \lambda\hat{l} - \lambda\hat{l} - (1-\lambda)\frac{\frac{\partial h^*}{\partial \hat{l}} l^* \hat{l}}{\frac{h^*}{\hat{l}} + \frac{\partial h^*}{\partial \hat{l}}}$$

$$= (1-\lambda)\left(\frac{\frac{h^*}{\hat{l}} + \frac{\partial h^*}{\partial \hat{l}}(1-\hat{l})}{\frac{h^*}{\hat{l}} + \frac{\partial h^*}{\partial \hat{l}}}\right) l^* \qquad \text{(A28)}$$

$$= (1-\lambda)\left(\frac{1 + \frac{\partial \log h^*}{\partial \log \hat{l}}(1-\hat{l})}{1 + \frac{\partial \log h^*}{\partial \log \hat{l}}}\right) l^*.$$

Here,

$$\frac{\partial \log h^*}{\partial \log \hat{l}} = -\frac{\partial \chi / \partial \hat{l}}{\partial \chi / \partial h} \frac{\hat{l}}{h}\bigg|_{h=h^*}. \qquad \text{(A29)}$$

The denominator is negative as given already by (A20). As for the numerator,

$$\frac{\partial \chi}{\partial \hat{l}} = \frac{\partial B(h)}{\partial \hat{l}} u'(wh)w. \qquad \text{(A30)}$$

And,

$$\frac{\partial B(h)}{\partial \hat{l}} = (e^* - 1) f(\rho^*) \frac{\partial \rho^*}{\partial \hat{l}} + e^* f(\rho^*) \frac{\partial e^*}{\partial \hat{l}} + \int_{\underline{\rho}}^{\rho^*} \frac{\partial e}{\partial \hat{l}} f(\rho) d\rho, \qquad \text{(A31)}$$

where

$$\frac{\partial e}{\partial \hat{l}} = -(1-\lambda)\frac{l^*}{\hat{l}^2} \qquad \text{(A32)}$$

and

$$\frac{\partial \rho^*}{\partial \hat{l}} = \frac{wh}{k^{1-\alpha}(h\hat{l})^\alpha} - \alpha h \frac{rk + wh\hat{l}}{k^{1-\alpha}(h\hat{l})^{\alpha+1}} = \frac{wh\hat{l} - \alpha \hat{y}^*}{E[\hat{y}]\hat{l}}. \qquad \text{(A33)}$$

Note that $E[\rho]=1$ (assumption) is used in the final form of the denominator above and, for the numerator, the sum of the capital rent payments and wage payments equals to the output at the default threshold, y*.

Comparing (A8)-(A10) and (A31)-(A33) with Assumption 2, we have

$$\frac{\partial B(h)}{\partial \hat{l}} = \frac{\partial B(h)}{\partial h}\frac{h}{\hat{l}} = 0\,. \tag{A34}$$

This implies

$$\frac{\partial \log h^*}{\partial \log \hat{l}} = 0 \tag{A35}$$

in (A28) and therefore the first order condition of firm profits with respect to worker power λ, (A27), becomes

$$0 = \frac{\partial h^*}{\partial \lambda}(1-\lambda)\int_{\underline{\rho}}^{\rho^*}\left(MPL_2 - w\right)l^* f(\rho)d\rho. \tag{A36}$$

Again, this shows two corner solutions $\lambda=1$ and $\lambda=0$ ($MPL_2=w$ for any ρ if $\lambda=0$) to satisfy the condition (to be local minima) and the possibility of an internal solution.

Because $\partial h^*/\partial\lambda > 0$ by Lemma 2, possibility of internal solution for the first order condition (A36) other than $\lambda=0$ or 1 is λ* that satisfies

$$0 = \int_{\underline{\rho}}^{\rho^*}\left(MPL_2 - w\right)l^* f(\rho)d\rho. \tag{A37}$$

This condition is (23) and can be indeed satisfied. MPL_2 (with l_λ) is below w as implied by (4). To see this, consider the case where $h = h_0^*$, the optimal human capital level at $\lambda=0$. Multiply the right hand side of (A37) by the optimal human capital investment h_0^* for $\lambda=0$:

$$\int_{\underline{\rho}}^{\rho^*}\left(\alpha\rho k^{1-\alpha}h_0^{*\alpha}l_\lambda{}^{\alpha-1}l^* - wh_0^*l^*\right)f(\rho)d\rho < \int_{\underline{\rho}}^{\rho^*}\left(\alpha\rho k^{1-\alpha}(h_0^*l^*)^{\alpha} - wh_0^*l^*\right)f(\rho)d\rho = 0. \tag{A38}$$

But, Lemma 2 suggests that, the larger worker power λ is, the larger is the optimal human capital investment h*. Therefore, for the optimal human capital investment $h_\lambda^*(>h_0^*)$ with positive worker power λ, it is possible that some λ satisfy

$$0 = \int_{\underline{\rho}}^{\rho^*}\left(\alpha\rho k^{1-\alpha}h_\lambda^{*\alpha}l_\lambda{}^{\alpha-1}l^* - wh_\lambda^*l^*\right)f(\rho)d\rho. \tag{A39}$$

Moreover, for most of $\rho \in \left[\underline{\rho}, \rho^*\right]$, the element of the parenthesis term in the right hand side of (A39) is negative, but, in order to pay the verification and negotiation cost $\tau>0$, the element of the parenthesis must be positive at $\rho=\rho^*$,

$$0 < \alpha\rho^* k^{1-\alpha}h_\lambda^{*\alpha}l_\lambda{}^{\alpha-1}l^{**} - wh_\lambda^*l^{**}, \tag{A40}$$

where the difference between l^* and $\hat{l}$ (and l_λ) is small at and near the threshold ρ^*. Intuitively, when λ is positive, with very low ρ, layoff is not optimally done and profits become largely negative; and thus, near the threshold ρ^*, the firm needs to make positive profits.

Next, we claim that the internal solution λ^* is indeed a maximand. Let L denote the right hand side of the first order condition (A36).

$$\begin{aligned}\left.\frac{\partial L}{\partial \lambda}\right|_{w=w_\lambda} &= \frac{\partial^2 h^*}{\partial \lambda \partial \lambda}(1-\lambda)\int_{\underline{\rho}}^{\rho^*}\left(MPL_2 - w_\lambda\right)l^* f(\rho)d\rho \\ &\quad -\frac{\partial h^*}{\partial \lambda}\int_{\underline{\rho}}^{\rho^*}\left(MPL_2 - w_\lambda\right)l^* f(\rho)d\rho \\ &\quad +\frac{\partial h^*}{\partial \lambda}(1-\lambda)\int_{\underline{\rho}}^{\rho^*}\frac{\partial MPL_2}{\partial \lambda}l^* f(\rho)d\rho.\end{aligned} \tag{A41}$$

Here, the first and the second lines are both equal to zero for $\lambda=\lambda^*$ because of (A37). Since it is easy to show $\partial MPL_2 / \partial \lambda < 0$, the overall (A41) is negative. In other words, the value of the right-hand-side of the first order condition (A36) is negative with λ slightly above λ^* and vice versa. This means that, at least locally, there is an inverse-U shape relations between the worker power λ and the firm profits (Figure 1).

VIII. PROOF FOR COROLLARY 5

In discussions below (A27) and (A36), we have already shown that $\lambda = 0$ and 1 are both equilibria as the corner solutions. Indeed, it is easy to see that $\lambda=0$ makes (A41) relation to be vertical (i.e., for any w, any range of r can satisfies the equilibrium condition). Hence, it is a local maximand. For $\lambda=1$ at w_1, while the first and the third lines of (A41) are equal to zero, the second line is clearly negative. Hence, $\lambda=1$ is also a local maximand and makes (A41) relation to be flat (i.e., $r = r_F$, irreleant of w). In this case, the standard competitive equilibrium without ex post labor adjustment prevails.

Moreover, even for internal solutions, it is difficult to establish the uniqueness. Proposition 5 says, given r and w are determined by Proposistions 3 and 4, there is λ^*, the internal solution to maximize the firm profits. However, Propositions 3 and 4 determines r and w uniquely under specific λ. This means that, under different λ, there can be different equilibrium values for r and w. Hence, the equilibrium triplet (r,w,λ) is not uniquely determined.

Still, there are some restrictions for λ^* to be an equilibrium. Recall that the optimal internal solution λ^* is derived, given r and w. However, for this set of (r, w, λ^*) to be an equilibrium, given this λ^*, equilibrium conditions for r and w defined in Proposition 3 and 4 needs to be satisfied. That is, given λ^*, an equilibrium set of (r, w) needs to satisfy condition (23). In other words, not every λ^* can survive as an equilibrium value.

IX. PROOF FOR PROPOSITION 6

From the production side, the social planner faces its first order condition, which is the first order condition of the private firm (A36) minus the net social loss, which is the sum of (24) and (25). Here, although $\lambda=0$ and 1 can make (A36) equal to zero, they cannot do so for the sum of (24) and (25). When $\lambda=1$, (24) is zero as no one is fired but (25) is positive. When $\lambda=0$, (25) is likely zero since it is likely no suboptimal retention of workers, implying $\hat{\rho} = \underline{\rho}$, but (24) is positive.

In general, there can be an internal solution λ^{SP} that solves the social planner's problem. Apparently, the privately optimal λ^* can be the same as socially optimal λ^{SP}, when the sum of (24) and (25) is zero. That is, when the negative and positive externalities of firing coincide.

Figure 1. Inverse-U Shape of Effects of Relative Bargaining Power on Firm Profit (*λ-profit plane*)

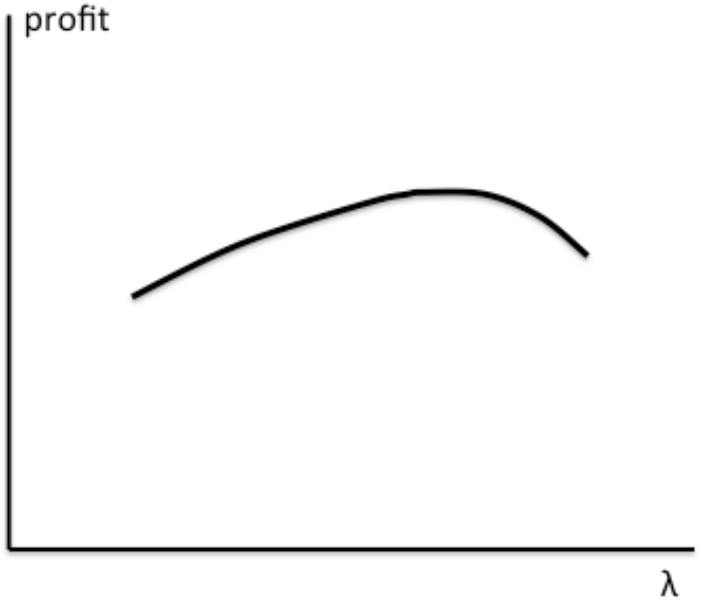


Figure 2a. Adoption of Financial Liberalization
(number of states deregulated)

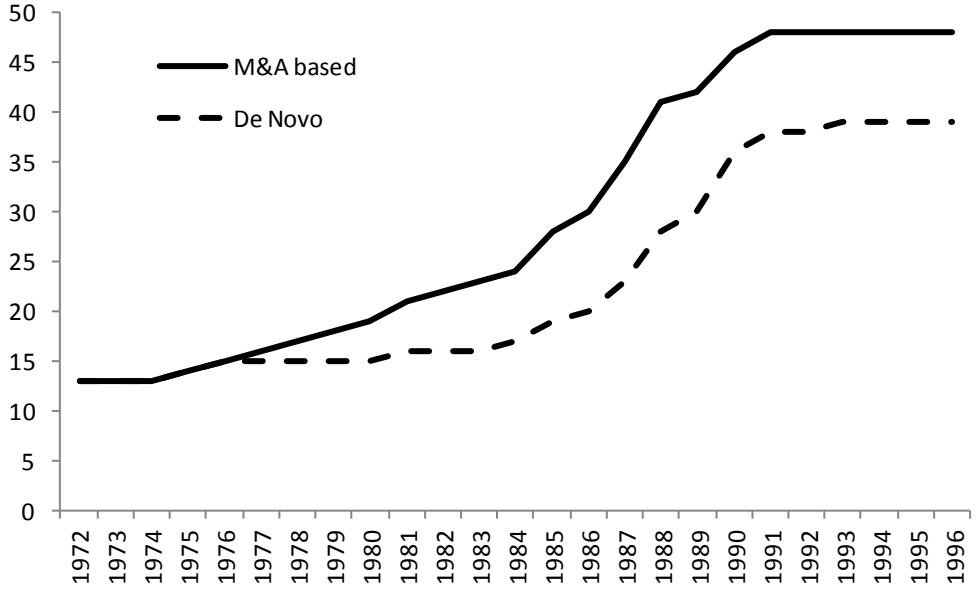


Figure 2b. Adoption of Employment Protection
(number of states with employment protection)

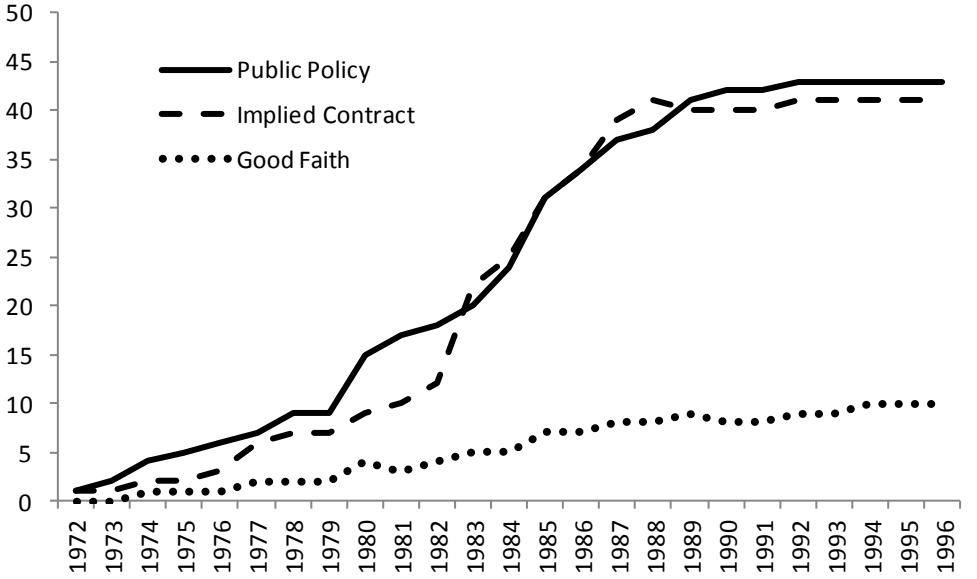
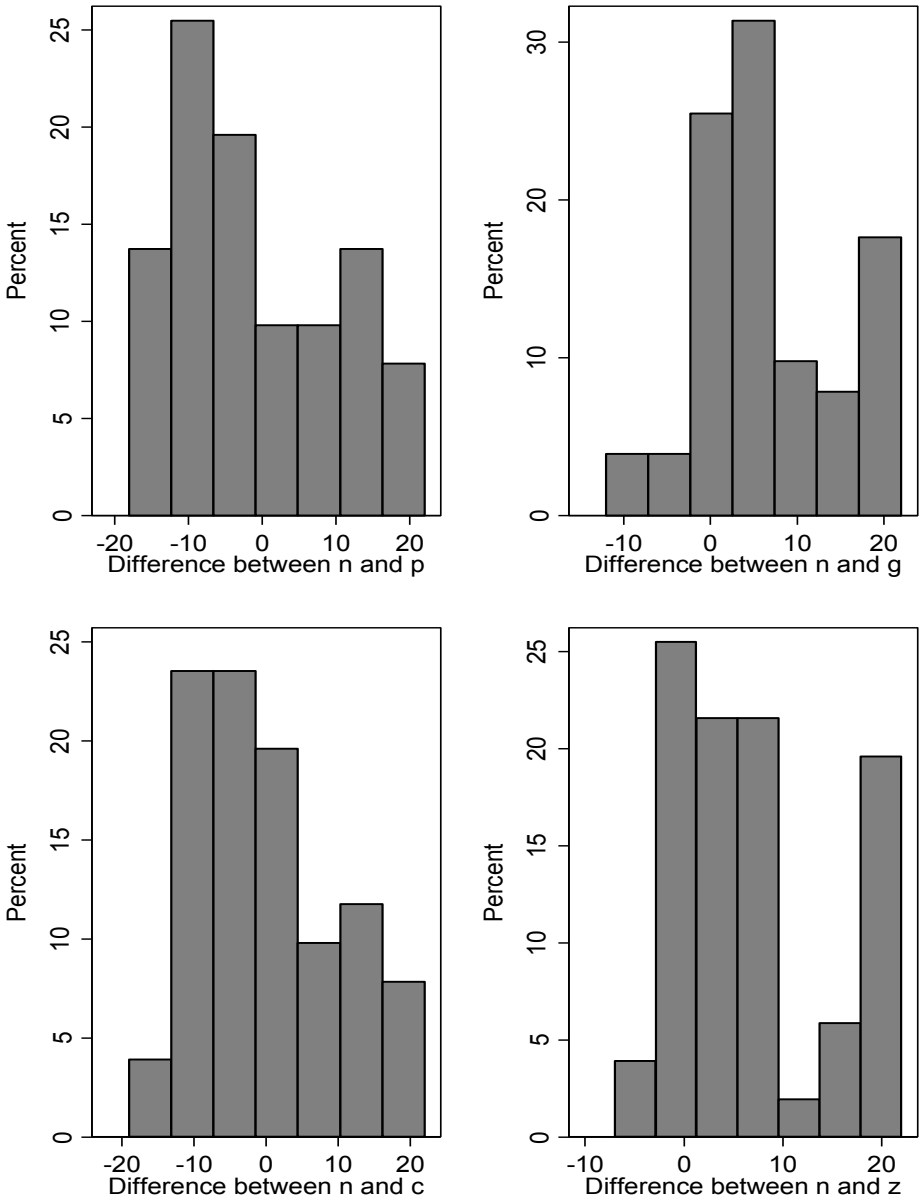
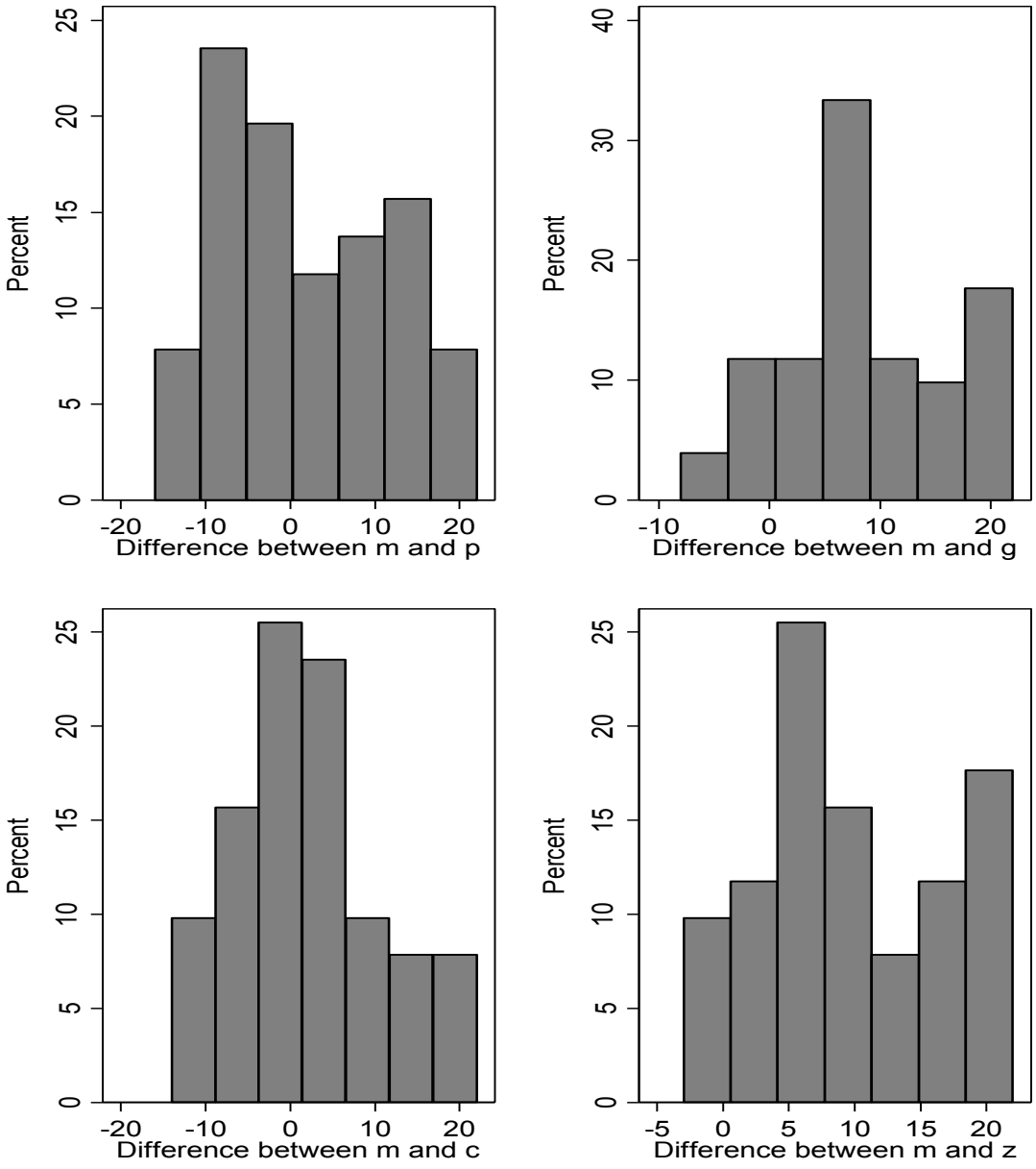


Figure 3a: The Pattern of Financial Deregulation and Adoption of Employment Protection



Notes:
n is dummy indicating the year branch restrictions were lifted via de novo branching
p is public policy index
g is good faith index
c is implied contract index
z is the earliest of p, g and c

Figure 3b: The Pattern of Financial Deregulation and Adoption of Employment Protection



Notes:
m is dummy indicating the year M&A branch restrictions were lifted
p is public policy index
g is good faith index
c is implied contract index
z is the earliest of p, g and c

Figure 4: US-wide Average of State-Specific Other Labor Protections

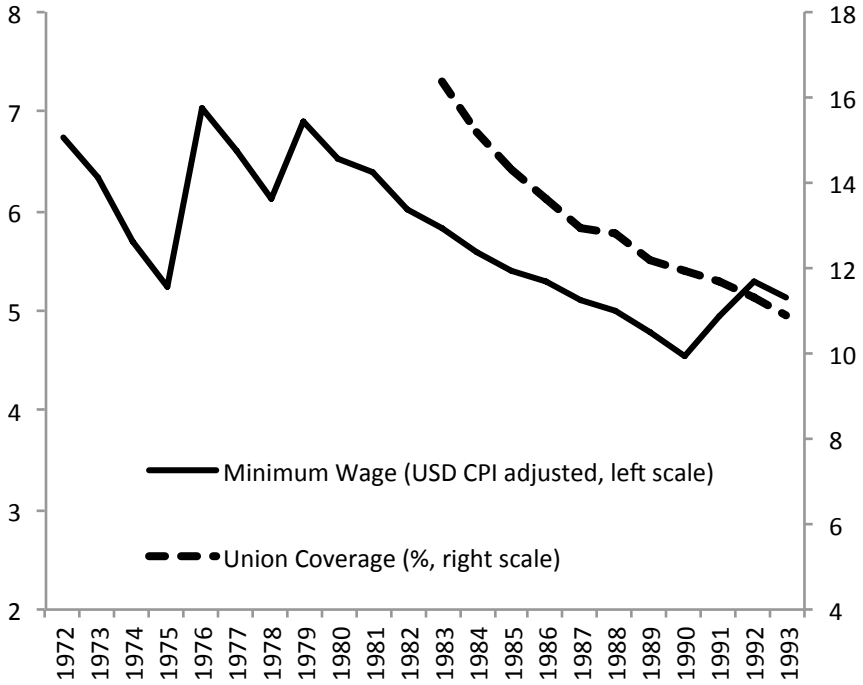


Table 1a. Key Descriptive Statistics of Variables

	Observation	Mean	Std. Dev.	Min	Max
Real Value Added Growth					
State-Year Growth Rate	1012	2.48	4.88	-34.92	35.44
State-Inudstry-Year Growth Rate	54706	2.43	19.67	-310.23	380.76
(after taking out 3 std dev outliers)	*46945*	*1.77*	*13.07*	*-53.57*	*53.51*
State-Year Institutional Changes					
Bank Branch Deregulation					
M&A	1012	0.49	0.50	0.00	1.00
de novo	1012	0.37	0.48	0.00	1.00
Exceptions for Wrongful Discharges					
Public Policy	990	0.45	0.50	0.00	1.00
Good Faith	990	0.07	0.26	0.00	1.00
Contract	990	0.41	0.49	0.00	1.00
Earliest	990	0.54	0.50	0.00	1.00
Other Labor Protection					
Union Coverage Rate (%)	1012	5.75	0.78	4.41	9.27
Minimum Wage Level, Real	506	13.02	5.46	3.70	28.00
Industry Characteristics					
External Finance Dependence	59	-0.49	2.01	-12.24	3.19
Sales / Fixed Assets Ratio	59	0.62	0.60	0.00	2.87
Intangible / Fixed Assets Rate	59	6.00	5.70	0.33	27.84
Schooling (Fraction of College Grad in2005)	49	0.44	0.18	0.19	0.83

Note: Court-ruled employment protection variables are not available for DC. Union data is available only from 1983. For state-industry level regressions, growth rates are used after removing 3 std dev outliers.

Table 1b. Correlation among State-Year Level Institutional Changes

	Financial Liberalization		Employment Protection				Other Labor Protection	
	M&A	de novo	Public Policy	Good Faith	Contract	Earliest	Union Coverage	Minimum Wage
M&A	1.000 *1012*							
de novo	0.768 *1012*	1.000 *1012*						
Public Policy	0.242 *990*	0.140 *990*	1.000 *990*					
Good Faith	0.144 *990*	0.111 *990*	0.250 *990*	1.000 *990*				
Contract	0.294 *990*	0.187 *990*	0.539 *990*	0.124 *990*	1.000 *990*			
Earliest	0.256 *990*	0.138 *990*	0.830 *990*	0.254 *990*	0.763 *990*	1.000 *990*		
Union Coverage	-0.315 *1012*	-0.159 *1012*	-0.513 *990*	-0.131 *990*	-0.524 *990*	-0.526 *990*	1.000 1012	
Minimum Wage	-0.162 *506*	-0.174 *506*	0.146 *495*	-0.039 *495*	0.145 *495*	0.233 *495*	0.238 *506*	1.000 *506*

Note: Italics numbers show the observation numbers. Court-ruled employment protection variables are not available for DC. Union data is available only from 1983.

Table 1c. Correlations among Industry-Level Characteristics

	External Finance Dependence	Sales / Fixed Assets Ratio	Intangible Assets / Fixed Assets	Schooling (Fraction of College Grad)
External Finance Dependence	1.000			
	59			
Sales / Fixed Assets Ratio	-0.436	1.000		
	59	*59*		
Intangible / Fixed Assets Ratio	-0.524	0.708	1.000	
	59	*59*	*59*	
Schooling (Fraction of College Grad in 2005)	-0.120	0.544	0.382	1.000
	49	*49*	*49*	*49*

Note: Italics numbers show the observation numbers.

Table 2a. State Level Regressions—Gross State Product

The dependent variable is the real growth rate of gross state product, deflated by national CPI index, over the period 1972 to 1993. FinLib is M&A based bank branch deregulation in each state. It is a binary variable, taking the value of one if deregulated. WorkRight is the exception for wrongful discharges based on either public policy, good faith, the implied contract, or the earliest of them in each state. It is a binary variable, taking the value of one if established. State level fixed effects as well as year dummies are included, but not reported. T-statistics based on robust standard errors are reported: * denotes significant at 10%; ** at 5%; and *** at 1%.

		Public Policy			Good Faith			Contract			Earliest		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
FinLib	1.621		1.785	1.397		1.690	1.561		1.575	1.669		1.708	1.265
	[2.700]***		[2.890]***	[1.670*		[2.809]***	[2.730]***		[2.934]***	[1.660]*		[2.836]***	[1.120]
WorkRight		0.816	0.950	0.562	-0.691	-0.643	-1.575	-1.637	-1.347	-0.669	-0.174	-0.011	-0.33922
		[1.243]	[1.459]	[0.700]	[-0.984]	[-0.916]	[-1.020]	[-0.889]	[-0.767]	[-0.830]	[-0.267]	[-0.017]	[-0.510]
FinLib*WorkRight				0.842			0.324			0.050			0.800
				[1.000]			[0.150]			[0.040]			[0.600]
N	1029	1008	1008	1008	1008	1008	1008	1008	1008	1008	1008	1008	1008
N Groups	48	48	48	48	48	48	48	48	48	48	48	48	48
R-squared	0.375	0.370	0.380	0.382	0.369	0.379	0.380	0.372	0.380	0.379	0.368	0.377	0.378

Table 2b. State Level Regressions—Non-Financial Sector Gross State Product

The dependent variable is the real growth rate of non-financial sector gross state product, deflated by national CPI index, over the period 1972 to 1993. FinLib is M&A based bank branch deregulation in each state. It is a binary variable, taking the value of one if deregulated. WorkRight is the exception for wrongful discharges based on either public policy, good faith, the implied contract, or the earliest of them in each state. It is a binary variable, taking the value of one if established. State level fixed effects as well as year dummies are included, but not reported. T-statistics based on robust standard errors are reported: * denotes significant at 10%; ** at 5%; and *** at 1%.

		Public Policy			Good Faith			Contract			Earliest		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
FinLib	2.089		2.137	1.492		2.078	1.909		2.045	1.525		2.096	0.853
	[3.333]***		[3.358]***	[1.690]*		[3.220]***	[2.910]***		[3.060]***	[1.730]*		[3.214]***	[0.880]
WorkRight		0.344	0.504	-0.141	-0.715	-0.656	-2.738	-0.902	-0.525	-1.336	-0.214	-0.014	-0.935
		[0.419]	[0.637]	[-0.150]	[-0.957]	[-0.874]	[-1.400]	[-0.626]	[-0.373]	[-1.380]	[-0.324]	[-0.021]	[-1.190]
FinLib*WorkRight				1.400			3.137			1.303			2.245
				[1.140]			[1.390]			[1.020]			[1.750]*
N	1029	1008	1008	1008	1008	1008	1008	1008	1008	1008	1008	1008	1008
N Groups	48	48	48	48	48	48	48	48	48	48	48	48	48
R-squared	0.256	0.254	0.264	0.267	0.255	0.265	0.268	0.255	0.264	0.267	0.254	0.264	0.270

Table 3. State-Industry Level Regressions (1972-1993)

The dependent variable is the real growth rate of gross state-industry product, deflated by national CPI index, over the period 1972 to 1993 (outliers are removed based on three standard deviations). FinLib is M&A based bank branch deregulation in each state. It is a binary variable, taking the value of one if deregulated. ExtFinDep is the industry level tendency of external finance defined in Rajan-Zingales (1998), calculated as the mean of median of each year from 1991 to 2006 using the Worldscope database. WorkRight is a binary variable, taking the value of one in each state, after the earliest of the three exceptions for wrongful discharges is established. Knowledge is the industry average use of intangible assets relative to fixed assets, sales to fixed asset ratio. or employment share of college graduates. State-year and state-industry fixed effects are included, but not reported. The reported t-statistics are based on robust standard errors corrected for clustering at the state level: * denotes significant at 10%; ** at 5%; and *** at 1%.

Knowledge proxy:	*N.A.*	*Intangible / Fixed Assets*			*Sales / Fixed Assets*			*Share of College Graduates*		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
FinLib*ExtFinDep	0.042		0.123	-0.012		0.123	-0.007		0.031	0.004
	[0.685]		[1.979]**	[-0.118]		[1.908]*	[-0.066]		[0.512]	[0.037]
WorkRight*Knowledge		1.417	1.490	1.333	0.106	0.116	0.090	3.003	3.032	3.273
		[6.510]***	[6.696]***	[5.217]***	[5.279]***	[5.415]***	[3.791]***	[4.446]***	[4.456]***	[3.729]***
FinLib*WorkRight*ExtFinDep				0.200			0.246			0.030
				[2.194]**			[2.362]**			[0.350]
FinLib*WorkRight*Knowledge				0.443			0.078			-0.337
				[1.795]*			[2.450]**			[-0.381]
N	50067	49204	49204	49204	49204	49204	49204	42484	42484	42484
R-squared	0.175	0.176	0.176	0.176	0.176	0.176	0.176	0.177	0.177	0.177

Table 4. State-Industry Level Regressions with Other Labor Protections (1983-1993)

The dependent variable is the real growth rate of gross state-industry product, deflated by national CPI index, over the period 1983 to 1993 unless otherwise noted (outliers are removed based on three standard deviations). FinLib is M&A based bank branch deregulation in each state. It is a binary variable, taking the value of one if deregulated. ExtFinDep is the industry level tendency of external finance defined in Rajan-Zingales (1998), calculated as the mean of median of each year from 1991 to 2006 using the Worldscope database. WorkRight is a binary variable, taking the value of one in each state, after the earliest of the three exceptions for wrongful discharges is established; state-specific union coverage rate (percentage of workforce covered by collective bargaining); or minimum wage level adjusted for CPI inflation. Knowledge is the industry average use of intangible assets relative to fixed assets. State-year and state-industry fixed effects are included, but not reported. The reported t-statistics are based on robust standard errors corrected for clustering at the state level: * denotes significant at 10%; ** at 5%; and *** at 1%.

WorkRight proxy:	*Exception for Wrongful Discharges*			*Union Coverage Ratio*			*Minimum Wage Level*			*Minimum Wage Level*		
Knowledge proxy:	*Intangible / Fixed Assets*			*Intangible / Fixed Assets*			*Intangible / Fixed Assets*			*Intangible / Fixed Assets*		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
										1972 -- 1993 data		
FinLib*ExtFinDep		0.270	0.068		0.309	0.519		0.344	0.959		*0.082*	*0.307*
		[2.694]***	[0.432]		[3.226]***	[2.617]***		[3.437]***	[2.140]**		*[1.329]*	*[1.598]*
WorkRight*Knowledge	0.350	0.448	-0.066	-0.120	-0.156	-0.154	-1.095	-1.308	-1.335	*-0.308*	*-0.343*	*-0.129*
	[0.416]	[0.510]	[-0.076]	[-2.335]**	[-2.916]***	[-3.011]***	[-4.150]***	[-4.779]***	[-4.195]***	*[-2.967]***	*[-3.286]****	*[-1.026]*
FinLib*WorkRight*ExtFinDep			0.338			-0.013			-0.117			*-0.018*
			[2.462]**			[-0.910]			[-1.357]			*[-0.503]*
FinLib*WorkRight*Knowledge			1.074			0.036			0.082			*0.284*
			[2.832]***			[1.416]			[1.069]			*[5.621]****
N	23536	23536	23536	23957	23957	23957	23957	23957	23957	*50067*	*50067*	*50067*
R-squared	0.212	0.212	0.212	0.211	0.211	0.211	0.211	0.211	0.211	*0.175*	*0.175*	*0.176*

Table 5. State-Industry Level Regressions without CA, MA, and NY (1972-1993)

The dependent variable is the real growth rate of gross state-industry product, deflated by national CPI index, over the period 1972 to 1993 (outliers are removed based on three standard deviations). FinLib is M&A based bank branch deregulation in each state. It is a binary variable, taking the value of one if deregulated. ExtFinDep is the industry level tendency of external finance defined in Rajan-Zingales (1998), calculated as the mean of median of each year from 1991 to 2006 using the Worldscope database. WorkRight is a binary variable, taking the value of one in each state, after the earliest of the three exceptions for wrongful discharges is established. Knowledge is the industry average use of intangible assets relative to fixed assets, sales to fixed asset ratio. or employment share of college graduates. State-year and state-industry fixed effects are included, but not reported. Data from states CA, MA, and NY are omitted in addition to omissions of DE and SD data in the benchmark regressions. The reported t-statistics are based on robust standard errors corrected for clustering at the state level: * denotes significant at 10%; ** at 5%; and *** at 1%.

Knowledge proxy:	*N.A.*	*Intangible / Fixed Assets*			*Sales / Fixed Assets*			*Share of College Graduates*		
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
FinLib*ExtFinDep	0.056		0.136	-0.001		0.137	0.006		0.039	0.008
	[0.877]		[2.087]**	[-0.006]		[2.010]**	[0.055]		[0.626]	[0.075]
WorkRight*Knowledge		1.382	1.461	1.297	0.104	0.115	0.082	2.847	2.883	3.447
		[5.895]***	[6.087]***	[4.877]***	[4.888]***	[5.023]***	[3.399]***	[3.759]***	[3.794]***	[3.764]***
FinLib*WorkRight*ExtFinDep				0.204			0.264			0.030
				[2.088]**			[2.377]**			[0.330]
FinLib*WorkRight*Knowledge				0.462			0.094			-0.856
				[1.754]*			[2.903]***			[-1.008]
N	46945	46082	46082	46082	46082	46082	46082	39787	39787	39787
R-squared	0.172	0.173	0.173	0.173	0.173	0.173	0.173	0.174	0.174	0.174

Table 6. State-Industry Level Regressions (Panel GMM, 1972-1993)

The dependent variable is the real growth rate of gross state-industry product, deflated by national CPI index, over the period 1972 to 1993 (outliers are removed based on three standard deviations). FinLib is M&A based bank branch deregulation in each state. It is a binary variable, taking the value of one if deregulated. ExtFinDep is the industry level tendency of external finance defined in Rajan-Zingales (1998), calculated as the mean of median of each year from 1991 to 2006 using the Worldscope database. WorkRight is a binary variable, taking the value of one in each state, after the earliest of the three exceptions for wrongful discharges is established. Knowledge is the industry average use of intangible assets relative to fixed assets, sales to fixed asset ratio. or employment share of college graduates. Estimation is based on Blundell and Bond (1998) with AR(1) or AR(2) terms in difference equations. Year dummies are included, but not reported. T-statistics based on two-step GMM standard errors are reported: * denotes significant at 10%; ** at 5%; and *** at 1%.

Knowledge proxy:	*Intangible / Fixed Assets*			*Sales / Fixed Capital*			*Share of College Graduates*		
	AR(1)	*AR(1)*	*AR(2)*	*AR(1)*	*AR(1)*	*AR(2)*	*AR(1)*	*AR(1)*	*AR(2)*
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
FinLib	1.053	0.843	0.784	1.039	0.904	0.779	0.819	0.705	0.655
	[8.145]***	[4.171]***	[3.631]***	[7.951]***	[4.450]***	[3.611]***	[6.302]***	[3.323]***	[2.913]***
FinLib*ExtFinDep	0.074	-0.096	-0.071	0.051	-0.103	-0.072	-0.001	-0.138	-0.113
	[1.835]*	[-1.586]	[-1.167]	[1.306]	[-1.674]*	[-1.167]	[-0.020]	[-2.254]**	[-1.813]*
WorkRight	-0.533	-0.605	-0.875	-0.013	0.130	-0.265	-3.326	-3.486	-3.840
	[-2.964]***	[-2.592]***	[-3.636]***	[-0.074]	[0.575]	[-1.140]	[-13.507]***	[-9.629]***	[-10.354]***
WorkRight*Knowledge	1.868	1.726	1.757	0.110	0.081	0.082	13.324	13.843	14.326
	[13.520]***	[8.431]***	[8.586]***	[7.536]***	[3.945]***	[3.991]***	[22.291]***	[14.293]***	[14.542]***
WorkRight*FinLib		-0.093	0.103		-0.263	-0.120		0.347	0.808
		[-0.280]	[0.302]		[-0.811]	[-0.362]		[0.721]	[1.654]*
FinLib*WorkRight*ExtFinDep		0.278	0.250		0.312	0.266		0.198	0.182
		[3.707]***	[3.307]***		[3.899]***	[3.305]***		[2.685]***	[2.446]**
FinLib*WorkRight*Knowledge		0.452	0.219		0.090	0.068		-0.632	-1.790
		[1.628]	[0.785]		[3.031]***	[2.271]**		[-0.501]	[-1.411]
N	45958	45958	42967	45958	45958	42967	39705	39705	37133
N Groups	2428	2428	2417	2428	2428	2417	2096	2096	2086
Sargan (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
m1 (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
m2 (p-value)	0.047	0.029	0.070	0.053	0.052	0.071	0.077	0.076	0.067