TCER Working Paper Series

# Basic Employment Protection, Bargaining Power, and Economic Outcomes

Stijn Claessens
Kenichi Ueda

May 2020

Working Paper E-148
https://www.tcer.or.jp/wp/pdf/e148.pdf

TOKYO CENTER FOR ECONOMIC RESEARCH
1-7-10-703 Iidabashi, Chiyoda-ku, Tokyo 102-0072, Japan

## Abstract

We propose a simple theory suggesting that basic employment protection can improve economy-wide welfare as it mitigates a time inconsistency problem that makes a firm's promise to workers less credible. By tilting the bargaining power in renegotiations on contract terms towards workers, basic employment protection can incentivize workers to invest in firm-specific human capital and allow firms to keep operating. This contrasts to the case of rigid labor protection, which forces firms to go bankrupt too often with economic costs. We test for the effects using a quasi-natural experiment: US workers gained basic protections between the early-1970s and the mid-1990s, but in years varying by state. We find employment protection to benefit the growth of knowledge-intensive industries. We corroborate another prediction that stronger bargaining powers of workers vis-à-vis other stakeholders since contemporaneous bank branch deregulations (i.e., reduction in banks' monopoly powers) also benefit knowledge-intensive industries. Although labor and financial reforms are rarely jointly investigated, we confirm that the direct positive effect of basic employment protection prevails when correcting for (changes in) creditors' powers and vice versa. Since the findings do not maintain for R&D-intensive industries, we interpret the firm-specific human capital in our theory broadly, e.g., as for white-collar jobs.



Stijn Claessens
Bank for International Settlements
Monetary and Economic Department
Centralbahnplatz 2, 4051 Basel, Switzerland
Stijn.Claessens@bis.org

Kenichi Ueda
TCER
and
The University of Tokyo
Graduate School of Economics / Graduate School of Public Policy
7-3-1 Hongo Bunkyo-ku Tokyo
uedak@e.u-tokyo.ac.jp

May 2020

# Basic Employment Protection, Bargaining Power, and Economic Outcomes

Stijn Claessens (BIS and CEPR, Stijn.Claessens@bis.org) and
Kenichi Ueda (The University of Tokyo, TCER, and CEPR, uedak@e.u-tokyo.ac.jp)*

**Abstract**

We propose a simple theory suggesting that basic employment protection can improve economy-wide welfare as it mitigates a time inconsistency problem that makes a firm's promise to workers less credible. By tilting the bargaining power in renegotiations on contract terms towards workers, basic employment protection can incentivize workers to invest in firm-specific human capital and allow firms to keep operating. This contrasts to the case of rigid labor protection, which forces firms to go bankrupt too often with economic costs. We test for the effects using a quasi-natural experiment: US workers gained basic protections between the early-1970s and the mid-1990s, but in years varying by state. We find employment protection to benefit the growth of knowledge-intensive industries. We corroborate another prediction that stronger bargaining powers of workers vis-à-vis other stakeholders since contemporaneous bank branch deregulations (i.e., reduction in banks' monopoly powers) also benefit knowledge-intensive industries. Although labor and financial reforms are rarely jointly investigated, we confirm that the direct positive effect of basic employment protection prevails when correcting for (changes in) creditors' powers and vice versa. Since the findings do not maintain for R&D-intensive industries, we interpret the firm-specific human capital in our theory broadly, e.g., as for white-collar jobs.

JEL Classification Numbers: O43, O16, J08, J83, G28, G33, G34

Keywords: Institutions and growth, employment protection, bank monopoly, time inconsistency

* We would like to acknowledge helpful comments of the editor and the referee of this journal, as well as Franklin Allen, Douglas Diamond, Adriano Rampini, Florencio Lopez-de-Silanes, Alex Monge, Martin Schindler, Katsuya Takii, Hajime Takizawa, Hajime Tomura, Robert M. Townsend, and Thierry Tressel. We have benefited from comments of participants at seminars at the IMF, RIETI, and the universities of Amsterdam, Hitotsubashi, Keio, Gakushuin, Tokyo, and Vienna, as well as the conference honoring the scholarship of Robert M. Townsend at the FRB Chicago and the University of Chicago, and several other conferences. We would also like to thank Liliya Repa and Mattia Landoni for their excellent research assistance. Earlier versions have been circulated under various titles since the authors were at the International Monetary Fund. This paper, especially theoretical study, is conducted as a part of the project "International Financial System and the World Economy: Medium and long-term issues" undertaken at the Research Institute of Economy, Trade and Industry (RIETI). This work is also supported by JSPS Kakenhi Grant Numbers JP16H02009 and the CARF research fund. The views expressed in this paper are those of the authors and should not be attributed to the Bank for International Settlements or any other institutions the authors have been affiliated with.

# I. INTRODUCTION

## A. Overview

We propose a simple illustrative model to explain a mechanism showing why a state guarantee on basic employment protection may improve economy-wide welfare. The mechanism is that basic, but not rigid, protection of workers can eliminate a time inconsistency problem that makes a firm's promise to workers noncredible, thereby, incentivizing workers to invest in firm-specific human capital. Hence, the basic labor standard can increase productivity. Our theory implies that this productivity effect should be larger for more knowledge-intensive industries, which are likely to require social capital in the workplace. This is our key empirical prediction.

In our theory, the degree of labor protection is represented by the bargaining power of workers vis-à-vis a firm. However, especially during financial distress, a firm's employment strategy is likely to be affected a lot by creditors, which are often banks. Facing tough creditors, a firm may need to reduce their workforces or cut wages against their promises to workers. In other words, if our theory is correct, the bargaining power of creditors also matters. This is our second empirical prediction. If this is the case, without correcting for a creditor's bargaining power, the estimated effects of employment protection would be biased. In the literature, it is rare to do this correction, if at all.[1]

Our theory also predicts that rigid labor protection creates unviable firms and is bad for the overall economy. This prediction is consistent with many previous papers which primarily focus on continental Europe. Hence, to check our key prediction on a basic, not rigid, labor protection, we naturally focus on our empirical application to a country without rigid employment protection, that is, the United States of America (US).

Specifically, we use a quasi-natural experiment in the US, that is, a series of state-by-state labor and financial market reforms over the period from 1972 to 1993. We find that the basic employment protection is beneficial to the growth of knowledge-intensive industries. This is true even when correcting for the state-level bank branch deregulation, which is known to have lowered the banks' monopolistic powers. By doing so, we also find that the positive growth effects for these industries by the state-level bank branch deregulation.

Note that a policy reform may create winners and losers. For example, firms may increase making riskier investments. This may be good for the economy as it may mean a higher level of R&D expenditure or more emergence of start-up firms (e.g., Acharya, et al., 2014). At the same time, however, a reform may also create more failed firms. If it brings the same expected return as before, the reform should not be considered as a success. Therefore, instead of a firm-level study, we focus on reforms' overall consequences, that is, their impacts on aggregate state-industry-level growth. Also, by focusing on the aggregate effects, we are less concerned about reverse causality, which may be a problem for studies at the individual firm level where firm performance can affect firm-level labor protection (e.g., a better performing firm can provide greater employment protection). We, nevertheless, conduct robustness tests that allow for the reverse causality and essentially confirm the same results.

[1] Also, the empirical literature on banking deregulation rarely corrects for contemporaneous changes in labor protection.

## B. Employment Protection

The US gradually established basic restrictions on unreasonable firing of workers from the 1970s to the 90s, state by state. Before this, employers in the US could freely fire workers. Based on initial precedent-setting case laws, Autor, Donohue, and Schwab (2006) document how states adopted de facto wrongful-discharge protection for employees.[2] 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 (e.g., firing a worker after four and a half years, just before completing a five-year vesting period for their pension).

The implied contract exemption is somewhat vague but has generally been 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 prohibitive for US firms to fire workers, unlike in some European countries and Japan, where more rigid labor laws make it almost impossible for firms to fire workers.

With few exceptions, empirical results have, so far, found that any labor market rigidities have negative, or at best insignificant, growth effects. Early work for the US protection for wrongful discharges found large negative effects on the number of people employed (Dertouzos and Karoly, 1992, 1993). Later studies, 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. An exception, which we discuss more in a later section, is Acharya, et al. (2014) who find an increase of patents at firm level.

Similarly, for other countries, empirical findings on labor protection are negative. Besley and Burgess (2004) find that state-level, pro-worker amendments in the relevant law lead to lower state outputs in India. Cross-country empirical studies of labor markets, using Organization of Economic Cooperation and Development (OECD) industry-level data (e.g., Scarpetta and Tressel, 2004) and firm-level data (e.g., Cingano, et al., 2010) support the view of largely inefficient employment protection. And, in another cross-country empirical analysis, Botero, et al. (2004) show that heavier labor regulation is associated with lower labor-force participation and higher unemployment.

Indeed, most theories predict that any forms of labor market rigidities are detrimental to firms and the aggregate growth (e.g., Hopenhayn and Rogerson, 1993; and Bertola, 1994). Yet, some theoretical models predict growth-enhancing effects of employment protection. The

[2] Since these are precedent or case-based actions, they may not necessarily take effects 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.

mechanism modelled is often the following (Murphy, 1986; Saint-Paul, 1996; Takizawa, 2003; Acharya, et al., 2014): firm-specific human capital is essential in the production process; to solicit such investment, firms need to assure workers of some degree of job security; and this then leads to greater outputs.[3] Also, corporate-finance models can predict such firm-specific investments. A particular implication of the incomplete-contract theory of the firm (e.g., Hart, 1995) is that workers with greater bargaining powers will have more incentives to invest in firm-specific skills. These theories, however, have difficulties in articulating why the government interventions are needed, because a private contract with an incentive pay and with some job security should be enough to overcome the problem.

As reviewed above, empirical evidence supportive of theories based on firm-specific human capital investments is limited. We surmise that there are two hidden problems in the existing literature. Firstly, firm-specific human capital investments are likely to be important for knowledge-intensive white-collar workers but not so much for blue-collar workers. Then, the effects of basic employment protection should only concentrate on knowledge-intensive industries. However, the previous empirical studies using the US's wrongful discharge protection do not differentiate industry characteristics. Secondly, for studies based on other countries, with most focus on Western Europe or Japan, where labor protection is generous, with firing often prohibitive in practice. This high level of employment protection does not allow one to test whether a basic level of labor protection, such as that introduced in the US, benefits economic growth, in particular by inducing greater firm-specific human capital investments.

### C. Relative Bargaining Power and Financiers

Job security is obviously threatened when a firm is in financial distress. In particular, banks may demand a distressed firm to lay off workers or to cut wages for the purpose of securing their financial claims. In this sense, what is important may be the bargaining power of workers, relative to those of creditors (and potentially other stakeholders). Indeed, banks' monopolistic powers have been changed contemporaneously with the employment protection in the US, therefore, it is better incorporated into an extension of our empirical analysis.

Historically, relative powers of workers in the US seems to have changed over the years.[4] Before the 1970s, banks were stronger, while workers were weaker. As discussed above, US workers gained more statutory protections, albeit still basic compared to many European countries. Over the same time, however, between the early-1970s and the mid-1990s, banks' monopolistic powers in the US were reduced gradually on a state-by-state basis by bank-branch deregulations, facilitating greater competition.

Jayaratne and Strahan (1996) describe the history of the bank branch deregulation in the US. Before the deregulation, unit banking was the rule: a bank could only operate from the location of its headquarters and could not open any branches. Starting in the early 1970s

[3] From a different perspective, Blanchard and Tirole (2008) shows that, given the dead-weight losses associated with unemployment insurance due to distortionary taxes, some level of employment protection can be socially optimal.

[4] In the US, corporate governance is currently often characterized as a combination of strong managers, relatively strong creditors, weak owners, and relatively weak workers, while in continental Europe it gets described as weak managers, relatively strong creditors and owners, and strong workers (Roe, 1994, Gelter, 2009).

(except for some states), banks were allowed to operate multiple branches within each state (intra-state 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 (inter-state banking).

Overall, the literature shows that the degree of banks' monopoly powers is considered inversely associated with the bank branch deregulations (see Strahan, 2003, for a review on the economic effects of US banking deregulation). A seminal paper, Jayaratne and Strahan (1996), already shows that states experienced faster economic growth after the branch deregulations. Many papers that followed support this finding. Theoretically, several channels can be thought to drive these findings, and some have been empirically tested. In particular, Black and Strahan (2001) show that the female share of managerial positions increased after the bank-branch deregulations, suggesting that bank owners and employees had enjoyed monopolistic rents that dissipated after the deregulations.[5]

Many studies cover the direct effects of employment protections and financial deregulations, but few of these studies take into account the contemporaneous changes in the relative bargaining powers of workers.[6] Yet, some theoretical models recognize the importance of jointly analyzing the roles and effects of various stakeholders' claims. Such analyses (e.g., Allen, 2005; Allen, Carletti, and Marquez, 2007; and 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. Such effects may also show up at an economy-wide level (e.g., Caballero and Hammour, 1998; and Gervais, Livshits, and Meh, 2008). A specific channel which shows why state intervention (e.g., basic employment protection) matters has, however, not been articulated.

Some papers have empirically analyzed the joint effects of labor and creditor rights in somewhat different perspectives. Falato and Liang (2016) provide firm-level evidence for the US which finds that, when creditors gain greater powers after loan covenant violations, worker layoffs are done in a larger scale, especially by firms facing financial constraints and weaker employee bargaining. 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

[5] Jayaratne and Strahan (1996) themselves argue that greater efficiency in bank lending most likely caused the gains as they find no evidence for increases in quantity of lending. Acharya, Imbs and Sturgess (2011) also find efficiency effects, but more of a risk vs. return nature, as they report that the industry-composition converges to the "efficient frontier" after bank branch deregulation in each state. Stiroh and Strahan (2003) show evidence for a competitive shake out of inefficient banks following the bank-branch deregulation. Also, with international cross-country study, Abiad, Oomes and Ueda (2008) find improvements in within-industry efficiency in capital allocation after (more broadly-defined) financial deregulations.

[6] Related is the empirical law and finance literature, mainly cross-country in nature, which has focused on creditors' and minority shareholders' rights, again largely considering these individual stakeholder's rights one by one. An extensive literature has investigated various effects of these rights using aggregate or individual firm data (La Porta, Lopez-de-Silanes, Shleifer and Vishny, 1997, 1998; Djankov, McLiesh, and Shleifer, 2007; De Nicolo, Laeven, and Ueda, 2008; Acharya, Amihud, and Litov, 2011; and Claessens, Ueda, and Yafeh, 2014). Studies generally document positive effects of stronger property rights on economic performance and firm valuation, consistent with theoretical benefits of securing (minority) investors' claims against abuse by insiders (management or controlling shareholders).

protection. While the specific effect of stronger employment protection depends on the degree of investor protection, in all cases, economic outcomes appear inefficient. 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 finance.[7]

Some research considers the joint effects of labor and financial conditions. Garmaise (2008) finds that because financially constrained small firms have more difficulties in hiring new employees, they provide greater *de facto* employment protection, thereby inducing firm-specific investments.[8] Some of these firm-level studies have to deal with the issue of endogeneity (i.e., better performing firms provide greater protection to their employees, e.g., Bae, Kang, and Wang, 2011). However, these firm-level studies cannot document economy- or industry-wide effects, such as the effects on extensive margins, that is, increased levels of entrepreneurship or business closures, which have been found in studies of US banking deregulations (e.g., Kerr and Nanda, 2009).

Besides changes in workers' and banks' powers, changes in shareholder protection could impact firm performance, through affecting the external-finance availability and improving the 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.[9] Moreover, listed firms, typically large, are mainly subject to these shareholder rules, with listing on national stock exchanges, making the rules of the respective exchanges and not (just) state rules relevant. Such firms also often establish their headquarters in states with laws most conducive to shareholders' interests. All together this makes firms' state headquarter addresses and local shareholders' laws less relevant for state-industry-level value added, therefore, we do not include differences in state-level shareholder protection in our regressions.[10]

## II. A Simple Theoretical Model

### A. Benchmark Model

We propose a simple illustrative model to explain a key mechanism which shows why a state guarantee on basic employment protection may improve economy-wide welfare. It is a four-stage game among many ex ante, identical continuum of firms of measure one and many ex

[7] From a political economy point of view, Pagano and Volpin (2005) explain that the observed negative correlation between employment protection and (minority) shareholder protection across OECD countries stems from collusion by insiders, that is, workers and owner-managers.

[8] In contrast, Cronqvist, et al. (2009) find that to enjoy greater private benefits entrenched CEOs pay more to employees (e.g., less CEO efforts in wage bargaining and improved relations with employees).

[9] 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.

[10] 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.

ante identical workers with measure one. For the sake of simplicity, all agents are assumed to be risk neutral.

- In the first stage, each firm employs an equal-size subset of workers and promises to pay a wage, $w$, after production. For the benchmark case, there is no startup costs, which we discuss later in relation to borrowing.

- In the second stage, a firm prepares for production at its plant and asks its workers to invest in firm-specific human capital. Without such investments, a worker remains unskilled ($h=1$). With investments, a worker gains skill $a$ (i.e., $h=1+a$), which is valuable only within the firm to which the worker belongs. A utility cost, $d$, is incurred by investing in such firm-specific human capital.

- In the third stage, exogenous business environment $z$ is revealed (i.e., *nature's* move) for each firm. It is either good ($z=g$) with probability $p$ or bad ($z=b$) with probability $1-p$.

- In the fourth stage, firms and workers freely observe both the skill levels of workers and the business environment. A firm then decides whether it operates or shuts down its plant. If it operates its plant, it produces goods with the production function $y=hL+z$. It pays total wage $wh$ to workers who supply $L=1$ unit of aggregate labor. If it shuts down its plant, it lays off workers without pay and does not produce anything ($y=0$).

Here, the wage structure in this model is based on a few underlying assumptions. At the first stage, we assume that the labor market is competitive ex ante. We also assume full observability and verifiability of skill levels and the business environment ex post. This means that the competitive labor market ex ante pins down the contingent labor compensation $wh$ to be equal to the marginal product of labor $h$, when the firm operates. That is, the wage becomes performance based, $w=1$.

In other words, for the sake of simplicity, but without loss of generality, we can normalize the compensation for just investing at the first stage to be zero. And, the wage is paid only at the fourth stage. For example, in reality, young workers or interns in their learning stages are often paid but at lower wages than experienced workers. In a way, we normalize the wage at the learning stage to be zero.

Also, we assume that a worker can switch to another job with a search cost after the first stage at the same wage but as a worker without firm-specific investment. For the sake of simplicity, we implicitly assume that the outside option value, including the search cost, is normalized at zero.

Moreover, we assume that a firm cannot or do not have to pay any wage if it shuts down its plant. This follows the realistic convention that a firm has a limited liability and would be free from any obligations when bankrupt.

Table 1a summarizes the payoffs of a worker and a firm in the normal form. In each cell, the left side is the payoff of a worker and the right side is that of the firm. Table 1b is a simplified version with specified values $h=1+a$, if invested, and $h=1$ otherwise, as well as $w=1$. Note that the firm's profit after the wage payments become just $z$. Figure 1 shows that this game as the extensive form.

**Figure 1: Extensive Form**

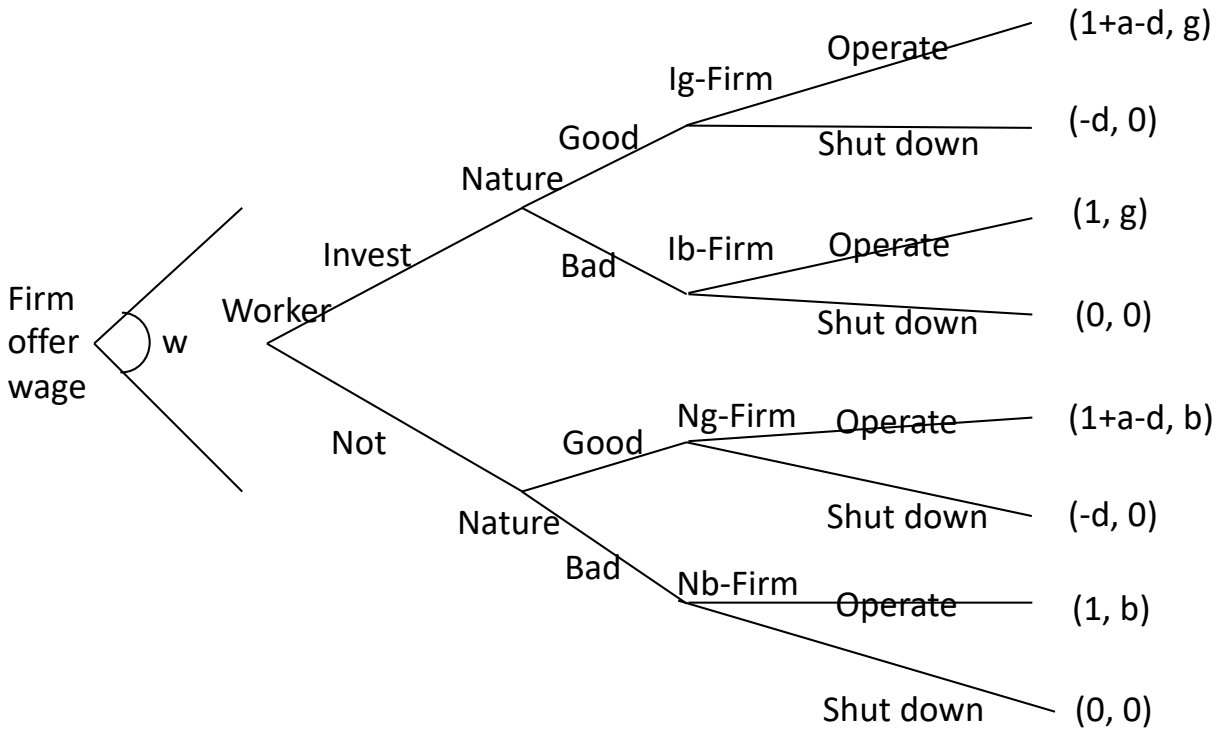



**Table 1a: Payoffs**

| | Operate | Shut down |
|---|---|---|
| Invest | *wh−d, h+z−wh* | *−d, 0* |
| Not Invest | *wh, h+z−wh* | *0, 0* |

**Table 1b: Payoffs**
**with investment *h=1+a* or not *h=1* and wage *w=1***
**under *z=g or b***

| | Operate | Shut down |
|---|---|---|
| Invest (*h=1+a*) | *1+a−d, z* | *−d, 0* |
| Not Invest (*h=1*) | *1, z* | *0, 0* |

For the illustrative purpose, but without loss of generality, we show here a numerical example, that is, *a=11, d=9, g=1,* and *b=−1.* We also assume the probability of a good environment to be larger than that of a bad environment, but not too large, that is, $1/2 < p < 9/10$. Tables 2a and 2b show this example for *Good* (*z=g=1*) and *Bad* (*z=b=−1*) environments, respectively.

**Table 2a: Numerical Example in Good State with *a=11, d=9,* and *z=g=1***

| | Operate | Shut down |
|---|---|---|
| Invest (*h=12*) | *3, 1* | *−9, 0* |
| Not Invest (*h=1*) | *1, 1* | *0, 0* |

**Table 2b: Numerical Example in Bad State with *a=11, d=9,* and *z=b=−1***

| | Operate | Shut down |
|---|---|---|
| Invest (*h=12*) | *3, −1* | *−9, 0* |
| Not Invest (*h=1*) | *1, −1* | *0, 0* |

While a worker chooses their strategy before the business environment is revealed, a firm can choose its strategy contingent on the business environment and worker's choice. Hence, a firm's strategy becomes a quadruple *(Ig-x, Ib-x, Ng-x, Nb-x)*, where *x* denotes firm's strategy, either to *Operate* or to *Shut down*. We denote a contingent strategy by adding prefix *Ig-* for the case of a worker's decision to *Invest* and nature's decision of a *Good* environment. The other three prefixes *Ib-, Ng-,* and *Nb-* are similarly defined. Then, an equilibrium can be expressed by a quintuple, *(worker's strategy, Ig-x, Ib-x, Ng-x, Nb-x).*

In the numerical example, *(Not Invest, Ig-Operate, Ib-Shut down, Ng-Operate, Nb-Shut down)* is a perfect Bayesian equilibrium (PBE). When a business environment turns out to be *Good*, then the choice to *Operate* its plant is the dominant strategy for a firm, regardless of worker's strategy (Table 2a). However, when a business environment turns out to be *Bad*, the other choice to *Shut down* its plant becomes the dominant strategy for the firm, regardless of worker's strategy (Table 2b). Knowing such a rational behavior at each node following the realization of the business environment, workers make their decisions on investing or not in the previous stage. Worker's expected utility by choosing to *Invest* in firm specific human capital is 3 with probability *p* and *−9* with probability (*1−p*), totaled *12p−9*. On the other hand, the expected utility is *p* by choosing *Not to Invest*. Hence, a worker will *Not Invest* when $p<9/11$, that is, the probability of a *Good* business environment is less than 82 percent, which is the case under the assumption of $1/2 < p < 9/10$. Therefore, *(Not Invest, g-Operate, b-Shut down)* is a Nash equilibrium. By construction, it is sequentially rational at each node, and hence it is PBE.

We can think of the case where a firm can commit its strategy ex ante to *Operate* or to *Shut down* its plant, regardless of the realization of the business environment and the worker's decision. The payoff matrix could be summarized simply with expected values and represented by Table 3a. In this case, in the numerical example, shown in Table 3b, *(Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Operate)* is a Nash equilibrium, when the probability of a *Good* state is $p > 1/2$, with which the firm prefers to commit to *Operate* as the dominant strategy. And, apparently, given such strategy, workers prefer to *Invest*.

A firm may even try to incentivize workers to *Invest* in the firm-specific human capital by threatening to *Shut down* if workers do *Not Invest*. This is another case in which a firm commits its strategy ex ante regardless of the realization of the business environment, but contingent on worker's action. In this case, *(Invest, Ig-Operate, Ib-Operate, Ng-Shutdown, Nb-Shutdown)* is also a Nash equilibrium. In the numerical example of Table 3b, the condition is the same when the probability of a *Good* state is $p > 1/2$.

However, these two Nash equilibria *(Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Operate)* and *(Invest, Ig-Operate, Ib-Operate, Ng-Shutdown, Nb-Shutdown)* are not sequentially rational. Ex post, a firm will choose to *Shut down* the plant at any nodes where a firm decides after seeing a *Bad* environment. Hence, these two Nash equilibria are not likely to be realized.

This is a time-inconsistency problem. Ex ante, before the production, the firm asks workers to invest in firm-specific human capital, by promising *Not to Shut down* its plant and to pay a wage according to their performance. However, ex post, if business environment turns *Bad*, a firm will choose to *Shut down* production, that is, to lay off all workers without paying a wage. The firm cannot commit to *Operate* because it rationally chose to *Shut down* ex post. Knowing this, workers would not invest in the firm-specific human capital and, therefore, the economy cannot achieve the efficient level of production.

More generally, we restrict attention to the following reasonable case and establish a proposition.

**Table 3a: Expected Payoffs**
**if a firm can commit to operate or to shut down its plant ex ante**
**with investment $h=1+a$ or not $h=1$ and wage $w=1$**
**under $z=g$ with probability $p$ and $z=b$ with probability $1-p$**

| | Operate | Shut down |
|---|---|---|
| Invest ($h=1+a$) | $1+a-d,\ pg+(1-p)b$ | $-d,\ 0$ |
| Not Invest ($h=1$) | $1,\ pg+(1-p)b$ | $0,\ 0$ |

**Table 3b: Numerical Example Expected Payoffs**
**if a firm can commit to operate or to shut down its plant**
**with $a=11$, $d=9$, and $z=b=-1$**

| | Operate | Shut down |
|---|---|---|
| Invest ($h=12$) | $3,\ 2p-1$ | $-9,\ 0$ |
| Not Invest ($h=1$) | $1,\ 2p-1$ | $0,\ 0$ |

***Assumption 1.***

*(a)* *A firm is ex ante viable, i.e., $E[z] = pg+(1-p)b > 0$.*

*(b)* *In a Bad business environment, the total output is negative if workers choose Not to Invest, i.e., $b < -1$.*[11]

*(c)* *If workers Invest*, the total output still remains positive *even in a Bad environment*, *i.e., $1+a+b>0$.*

*(d)* *Worker's gain from firm-specific human capital investment, if utilized, is larger than the cost, $a > d$.*

*(e)* *The probability of a Good state is bounded by the above by $p < d/a$.*

**Proposition 1.**

*Under Assumption 1, there are three Nash equilibria, which are (Not Invest, Ig-Operate, Ib-Shut down, Ng-Operate, Nb-Shut down)*, *(Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Operate)* and *(Invest, Ig-Operate, Ib-Operate, Ng-Shutdown, Nb-Shutdown). However, only the first one, inefficient equilibrium, (Not Invest, Ig-Operate, Ib-Shut down, Ng-Operate, Nb-Shut down)*, *is sequentially rational, that is, a perfect Bayesian equilibrium.*

*Proof.*

*(Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Operate)* is a Nash equilibrium if the firm commits to always *Operate* its plant is the dominant strategy. Indeed, such a commitment brings a firm expected payoff of $pg+(1-p)b > 0$, which is larger than zero brought by commitment to *Shut down,* by Assumption 1 (a). Knowing this, the worker's ex ante expected payoff to *Invest* is $1+a-d$, while it is $1$ if *Not Invest* (and the firm *Operates*). But, because of $a > d$ (Assumption 1(d)), workers choose to *Invest*.

Similarly, *(Invest, Ig-Operate, Ib-Operate, Ng-Shutdown, Nb-Shutdown)* is a Nash equilibrium if the firm commits to *Operate* its plant contingent on the worker's decision to *Invest* and to *Shut down* its plant, contingent on the worker's decision *Not to Invest* is the dominant strategy. Such a contingent commitment brings a firm expected payoff of $pg+(1-p)b > 0$, which is larger than zero brought by commitment to *Shut down,* by Assumption 1(a) when a worker decides to *Invest*. The worker's ex ante expected payoff to *Invest* is $1+a-d$, while it is $0$ if *Not Invest* (and the firm *Shuts down*). In this case, workers always choose to *Invest* without requiring Assumption 1(d) because the firm incentivizes workers to do so.

However, ex post, a firm's rational choice is to *Shut down* its plant in a *Bad* environment because the payoff is $b < 0$ under Assumption 1(b).[12] Therefore, both *(Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Operate)* and *(Invest, Ig-Operate, Ib-Operate, Ng-Shutdown, Nb-Shutdown)* cannot be sequentially rational. On the other hand, a firm chooses to *Operate* in a

[11] We assume this because the total output $1+b$ becomes negative without workers' investments. It would then create a socially inefficient firm if it *Operates* in a *Bad* environment. We would like to assume such inefficient production in this specific contingency to have inefficient labor protection in the model, as is often discussed in case of rigid labor laws in the literature.

[12] For this result, $b<0$ is enough, though Assumption 1(b) states $b<-1$.

*Good* environment ex post because the payoff is positive $g > 0$, which is implied by Assumption 1(a) and (b). These are dominant strategies of a firm.

Anticipating these ex post decisions by a firm, a worker's expected payoff becomes, if *Invest*, $p(1+a-d) + (1-p)(-d) = p(1+a)-d$ and, if *Not Invest*, $p1 + p0 = p$. Therefore, workers choose *Not Invest* when $p(1+a)-d < p$, that is, $p<d/a$, which is true under Assumption 1 (d). That is, *(Not Invest, Ig-Operate, Ib-Shut down, Ng-Operate, Nb-Shut down)* is a unique PBE.

*Q.E.D.*

As shown in the proof above, the efficient Nash equilibria *(Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Operate)* and *(Invest, Ig-Operate, Ib-Operate, Ng-Shutdown, Nb-Shutdown)* are not sequentially rational and not likely to be selected in the real world.

## B. Renegotiation

There could be a gain by keeping *Operating* by renegotiating the employment terms, wage-cut or partial worker layoff, after observing the *Bad* business environment but before producing outputs. Here, we investigate implications of such an opportunity in the model. In particular, we allow renegotiation with cost $\tau$ incurred to a firm to see if the efficient outcome can be achieved as PBE.

Note that, in the theory section, for the sake of simplicity, we focus on the renegotiation between wage-cut vs. shutting down (complete layoff), but we can readily apply the theoretical results to renegotiation between partial employment protection (partial layoff) versus shutting down (complete layoff), which we focus on in the empirical section.

Several reasons support this equivalent interpretation. Firstly, any level of employment protection would increase the workers' bargaining powers on wage. Secondly, more importantly, in a general setup, employment protection has a direct effect similar to wage bargaining. For example, if a firm has several product lines and if business environment $z$ is specific to each product, then an option to shut down one of the product lines is equivalent to a layoff of a part of the workers.

Thirdly, with a more general production function, for example, $y = k^{\alpha}(hL)^{1-\alpha} + z$, if the firm invests in capital $k$ at the first stage, then the layoff of some portion of workers $L$ at the fourth stage can achieve the same effects for a firm and a worker as reduction of promised wage $w$ in a *Bad* environment. Both can increase the firm profits by making the marginal product of labor in line with the wage in a *Bad* environment ex post. Specifically, the marginal product of capital in a *Bad* environment ($z=b$) ex post is lower than the promised wage ($w$), that is, $MPL = (1-\alpha)zk^{\alpha}(hL)^{1-\alpha} < w$. Either by worker layoff (reducing $L$) or wage-cut (lowering $w$), a new level of *MPL* could become equal to a new level of wage, achieving the efficient level of production ex post. Apparently, laying off 10 percent of the workforce ex post gives the same expected payoff as a wage-cut of 10 percent for a risk-neutral worker.

In our theory with renegotiation, the wage contract, given full information ex post, can be still written as contingent contracts as before but now it is not just a performance pay ($w=1$) but also possibly contingent on renegotiation. For the sake of simplicity, and as a refinement of sequentially rational PBE, we assume sequential change in wage (or employment in a more

general setup). That is, we keep assuming that the performance pay ($w=1$) is promised ex ante but it would change if renegotiation happens.[13]

We let the bargaining power of a firm to be represented by transfer $\lambda$ to the firm. It also represents how much lower the payments to workers become. It possibly takes the range of $\lambda \subseteq [0, wh]$ (in the numerical example, $[0, 1+a]=[0, 12]$ if invested, and $[0, 1]$ under no investment). Note that the participation constraint for a worker is non-existent or $\lambda \leq wh = 1+a$, *that is.,* possibly a full transfer to the firm (and zero payoff for a worker), because the disutility of investment by a worker is already sunk.

We investigate whether such a renegotiation opportunity for workers and firms can achieve efficient outcome. At least, as shown below, any equilibrium with renegotiation would not create unviable firms.

**Lemma 1**
*Under Assumptions 1, no matter how a firm can reduce labor compensation, a firm would not change its decision to Shut down its plant in a Bad environment when workers do Not Invest.*

*Proof.*
This is because the firm's income from *Operating* its plat in a *Bad* environment after seeing workers did *Not Invest* would become negative, $h+b–wh = b < 0$ without any transfers. Note that $h=1$ without investment and that always $w=1$ is offered ex ante due to the labor market competition. Also, note that this is nothing to do with what would happen in a *Good* environment. With lowering wage or transfers to a firm, the firm's income from its *Operation* in this case could increase up to $h+b = 1+b$ with full transfer of $\lambda = wh$. Still, the payoff is negative, $1+b < 0$, under Assumption 1(b).

*Q.E.D.*

We can consider a simple reduced-form version of renegotiation under the laws and regulations. Instead of modeling renegotiation process in detail, we just need to alter the payoffs in case of renegotiation. That is, the payoff to a firm when workers *Invest* changes from $z$ without renegotiation to $z-\tau+\lambda$ with renegotiation, where $z=g$ or $b$. Accordingly, the payoffs to a worker changes from $1+a-d$ to $1+a-d-\lambda$, as shown in Table 4a. In the numerical example, the payoffs of firm's *Operation* in a *Bad* environment after workers' *Investment* changes from $(3, -1)$ to $(3-\lambda, -1-\tau+\lambda)$, as in Table 4b.

Obviously, with rigid labor protection, a promised wage would not be lowered (and, in a general setup, workers would not be laid off) in operating firms, that is, $\lambda=0$. Then, in a *Bad* environment, firms would choose to *Shut down*. Workers would *Not Invest*. This is nothing but the benchmark model without renegotiation. And, the unique PBE is inefficient, *(Not Invest, Ig-Operate, Ib-Shutdown, Ng-Operate, Nb-Shutdown)*.

[13] Because such wage alteration ex post is rationally expected, this scheme is essentially equivalent to ex ante contingent contract that is renegotiation proof. This completeness of contracts differ from incomplete contract literature, including Acharya et al. (2014).

**Table 4a: Payoffs in Bad State with Renegotiation with investment $h=1+a$ or not $h=1$ and wage $w=1$ under $z=b$**

| | Operate | Shut down |
|---|---|---|
| Invest ($h=1+a$) | $1+a-d-\lambda,\ b-\tau+\lambda$ | $-d,\ 0$ |
| Not Invest ($h=1$) | $1,\ b$ | $0,\ 0$ |

**Table 4b: Numerical Example in Bad State with Renegotiation with $a=11$, $d=9$, and $z=b=-1$**

| | Operate | Shut down |
|---|---|---|
| Invest ($h=12$) | $3-\lambda,\ -1-\tau+\lambda$ | $-9,\ 0$ |
| Not Invest ($h=1$) | $1,\ -1$ | $0,\ 0$ |

At the other extreme, if a firm has the sole bargaining power on cutting wages (or laying off some workers in a general setup), then a firm rationally choose the full transfer $\lambda=1+a$ ($=12$ in the numerical example), that is, zero wage. This would make the payoff, when a firm *Operates* in a *Bad* environment after workers *Invest*, to be $(-d,\ 1+a+b-\tau)$, which is $(-9,\ 11-\tau)$ in the numerical example. In this case, a firm rationally chooses to *Operate* in a *Bad* environment ex post. But, then, the workers would *Not Invest* at all ex ante because there is no compensation for investment in a *Bad* environment even when firms *Operate*. Here, the inefficient equilibrium *(Not Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Shutdown)* is the unique PBE. This shows that the ex post renegotiation would not always make the economy efficient, even when a firm can lower labor costs.

However, avoiding these two extremes can help the economy to achieve the efficient outcome. Hence, there is a possibility for a state intervention to increase welfare by restricting the bargaining power somewhere in the middle, that is, by removing rigid labor protections and by limiting a firm's too strong bargaining power. In the numerical example in Table 4b, if workers have some bargaining powers and just honor the firm's participation constraint, $\lambda=1+\tau$, then they would make the firm's payoff of *Operation* in a *Bad* environment after workers' *Invest* to be $0$ and worker's to be $2-\tau$. In this case, a firm chooses to *Operate* and the workers would *Invest* ex ante. Hence, *(Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Shutdown)* becomes the perfect Bayesian equilibrium.

More generally, as renegotiation happens endogenously, we investigate the detailed conditions below. We have to recognize two cases regarding the firm's commitment. In the first case, firm's promises on wage and employment are enforced unless a firm files formal bankruptcy in financial distress (i.e., a *Bad* environment), either to *Shut down* (i.e., liquidation such as US Chapter 7) or to *renegotiate to Operate* (i.e., reorganization such as US Chapter 11). In the second case, we assume that a firm cannot commit to any promises and may renegotiate labor contracts ex post even in a *Good* environment.

***Formal bankruptcy case***

In this case, *Shutting down* or *Reorganizing to Operate* its plant are both legally allowed only in a *Bad* environment (i.e., in financial distress). With renegotiation (i.e., reorganization), a firm would lay off some workers or lower promised wage. There are three subcases regarding renegotiations and one borderline subcase, as shown in the following proposition.

**Proposition 2**
*(a) For $\lambda \subseteq (-b+\tau, 1+(a-d)/(1-p))$, the efficient equilibrium (Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Shutdown) is the unique PBE, as renegotiation occurs between a firm and workers to lower the labor costs in a Bad environment after workers Invest in firm-specific human capital.*

*(b) For smaller $\lambda \subseteq [0, -b+\tau)$, the inefficient equilibrium (Not Invest, Ig-Operate, Ib-Shutdown, Ng-Operate, Nb-Shutdown) is the unique PBE, as the firm would not renegotiate and just Shut down its plant in a Bad environment.*

*(c) For larger $\lambda \subseteq (1+(a-d)/(1-p), 1+a]$, the inefficient equilibrium (Not Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Shutdown) is the unique PBE, as the workers do Not Invest. This happens even if a firm would be willing to renegotiate to Operate in a Bad environment if workers were to Invest, because only a little remains for workers after such renegotiation.*

*(d)* The borderline smaller-$\lambda$, that is, $\lambda=-b+\tau$, supports two PBE, *(Not Invest, Ig-Operate, Ib-Shutdown, Ng-Operate, Nb-Shutdown)* and *(Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Shutdown).* Also, the borderline larger-$\lambda$, that is, $\lambda=1+(a-d)/(1-p)$, supports two slightly different PBE, *(Not Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Shutdown)* and *(Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Shutdown).*

*Proof.*
Transfer $\lambda$ from workers to the firm after renegotiation should be large enough for the firm to participate in the renegotiation. Specifically, for a firm to participate in renegotiation in a *Bad* environment after workers *Invest*, the firm's payoff from *Operation* after renegotiation should be higher than the firm's payoff from *Shutting down* its plant. That is, the firm's participation constraint for renegotiation is

$$\lambda \geq -b+\tau. \tag{1}$$

This immediately implies Proposition 2(b), that is, for smaller $\lambda \subseteq [0, -b+\tau)$, the inefficient outcome *(Not Invest, Ig-Operate, Ib-Shutdown, Ng-Operate, Nb-Shutdown)* is the unique PBE.
On the other hand, if transfer $\lambda$ from workers to the firm after renegotiation is too large, workers would not be incentivized to invest in firm-specific human capital ex ante. Specifically, for a worker to *Invest* in human capital, the ex ante expected return from the *Investment* should be higher than *No Investment.* That is,

$$p(1+a-d) + (1-p)(1+a-d-\lambda) \geq p1 + (1-p)0. \tag{2}$$

Note that the left-hand-side is the worker's payoff in the case that a worker chooses to *Invest*, assuming a firm would choose to *Operate* with renegotiation in a *Bad* environment. The right-hand-side is the worker's payoff in the case that a worker chooses to *Not Invest* and that, due

to sequential rationality, a firm chooses to *Operate* its plant in a *Good* environment but to *Shut down* its plant in a *Bad* environment.

By simplifying the condition, we obtain the upperbound,

$$\lambda<1+(a-d)/(1-p) \tag{3}$$

for a worker to *Invest* assuming renegotiation occurs afterwards in a *Bad* environment. This is the worker's incentive constraint to *Invest.* This immediately supports (a), that is, for $\lambda\subseteq(-b+\tau,\ 1+(a-d)/(1-p))$, the efficient outcome *(Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Shutdown)* is the unique PBE.

Also, another immediate result is Proposition 2(c), that is, for larger $\lambda\subseteq(1+(a-d)/(1-p),\ 1+a]$, the inefficient outcome *(Not Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Shutdown)* is the unique PBE.

Lastly, the borderline cases stated in Proposition 2(d) obviously support two adjacent equilibria.

*Q.E.D.*

Note that, the worker's incentive constraint to *Invest* (3) does not require the transfer $\lambda$ to be more than its maximum, $1+a$. To see this, note that $1+(a-d)/(1-p) < 1+a$ is simplified to $p<d/a$, which is Assumption 1(d).

**Table 5a: Payoffs in Good State with Renegotiation with investment *h=1+a* or not *h=1* and wage *w=1 under z=g***

| | Operate | Shut down |
|---|---|---|
| Invest ($h=1+a$) | $1+a-d-\lambda_{Ig},\ g-\tau+\lambda_{Ig}$ | $-d,\ 0$ |
| Not Invest ($h=1$) | $1-\lambda_{Ng},\ g+\lambda_{Ng}$ | $0,\ 0$ |

**Table 5b: Payoffs in Bad State with Renegotiation with investment *h=1+a* or not *h=1* and wage *w=1 under z=b***

| | Operate | Shut down |
|---|---|---|
| Invest ($h=12$) | $1+a-d-\lambda_{Ib},\ b-\tau+\lambda_{Ib}$ | $-d,\ 0$ |
| Not Invest ($h=1$) | $1,\ b$ | $0,\ 0$ |

***Informal restructuring case***

Now, we assume that a firm can fire workers freely without facing financial distress and without going through a formal bankruptcy procedure. In this case, a firm may have an incentive to renegotiate with workers to cut wages (or to lay off some workers in a general setup) also in a *Good* environment. While "*Operate*" part of *Ig-Operate* or *Ng-Operate* is legally enforced in a *Good* environment in Proposition 2, it is no longer the case here. And, after renegotiation, the ex post payoffs become different. Note that, off-equilibrium payoffs may be also altered.

We need to redefine the concept of the bargaining power. If renegotiation happens only in one case*, Ib-Operate*, as in Proposition 2, then the bargaining power of a firm can simply be represented by the transfer to the firm, $\lambda \subseteq [0, 1+a]$, possibly taking all the worker's ex post income $1+a$. However, here, renegotiation could happen in two more cases, *Ig-Operate* and *Ng-Operate,* hence, we need to define the relative bargaining power of a firm as the payoff to the firm out of total ex post outputs ready for allocation. Note that, there would not be a renegotiation in *Nb-* case because of Lemma 1. We assume the following.

**Assumption 2**
*The relative bargaining power is determined by institutions and policies and is the same for any contingencies.*

We let $\mu \subseteq [0, 1]$ to denote the relative bargaining power. For the *Ib-Operate case*, as in the previous section, with transfer $\lambda_{Ib} \subseteq [0, 1+a]$, the relative bargaining power is expressed as

$$\mu = \frac{b+\lambda_{Ib}}{1+a+b} \; or \; \lambda_{Ib} = \mu(1+a) - (1-\mu)b. \tag{4}$$

Similarly, for the *Ig-Operate* case, with transfer $\lambda_{Ig} \subseteq [0, 1+a]$,

$$\mu = \frac{g+\lambda_{Ig}}{1+a+g} \; or \; \lambda_{Ig} = \mu(1+a) - (1-\mu)g \tag{5}$$

and for the *Ng-Operate* case, with transfer $\lambda_{Ng} \subseteq [0, 1]$,

$$\mu = \frac{g+\lambda_{Ng}}{1+g} \; or \; \lambda_{Ng} = \mu - (1-\mu)g. \tag{6}$$

Using this notation $\mu \subseteq [0, 1]$ representing the relative bargaining power of a firm, we can obtain results similar to Proposition 2, as below. The payoffs are shown in Table 5a and b.

**Proposition 3**
*(a) For $\mu \subseteq (\tau/(1+a+b),\ 1-d/(1+a+b(1-p)-p))$, the efficient equilibrium (Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Shutdown) is the unique PBE, as renegotiation occurs between a firm and workers to lower the labor costs in a Bad environment after workers Invest in firm-specific human capital.*

*(b) For smaller $\mu \subseteq [0,\ \tau/(1+a+b))$, the inefficient equilibrium (Not Invest, Ig-Operate, Ib-Shutdown, Ng-Operate, Nb-Shutdown) is the unique PBE, as the firm would not renegotiate and just Shut down the plant in a Bad environment.*

*(c) For larger $\mu \subseteq (1-d/(1+a+b(1-p)-p), 1]$, the inefficient equilibrium (Not Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Shutdown) is the unique PBE, as the workers do Not Invest.*

*(d)* The borderline smaller-$\mu$, that is, $\mu = \tau/(1+a+b)$, supports two PBE, *(Not Invest, Ig-Operate, Ib-Shutdown, Ng-Operate, Nb-Shutdown)* and *(Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Shutdown)*. Also, the borderline larger-$\mu$, that is, $\mu = 1-d/(1+a+b(1-p)-p)$, supports slightly different two PBE, *(Not Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Shutdown)* and *(Invest, Ig-Operate, Ib-Operate, Ng-Operate, Nb-Shutdown)*.

*Proof.*
Lemma 1 still holds so that a firm would not renegotiate and would *Shut down* its plant in a *Bad* environment after workers did *Not Invest*. Hence, *Nb-Shutdown* is always a part of an equilibrium.

Even without renegotiation, a firm always chooses to *Operate* its plant in a *Good* environment regardless of workers' *Investments*, as shown in Proposition 2. Hence, with any renegotiation to increase a firm's payoff would not change this decision. In other words, both *Ig-Operate* and *Ng-Operate* constitute a part of an equilibrium.

In the case of *Investment* and a *Bad* environment (*Ib*), renegotiation happens the same way as in Proposition 2. Hence, the same participation constraint as in Proposition 2 determines whether a firm decides to *Operate* or to *Shut down* its plant. That is, $\lambda_{Ib} \geq -b+\tau$, which is translated to using relative bargaining power $\mu$, as

$$\mu \geq \frac{b+\lambda_{Ib}}{1+a+b} = \frac{\tau}{1+a+b}. \tag{7}$$

This is the smaller borderline appears in Proposition 3(a) and (b).

Regarding the larger borderline which appears in Proposition 3(b) and (c), we need to consider the ex ante incentive condition for a worker to *Invest* in firm specific human capital, similar to equation (2) in the previous section. Specifically, for a worker to *Invest* in human capital, the ex ante expected return from the *Investment* should be higher than *No Investment,*

$$p(1+a-d-\lambda_{Ig}) + (1-p)(1+a-d-\lambda_{Ib}) \geq p(1-\lambda_{Ng}) + (1-p)0. \tag{8}$$

Using (4)-(6) to substitute $\lambda s$ by $\mu$, we obtain

$$1+a-d-p-\mu(1+a)+(1-\mu)b+p\{(1-\mu)(g-b)+\mu-(1-\mu)g\} \geq 0, \tag{9}$$

which is simplified to

$$1+a-d-p-\mu(1+a)+(1-\mu)b+p\{\mu-(1-\mu)b\} \geq 0,$$
$$1+a-d-p-\mu(1+a+b(1-p)-p)+b(1-p) \geq 0,$$

and hence

$$\mu \leq 1-\frac{d}{1+a+b(1-p)-p}. \tag{10}$$

This is the larger borderline for the relative bargaining power $\mu$. Note that because of $b < -1$ (Assumption 1(b)),

$$1 + a + b(1-p) - p > 1 + a + b(1-p) + bp = 1 + a + b > 0, \tag{11}$$

where the last inequality comes from the latter half of Assumption 1(c) (i.e., the total output is positive if workers *Invest*).

*Q.E.D.*

Note that a stronger condition (10) in *Ig-Operate* case can be obtained using (5) and (11) as

$$\mu = \frac{b+\lambda_{Ib}}{1+a+b} < 1 - \frac{d}{1+a+b},$$

that is,

$$\lambda_{Ib} < 1 + a - d. \tag{12}$$

Compared to the worker's incentive constraint to *Invest* in Proposition 2, $\lambda_{Ib} \leq 1 + (a-d)/(1-p)$, this condition (12) is a tighter condition, assuming that (12) is close enough to the original one (10) (i.e., if $b$ is close to –1). In other words, a larger bargaining power of workers is necessary to achieve the efficient outcome in this informal restructuring case than in the formal bankruptcy case.

***Needed for a statutory basic labor standard***

Proposition 2 and 3, in particular the cases of (b) and (c), imply that the economy cannot achieve the efficient outcome with a too small or a too large bargaining power of a firm. When this happens even workers and firms can engage in renegotiation. In particular, with a too large bargaining power of a firm, a firm will almost freely cut wages (or partially lay off workers in a more general setup) to maximize its payoff ex post. In this case, renegotiation would happen in three out of four cases (except for *Nb-Shutdown*), but it does not make the economy achieve efficient equilibrium, as workers do *Not Invest*.

When firms have large bargaining power to alter labor contracts ex post, workers' bargaining power needs to be enhanced somewhat to achieve the economy-wide efficiency. Without any laws and regulations, the rights to fire workers and to stop production are vested in the firm management, which maximizes the owner (shareholder) value ex post or, in financial distress, the creditor value. At least, this is the case for many states in the US, in the 1970s and 80s, as we explain in the empirical section.[14] Even if it promises a wage, a firm can lower wage payments by threatening complete layoffs or bankruptcy in a *Bad* environment. Anecdotal evidences suggest that such renegotiation (i.e., labor restructuring) also happen in a *Good* business environment, consistent to our theoretical prediction.

This selection of an inefficient equilibrium without state intervention (Proposition 2 and 3(b) cases) is a variant of time-inconsistency problems arising from sequential rationality in a decentralized equilibrium. The only way to achieve the efficient outcome as PBE is to alter the payoff matrix by some form of state intervention to empower the bargaining power of workers. Here, we are not saying that state intervention is needed to help firms to commit to ex post unprofitable behavior to achieve a non-PBE, efficient, Nash equilibrium in

[14] An institutional exception of having workers in firm managements is found in Germany where the board includes workers' representatives. This, however, is also due to laws and regulations.

Proposition 1, rather, the sequentially rational, efficient, PBE is naturally selected as a credible outcome with a slightly different payoff structure by laws and regulations.

Needless to say, too much labor protection also makes the economy select an inefficient equilibrium (Proposition 2 and 3(c) cases). Hence, the state intervention should not be so large. We can, therefore, interpret the necessary intervention to empower workers and to achieve efficient equilibrium (Proposition 2 and 3(a) cases) as a statutory *basic labor standard*.

## C. Further Theoretical Considerations and Empirical Implications

### *Creditors*

We have so far considered that labor protection at any degree can be considered to raise the bargaining power of workers. However, it is also natural to think that the key bargaining parameter $\mu$ or $\lambda$ is altered by the creditors' power. For example, we can consider a case in which a firm's bargaining power is influenced by creditors in financial distress, that is, a *Bad* environment in our model.

Suppose a firm borrows funds from a bank in the first stage at a fixed interest rate to start up, then the bank's bargaining power influences the firm's bargaining position with workers. Perhaps, the bank may demand the firm profit to be the same level in a *Bad* environment as in a *Good* case, by demanding to repay the promised principal and interests of loans. Such full repayments to creditors may be possible only by a large reduction in labor costs. In this case, $\lambda_{Ib}$, firm's bargaining power against workers, needs to be high, $\lambda_{Ib}=g-b$, which is possibly larger than the upperbound of efficient $\lambda_{Ib}$ or $\mu$ so that expected renegotiation on wage-cut causes workers to choose *Not-to-Invest.*

In other words, relative bargaining power of workers and creditors as stakeholders matter for the efficiency of firm production. This is another novel viewpoint compared to previous literature. To see this as true, in the empirical investigations on effects of labor protection, we correct for a proxy of banks' bargaining power. By doing so, we also provide the estimates of the effects of the banks' bargaining power itself.

### *Meaning of Firm-Specific Human Capital*

The time-inconsistency problem stems from the model setup in that the worker's payoff from the first-period action cannot be separated from the firm's second-period action. This happens because the human capital investment is firm specific. If, instead, the human capital investment is about a general skill that is useful in other firms, a worker can easily find another job in the beginning of the second period with a higher salary. Then, there would be no time-inconsistency problem.

The firm-specific human capital we consider is something that workers cannot carry to other firms when they leave. Hence, it would not be priced in the market outside the firm. In this sense, it should not be just a job skill.

*Social capital*

We interpret firm-specific human capital as social capital within a firm, for example, to become familiar with a firm's peculiar way of doing business and to establish inter-personal relations within the firm. In this sense, basic labor standards should be more relevant for white collar workers than blue-collar workers. Empirically, industries with higher percentage of white-collar workers should be affected more by the introduction of basic labor standards.

*Trade secrets*

Another possible interpretation of firm-specific investment is a legally-created one, associated with R&D activities, whose outputs are protected by patents, or more general frontier or key knowledge, which are often protected by non-disclosure agreement or by the employment contract prohibiting starting to work in rival firms within a certain period after quitting (i.e., "post-employment covenants not to compete").[15] In this case, invested knowledge is legally prohibited to transfer to other firms, thus, becomes firm-specific artificially. Those are, however, only likely to be relevant for highly paid managers and professionals (e.g., researchers, engineers, programmers, investment bankers, and lawyers).

*R&D*

There are two opposing views on the relationship between R&D and labor protection. A seminal paper by Saint-Paul (2002) argues that an innovation to create new goods is done less by a country with a rigid labor market.[16] This is a typical result showing that rigid labor protection is bad for growth. On the other hand, Acharya, et al. (2014) stresses the beneficial effects of employment protection, particularly, protection against wrongful discharges in US states, for incentivizing the workers to invest more in R&D activities.

Our theory covers both cases. That is, that both little and rigid labor protection are bad for the economy. Only the middle-level protection, such as protection against wrongful discharges, is good for the economy. Besides, the R&D-based story may be not so well linked to our theory, as discussed below. In any case, in the empirical section, we look into any differential effects, depending on industry-specific R&D levels.

Note that Acharya, et al. (2014) shows a model with a time inconsistency similar to ours. However, their model relies on an incomplete contract so that there will be no performance pay, by which the R&D activity can be incentivized through the wage contract. Our theory allows such a simple performance pay scheme. But, such an optimal compensation scheme seems to eliminate the theoretical implications in Acharya, et al. (2014).[17]

---

[15] See Gilson (1999).

[16] In the model of Saint-Paul (2002), a higher cost of firing induces an overall higher labor cost for producing riskier goods, which are relatively new goods. Hence, a country with a higher firing cost specializes in secondary innovations to produce more efficiently old, time-tested goods, which on average survives longer than (and, thus, less risky than) the new goods, which require primary innovations. In contrast, our theory does not talk about different goods but discusses a bankruptcy-related situation (or a poor promise-keeping institutional setup). It seems that Saint-Paul (2002) assumes firms have to pay firing costs even, when their goods are no longer sold, that is, likely in bankruptcy. Our theory, at least for Proposition 2, instead, assumes that, if a firm declares bankruptcy, it can escape from promises. (Proposition 3 even assume that a firm can always escape from promises.)

[17] In Acharya, et al. (2014), the workers' investment level is not known to a firm. However, if we interpret R&D efforts or innovative knowledge accumulation as the firm-specific investments, it would be natural to model the

Note also, although R&D could become a firm-specific investment artificially through legal protection, R&D could also become a general investment. This happens if they are patented and sold or licensed to other firms. Even in the case that they are not patentable, the innovations could be mimicked freely or perhaps with learning costs (i.e., reverse engineering). If it requires learning costs, the investment could still be firm specific but with low profitability. Again, considering these possibilities, interpreting R&D as the firm-specific human capital investments is only weakly consistent with our theory.

### *Summary empirical predictions*

A key empirical prediction of our theory can be summarized as the following hypotheses H1 to H4.

**H1:** Basic, but not rigid, protection of workers raises the outputs for knowledge-intensive industries, which are likely to require social capital in the workplace.

**H2:** Weakening of banks' bargaining power also raises the outputs for knowledge-intensive industries.

**H3:** The effect of H1 should be present even when correcting for banks' bargaining power. At the same time, H2 should also hold, correcting for employment protection.

**H4:** Similar predictions could work but in a less certain way for R&D-intensive industries.

## III. DATA AND FACTS

### A. Employment Protection

The exemption for wrongful discharges, that were gradually established in the US from the 1970s, is considered as a basic employment protection, not a rigid one, as discussed in the introduction section. For our empirical analysis, from Autor, Donohue, and Schwab (2006), we create four employment protection indexes, depending on which, if any, of the three protections is adopted or recognized by the specified state court, or if any of the three is introduced, with each index having a binary value of 1 or 0: *WorkRight = public policy*; *good faith*; *implied contract*; or *earliest*. For the period of 1972 to 1993, Figure 2a shows the number of states that have adopted the three forms of employment protection.

Summary statistics, including those for all other variables used in this paper, are shown in Table 6a. Table 6b shows the correlation among the three employment protection indexes, with the highest between implied contract and public policy, 0.54, meaning the contract-based protection is often likely considered together with the (more specific) public-policy-based protection. Good-faith-based protection, on the other hand, shows a bit of a different picture, that is, lower adoption rates with less correlations with the other two (0.25 and 0.12). Public

---

ex post productivity *z* (i.e., a *Good* or *Bad* environment) to rely on R&D and innovative efforts. Then, even under imperfect information of workers' investments, an optimal labor contract can incentivize workers to invest by making the worker compensation contingent on firm profits. Acharya, et al. (2014) assume away such optimal contract by focusing on incomplete (i.e., fixed wage) contracts. This seems a key assumption for the theoretical model by Acharya, et al. (2014).

policy is often the earliest one adopted among the three, with the correlation between public policy and the earliest being 0.83. We, therefore, use public-policy-based employment protection in our benchmark regressions.[18]

## B. Bank Branch Deregulation

The data we use on bank branch deregulations comes from Jayaratne and Strahan (1996). Specifically, we define two financial deregulation indexes: *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. Figure 2b shows the number of states that have allowed mergers and acquisitions (M&A) or *de novo* branches. It shows the accelerating trend of the financial deregulation between the 1970s and the 1990s. Note that the M&A-based branch deregulations always precede *de novo* deregulations and the correlation between the two is high at 0.77 (Table 6b). We use the M&A-based one as the regressor.[19]

## C. Interaction of Two Institutional Changes

Changes in bank monopoly rights and employment protection did not occur at the same time though in each state. Figures 3a and 3b show the number of years between financial deregulations and the changes in employment protection at the individual state level. It is clear that the two policy changes occurred in some states at quite different points in time, as the number of years between financial deregulations and changes in employment protection varies from minus 20 to plus 20. Table 6b provides some further indication of the (lack of) overlaps in the two reforms by showing the raw correlations between the various indexes. Most correlations between employment protection and financial deregulation indexes are relatively low, though not negligible, between 0.14 and 0.29, reflecting the variations in time and across states when these two types of reforms were adopted.

## D. 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 and Zingales (1998), who constructed the external-finance dependency of each industry in the US.[20] We also create similar variables that measure the *natural* characteristics of knowledge intensity of

[18] In an earlier working paper version, we use all three, as well as the earliest one. The results are broadly robust.
[19] In an earlier working paper, we also use *de novo* based variable and obtained robust results.

[20] We use Thomson Reuters data from 1991 to 2006. While the values of external-finance dependency differ from Rajan and Zingales (1998)—they use a different period and Compustat data, industry rankings are virtually the same. Also, by 1991 the financial and labor reforms had been largely completed and the firm-level dependency on external financing and knowledge can be expected to be near their steady states (i.e., "natural" tendencies). Note that, if we include shareholder issues in our study, we should also use a variable capturing equity-finance needs, for example, those proposed by Black, Jan, and Kim (2006).

each industry in the US using data from a different period. It is defined as the average use of intangible assets per 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 to 2006. To check the robustness of our results in 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.[21]

Note that, although our arguments refer to firm-specific human capital, no such data is readily available. Instead, we have to use general human-capital measures at the industry level. This should be fine since we interpret firm-specific human capital as social capital in the workplace, which should require similar, though idiosyncratic, sets of office procedures and social networks. Those firm-specific organizational knowledge that require substantial learning is expected to be relatively low for industries that do not require much skills and is instead filled with more manualized and simpler operations.

The correlations among these industry-level characteristics are sizable, as expected (Table 6c). The two knowledge-intensity 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. Schooling has a correlation of 0.54, with the intangible asset ratio and 0.38 with the sales-to-fixed-asset ratio.

Note that knowledge intensity and external-finance dependence are negatively correlated. Table 6c shows that the correlation between external-finance dependence and intangible-to-fixed-asset ratio is a negative 0.44, that is, more external-finance-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. Correlation with the fraction of college graduates is low, negative 0.12.

## E. State-Industry Growth Data

We use growth in state-industry level value added to analyze the effects of changes in employment protection and financial regulation. The output growth data come from the US Bureau of Economic Analysis (BEA). Data cover the value added produced in each 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 use real growth rates, adjusted for national price (CPI) changes for the relevant years, that is, from 1972 to 1993.[22]

---

[21] This measure is taken from Buera and Kaboski (2012), who report the 2005 and 1940 data, which are highly correlated (more than 0.7), and we use their average. 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.

[22] We use national prices for several reasons. Firstly, to be comparable with what Jayaratne and Strahan (1996) and other such studies do. Secondly, state-specific price indexes are available only from 1978 and using those would make our sample shorter and miss some important reforms. Thirdly, state-specific reforms can affect the prices of non-tradable goods (e.g., land rents) because of productivity changes, but such price changes should be considered part of the overall gains from reforms (see also Johnson, et al. (2009) regarding PPP adjustments in cross-country growth studies). Note that we cannot use total factor productivity (TFP) due to lack of data at the state-industry level.

Data are available for all 50 US states and the District of Colombia, but following the literature, Delaware and South Dakota are dropped, as they allowed much more open financial systems early on in attempts to specialize in financial services. Altogether we have some 50,000 state-industry level observations. Table 5a shows that the average growth in value added is 2.4 percent, but with a large variation. Note that, as we observe some clear outliers in the raw data, we take out observations with growth rates that are higher or lower than three standard deviations.

## IV. EMPIRICAL ANALYSIS

### A. State-Industry Level Regressions and Industry Characteristics

Our analysis in this section shows positive effects on growth of the introduction of the basic employment protection, based on state-industry level regressions. We also run a simple state-level growth regression using OLS (report omitted). There, we find that the employment protection has insignificant effects on overall state growth, confirming the findings of the previous literature.

Since reforms happen at the state level, we still focus on their overall consequences, that is, their impact on aggregate, but now state-industry-level, growth. State-industry level regressions also allow us to detect the channels through which the enhancement of basic employment protection affects output growth, in particular for those industries requiring firm-specific human capital or social capital following our theory. By focusing on aggregate effects, we can be less concerned about reverse causality. And using only US state-industry-level data also overcomes some of the problems prevalent in cross-country studies, where results can be driven by hard-to-control-for various country characteristics and other factors.

For **H1**, the key issue is the coefficient $\beta$ of the interaction term between the state-level changes in employment protection (*WorkRight*) and the industry-level knowledge intensity (*KnowledgeDep*) in the following regression,

$$g_{j,s,t} = \alpha_{j,s} + \alpha_{s,j} + \beta WorkRight_{s,t-1} * KnowledgeDep_j + \epsilon_{j,s,t}. \quad (13)$$

Table 7, column 1 shows that the estimated coefficient $\beta$ of the interaction term in (13) is positive and statistically significant, as predicted. Hence, **H1** is confirmed, that is, the basic employment protection raises the growth of knowledge-intensive industries.

We use only the nonfinancial sectors in the regressions to avoid any direct effects of the financial reforms on the financial sector itself. Note that we include the state-industry fixed effects $\alpha_{s,j}$ to capture any state-specific industry growth trends, and state-year fixed effects $\alpha_{s,t}$ to control for other factors, such as state-specific business cycles and other policy changes. The use of these 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. We report robust *t*-statistics corrected for clustering at the state level.

In the benchmark regressions (13) to (17), we proxy the knowledge intensity by the intangible-asset-to-total-asset ratio. We use the public-policy-based employment protection in these benchmark regressions. The regressions with the other three employment protection

measures show similar results, though those with good-faith based protection were a bit weaker (report omitted). As for the bank branch deregulation, we use the M&A based one, often preceding the *de novo* based one, with which regression results mostly hold (report omitted).

The estimated coefficient $\beta$ is roughly about one and the mean of intangible-asset-to-fixed-asset ratio is about 0.6 with its standard deviation also about 0.6. Then, compared to the average-knowledge-requiring industry, firms belonging to the industry that requires knowledge one-standard-deviation above the average enjoy 0.6 percent higher growth annually after the basic employment protection is introduced in their states. Note that the base effect, without industry specific effect of the employment protection, is hidden in state-year fixed effects. However, it is zero according to the state-level regression, as discussed above. Although greater employment protection has little effect on overall state-level economic activity, it helps the growth of those industries that are more knowledge dependent. This also suggests that greater employment protection adversely affects low knowledge-intensive industries, which is consistent with majority of the literature.

Next, we look into the indirect effect of the bank branch deregulation (**H2**), by running the following regression,

$$g_{j,s,t} = \alpha_{j,s} + \alpha_{s,j} + \gamma FinLib_{s,t-1} * KnowledgeDep_j + \epsilon_{j,s,t}. \quad (14)$$

Recall that, according to our theory, less bargaining powers of banks can increase the relative bargaining powers of workers on ex post layoffs and wage-cut, and incentivize workers to invest in firm-specific human capital ex ante. Hence, we expect an increase in knowledge intensive industries (*KnowledgeDep*) after the bank branch deregulations (*FinLib*), which ended the bank monopoly in each town.

In line with this hypothesis **H2**, Table 7, column 2 shows that estimated coefficient $\gamma$ in (14) is significantly positive. The size is about the same as $\beta$ of (13), hence, the economic impact is similar, that is, firms in the industry requiring one-standard-deviation above the average knowledge grows about 0.6 percent higher after bank branch deregulations.

On the other hand, employment protection may directly influence external-finance-dependent industries. This view is in line with several papers discussed in the literature review. For example, external-finance dependency matters for de facto worker protection (Garmaise, 2008; Cronqvist, et al. 2009; Bae, Kang, and Wang, 2011). However, the following regression (15) with the interaction term of employment protection and external-finance dependency does not return significant coefficient estimate of $\delta$, dismissing a direct link between employment protection and external-finance dependency (Table 7, column 3),

$$g_{j,s,t} = \alpha_{j,s} + \alpha_{s,j} + \delta WorkRight_{s,t-1} * ExtFinDep_j + \epsilon_{j,s,t}. \quad (15)$$

One might suspect that the coefficient $\gamma$ in (14) may simply reflect the well-known mechanism that external-finance-dependent industries grow more with financial liberalization. Such effect should be captured by coefficient $\kappa$ on the interaction term of the following regression,

$$g_{j,s,t} = \alpha_{j,s} + \alpha_{s,j} + \kappa FinLib_{s,t-1} * ExtFinDep_j + \epsilon_{j,s,t}. \quad (16)$$

However, coefficient $\kappa$ turns out to be zero (Table 7, column 4). This is somewhat puzzling as the state-level-growth effect by the bank-branch deregulation is confirmed in the literature (Jayaratne and Strahan, 1996) and we did replicate the same positive result in the state-level regression (report omitted).

Mechanisms consistent with both results seem to be that either the bank-branch deregulation matters the same way for all the industries or that it positively affects some industries and negatively affects other industries, other than external-finance dependency. The latter possibility may stem from the fact that firms with more intangible assets face tighter financial constraints as predicted by less collateralizability of intangible assets. In this case, knowledge intensity and external-finance dependency should correlate with each other, and indeed also negatively as shown in Table 6c. Hence, we need to take care of both characteristics in one regression.

More generally, all of these four interaction terms in (13) to (16) above, may influence each other because the enhancement of basic employment protection and bank branch deregulations occurred contemporaneously.[23] This is our concern about the bias if we study labor protection and financial deregulation separately.

More importantly, our hypothesis **H3** states that both policy reforms should have significant growth effects on knowledge-intensive industries even correcting for each other. We, therefore, conduct the following benchmark regression, which include all the four interaction terms,

$$g_{j,s,t} = \alpha_{j,s} + \alpha_{s,j} + \beta WorkRight_{s,t-1} * KnowledgeDep_j + \gamma FinLib_{s,t-1} * KnowledgeDep_j + \delta WorkRight_{s,t-1} * ExtFinDep_j + \kappa FinLib_{s,t-1} * ExtFinDep_j + \epsilon_{j,s,t}. \quad (17)$$

Most important estimates of coefficients $\beta$ and $\gamma$ become somewhat smaller than (13) and (14), respectively, perhaps because of covariations among variables, but not much different from the one-by-one regression results, and they are still sizable (Table 7, column 5). This confirms our hypothesis **H3.**

Also, in line with our conjecture, the estimate of $\kappa$ for the interaction term between financial liberalization and external-finance dependency now turns positive from zero, about 0.2. Firms belonging to an industry with one-standard-deviation (about 2) higher external-finance dependency gains 0.4 percent higher growth rate on average after the bank branch deregulations. By the way, the estimate of $\delta$ remains zero.

Note that changes in employment protection have positive effects on knowledge-intensive industries, which are less external-finance dependent. Without controlling for this, the positive effect of contemporaneous bank-branch deregulation on the growth of external-finance-dependent industry is hidden and biased in (16). In this regard, our estimation strategy contrasts with many previous studies focusing only on either labor or financial reforms.[24]

---

[23] Moreover, knowledge intensity and external-finance dependency are correlated negatively.

[24] The bank deregulation literature has so far, explicitly or implicitly, focused on the effects of banks' ex-ante monopolistic behavior on credit allocations. A reduction in monopolistic rents then leads to more loans being extended and resources being better allocated among firms, resulting in higher economic growth. But this channel has no predictions on the interactions between financial liberalization and employment protection

## B. Robustness Checks

### *Alternative Knowledge Measures*

As our first robustness test, we use two alternative sectoral measures for knowledge intensity and re-estimate the specification with four interaction terms (17). The first one is the sales-to-fixed-asset ratio, the reciprocal of conventional capital intensity, calculated at the industry level (Table 8, column 1). This variable, however, may be a weaker measure of knowledge intensity as it is influenced by the intermediate and (unskilled) labor inputs relative to fixed asset. The second is the industry-specific fraction of college graduates (Table 8, column 2).

Using either measure, the key benchmark regression results hold. They confirm significantly positive $\beta$, that is, basic employment protection increases value added growth in knowledge intensive industries. As for the other interaction terms, the first alternative proxy brings the same results as in the benchmark, that is, significantly positive $\gamma$ and $\kappa$ but insignificant $\delta$. The second alternative proxy, however, bring a weaker result with insignificant $\gamma$, $\kappa$, and $\delta$.

### *R&D*

We also use a more narrowly defined knowledge proxy, that is, R&D-expenditure-to-sales ratio. This is based on another theoretical interpretation that the firm-specific investments are primarily about the patents and other secrets that are banned legally for transfer to other firms. Unlike our interpretation of firm-specific human capital more broadly, such as social capital in workplace, this R&D interpretation is only weakly consistent with our theory (**H4**), as discussed above.

The empirical result seems consistent with our conjecture. That is, when we use R&D-expenditure-to-sales ratio as a proxy for knowledge intensity, no coefficient is significant (Table 8, column 3). This confirms our hypothesis **H4**. Note, however, that it is also difficult to completely dismiss R&D interpretation of firm-specific investments because the data on R&D expenditure is noisy. It is almost zero for 41 out of 59 industries and the mean value is near zero, partly because it is often said to be defined loosely in accounting and also because R&D expenditure is not necessarily reported by firms.

Acharya, et al. (2014) show that the number of new patents increased due to the employment protection in their firm level study.[25] However, it shows only one side of the coin because the employment protection would potentially raise labor hoarding in unsuccessful firms. Hence, the overall efficiency gain is difficult to judge without looking at industry or macro-level impacts. Moreover, if the innovative knowledge is less patentable, but if it is still important and embodied in person, then the postemployment covenants not to compete (i.e., prohibiting former employees to work for rival firms right after quitting) is an important factor. This omitted variable is likely weakening the effects of R&D expenditure and, thereby, influencing the size of R&D expenditure. Indeed, Gilson (1999) discusses two cases, California versus

---

reforms. An exception is Perotti and Spier (1993) who argue that less powerful creditors may extend loans or agree to reschedule repayments so that workers can keep their wage or job. Another possibility is that job security was higher before the financial deregulation if less competitive banks kept inefficient firms afloat (e.g., zombie firms). In such a theory, however, with more inefficient firms, firm-specific human capital investments would decline with the financial deregulation and aggregate value-added would not grow faster.

[25] Acharya, et al. (2014) also show that the number of startup firms increased due to the employment protection.

Massachusetts, how the difference in postemployment covenants not to compete have affected the high-tech industry growth in two states.

Note that intangible assets used in our benchmark regressions include patents and other achievements as results of R&D activities and more general innovative efforts. In this sense, some effects captured by our benchmark regressions could be attributed to R&D and innovative activities. But, again, R&D-reliant industries do not show a clear increase in their growth after the introduction of the employment protection.

***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 already allowed interstate banking before 1993, especially at the borders. We, therefore, also run the benchmark regression with four interaction terms using data only up to 1990. This does not show any qualitative differences—with a bit stronger $\beta$, $\gamma$, and $\kappa$ but insignificant $\delta$—in effects of the employment protection reform and the financial deregulation on value added growth (regression results omitted).

***Reverse Causality and Endogenous Policy Changes***

Our results could be due to reverse causality if differences in growth prospects in industries with varying external-finance dependence or knowledge intensity bring changes in financial regulation or employment protection. For example, firms may exercise more political pressure towards financial deregulation in a state 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 these were the case, our regression results would have an upward bias and the wrong interpretation may follow.

One simple, but very rough, check for the reverse causality is to conduct state-industry level regressions excluding some states. We already excluded the states of Delaware and South Dakota as they had more liberalized financial systems for most of the period, maybe precisely because they had greater growth opportunities in financial services. We then also exclude the states of California and Massachusetts which arguably had the highest knowledge-intensive-industry growth over the sample period and, therefore, may have adopted greater employment protection. The regression results without these two states (report omitted) are, however, virtually the same as in Table 6.[26]

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.[27] Note that, using the first difference model

[26] Additionally, omitting the state of New York gives us similar results (report omitted). Another potential source of bias may be spillovers. We have focused on within-state and time-series variations, including using standard errors clustered at the state-level. In 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 lead to higher growth in the state itself, even though it did not yet adopt any policy changes. Policy spillovers may arise due to political pressures or learning effects, states mimicking 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.

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

means we cannot include any more state-year and state-industry fixed effects and, therefore, need to re-introduce the changes in employment protection and the financial deregulations as stand-alone regressors. However, taking differences makes it impossible to include industry characteristics (knowledge intensity and external-finance dependence) as stand-alone variables.[28]

Table 9 shows that the key results hold for all the relevant knowledge proxies, that is, intangible-to-fixed-asset ratio, sales-to-fixed-capital ratio, and now also for the college-graduate share.[29] That means, with any of those knowledge proxies, knowledge-intensive industries grow more with basic employment protection ($\beta>0$) and with bank-branch deregulation ($\gamma>0$). Hence, the robustness is confirmed. On the other hand, unlike the benchmark regressions, the effects of basic employment protection on external-finance-dependent industries become significantly positive ($\delta>0$). However, the benchmark results on the effects of financial liberalization on external-finance-dependent industries ($\kappa$) become somewhat weaker.

***Minimum Wage and Labor Union***

The US also have another form of labor protection, namely, minimum wages. A high minimum wage is likely to reduce employment, especially in low-skill industries (Partridge and Partridge, 1999). The union coverage (i.e., the portion of workforce that are covered by union collective bargaining) can be also seen as another measure of (de facto) employment protection. While unions in the US typically call for higher wages, they appear less effective in protecting employment (in part, as firms may migrate to other states). Indeed, states with stronger unions have relatively been losing jobs over time. In this sense, the union coverage is expected to have aggregate effects through artificially raising (promised) wage level, rather than protecting employment.

Still, in terms of wages, minimum wages or union coverage seem to assure quite a strong protection for specific sets of workers. Our simple theory then suggests that firms would simply default when facing financial distress and would not keep their promises to workers. Knowing that, workers have no incentive to invest in firm-specific human capital. Hence, we predict both the higher minimum wage and the greater union coverage should lower the growth of knowledge-intensive industries.

Minimum wages vary across US states and over time. The federal minimum wage is used as 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 obtained, from the US Department of Labor, each state's minimum wage for all of our sample years. We deflate the minimum wages by the national CPI and used the real values in the regressions. We use state-level annual data on the union coverage from Hirsh and MacPherson (2003) from 1983 onwards. While union coverage differs among industries, state-industry level data

[28] 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.

[29] 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 (columns 1, 3, and 5) but the *m2* test for the AR(2) specifications are fine (columns 2, 4, and 6). These results, however, need to be interpreted with caution as the Sargan tests generally reject as null that the over-identifying restrictions are valid (i.e., "goodness of fit" is low).

on union coverage are not available. In any case, such industry differences, with their slow movements over time, could be absorbed in the state-industry fixed effects in our regressions.

Figure 4 shows the evolution of the averages of the state-specific minimum wages (solid line) and the union coverages (dotted line). Both are on declining trends, although the minimum wages show a zigzag pattern in the 1970s, in part because corrections for inflation, which was high in that decade, may be imperfect. Correlations between these two variables and the exemption for wrongful discharges are reported in Table 6b. Union coverage is negatively correlated with the public policy-based employment protection index, about -0.5. However, the minimum wage is just slightly, positively correlated with the employment protection index.

We examine the effects of minimum wages and unions by using them in place of replacing the exemption for wrongful discharge in the benchmark regression. Note again that any other state-level policy changes are already absorbed in the state-year fixed effects and the state-industry trends in the state-industry fixed effects.

Table 10 shows the regression results replacing the *WorkRight* variable with either the minimum wage or the union coverage. The results are otherwise based on the benchmark specification, 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.

Table 10, column 1, confirms the robustness of the benchmark regression results of Table 7 for this specific period (1983–93), using the public-policy-based exemption for wrongful discharge. The result is essentially the same as before, although now shows even significantly a positive coefficient $\delta$ on the interaction term between the employment protection and the external-finance dependence.

Column 2 shows that more union coverage lowers the growth of knowledge-intensive industries, in line with our theoretical prediction for too strong labor protection. The union coverage also reduces growth of external-finance dependent industries. This is difficult to explain based on our theory. However, both results are consistent with broader literature that shows negative effects of rigid labor protection. In terms of bank-branch deregulation, the effects are still positive as in the benchmark regression, for both external-finance-dependent industries and knowledge-intensive industries.

Column 3 shows the regression results using minimum wages as the *WorkRight* variable. Because the data for minimum wages are available from 1972, column 4 reports essentially the same regression but based on both the shorter sample period (1983–93) and the longer period (1972–93) as in the benchmark regression. The results are almost the same as column 2, the union-coverage case, showing detrimental effects on knowledge-intensive industries, with somewhat weaker results based on the longer sample period.

## V. CONCLUSION

We develop a simple theory to explain why a state guarantee on basic employment protection may improve economy-wide welfare. Without it, a firm is unlikely to be able to honor its promised wage ex post when in financial distress and perhaps even when in a good business

environment. Knowing that, workers do not have incentives to invest in firm-specific human capital. This is a time-inconsistency problem. However, given the possibility of bankruptcy, the state is not able to force firms to keep employment in any circumstances.

However, by introducing an appropriate, basic level of employment protection, the state can tilt the bargaining power of workers in renegotiation of contract terms with a firm. When such a state support can mitigate wage-cut or the number of layoffs somewhat ex post, workers are given good enough incentives to invest in firm-specific human capital ex ante. A firm would also choose to keep operating even in a bad business environment, because it can make profits thanks to workers' investments and renegotiated labor costs. This equilibrium is efficient from both ex ante and ex post viewpoints.

Our theory also shows the other extreme. A strong protection of workers for active firms is detrimental to the economic productivity in our model. This is because firms would choose bankruptcy ex post during financial distress due to the lack of a renegotiation opportunity of lowering labor costs.

This theory works through firm-specific human capital investments, which we would like to interpret as social capital, often important in white-collar offices. We, therefore, conjecture that basic employment protection is likely beneficial for knowledge-intensive industries but not for less-knowledge-intensive industries. We confirm this using quasi-natural experiments in the US regarding labor and financial market reforms over the period from 1972 to 1993.

Our finding is somewhat different from the generally little effects found by establishments of exemptions from wrongful discharges on job creation in the US, although in line with positive effects found on R&D activities. However, in our empirical investigations, R&D-intensive industries grow less clearly with the introduction of the employment protection. This suggests that firm-specific human capital, in our theory, is something broader than innovative activities.

Our finding also differs from the broader empirical literature on labor protection, since that has found perverse effects, in particular for continental Europe and Japan. The difference, we believe, stems from our focus on basic employment protection, rather than rigid protections that literature often study. Indeed, our empirical analysis in the robustness section also shows negative effects on knowledge intensive industries by rigid labor protection, that is, minimum wages and labor union coverages.

Moreover, we also find a corroborative evidence specific to our theory on relative bargaining powers between workers and creditors. That is, the growth of knowledge-intensive industries follows weakened bank monopoly powers after bank-branch deregulations. According to our theory, the balance between these workers' and creditors' bargaining powers affect corporate decisions jointly, especially when a firm is in financial distress and faces the need for labor and loan restructuring. Our analysis, in this regard, contrasts to much of the previous research, which usually study the effects of labor protection and financial liberalization separately from each other.

**Figure 2a. Adoption of Employment Protection**
**(Number of states with employment protection)**

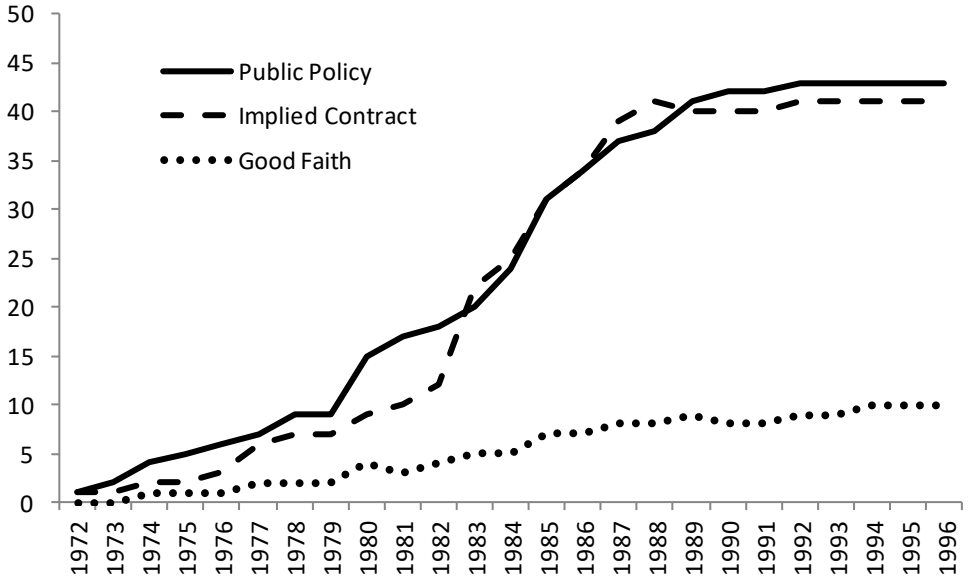



**Figure 2b. Adoption of Financial Deregulation**
**(Number of states deregulating)**

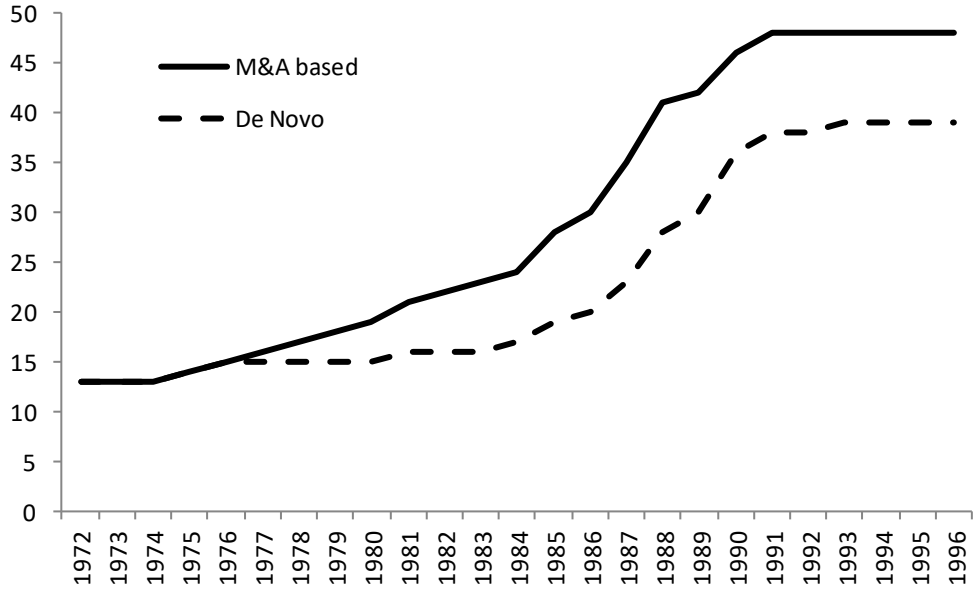
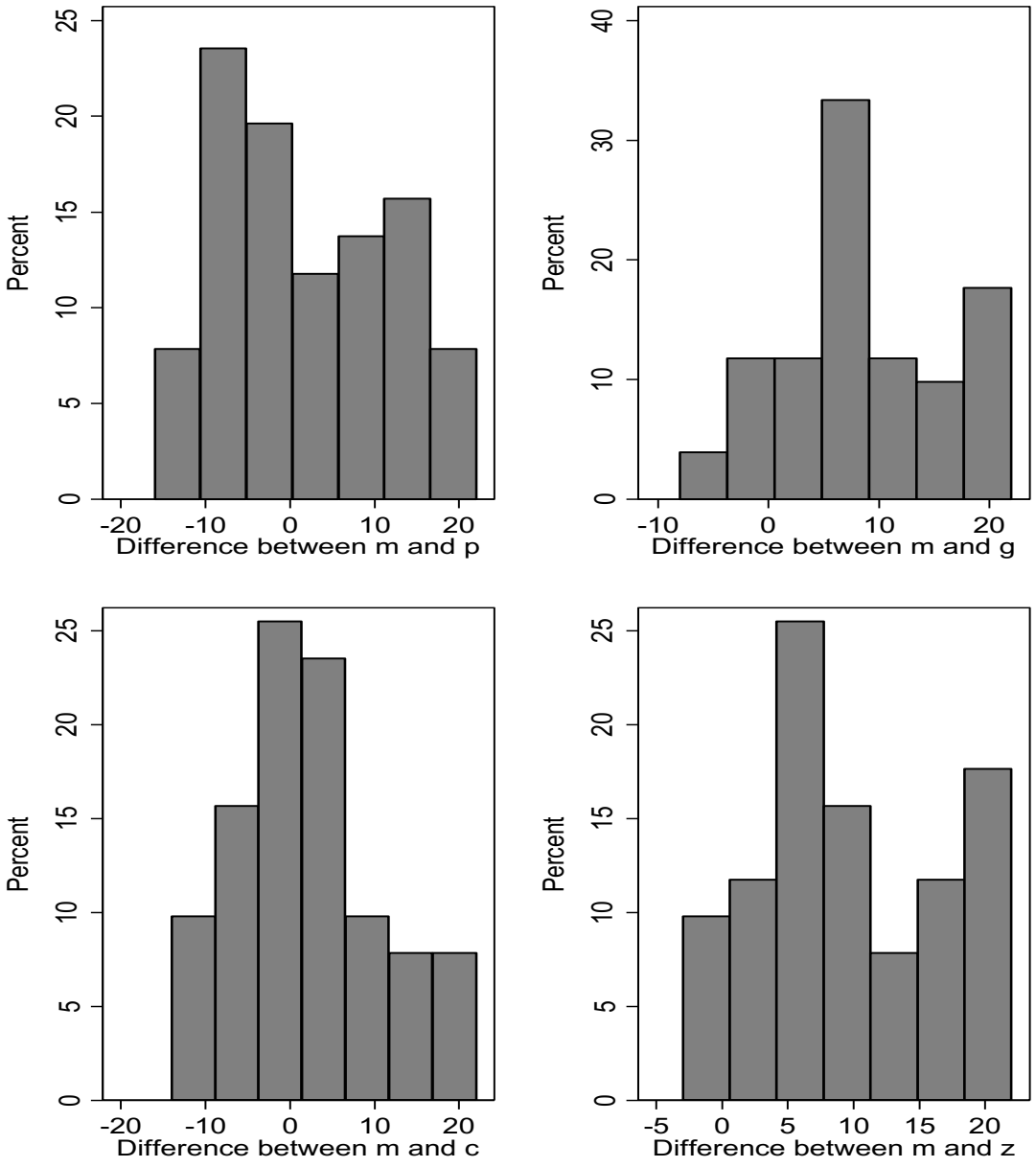
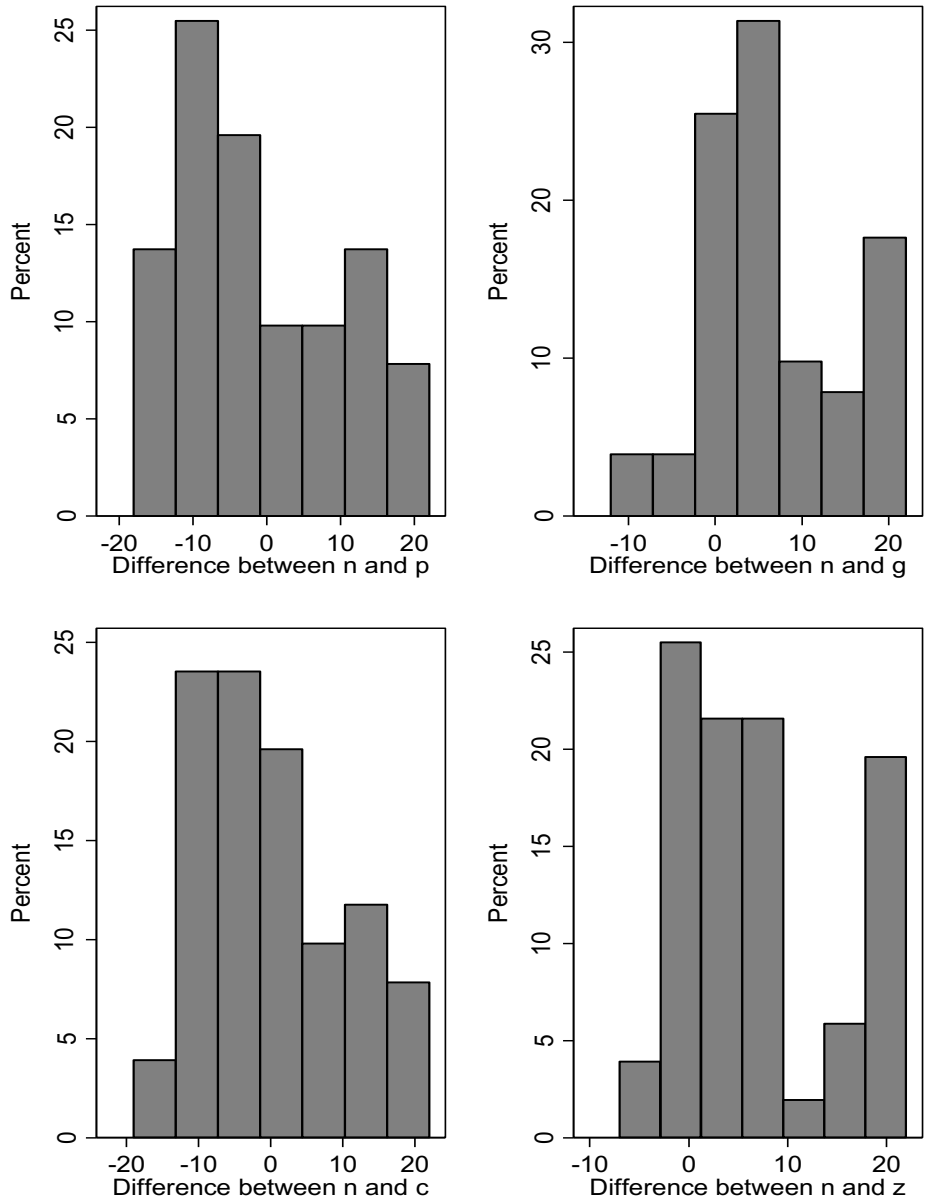


**Figure 3a: Pattern of Adoption of Employment Protection and Financial Deregulation**




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

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




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

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

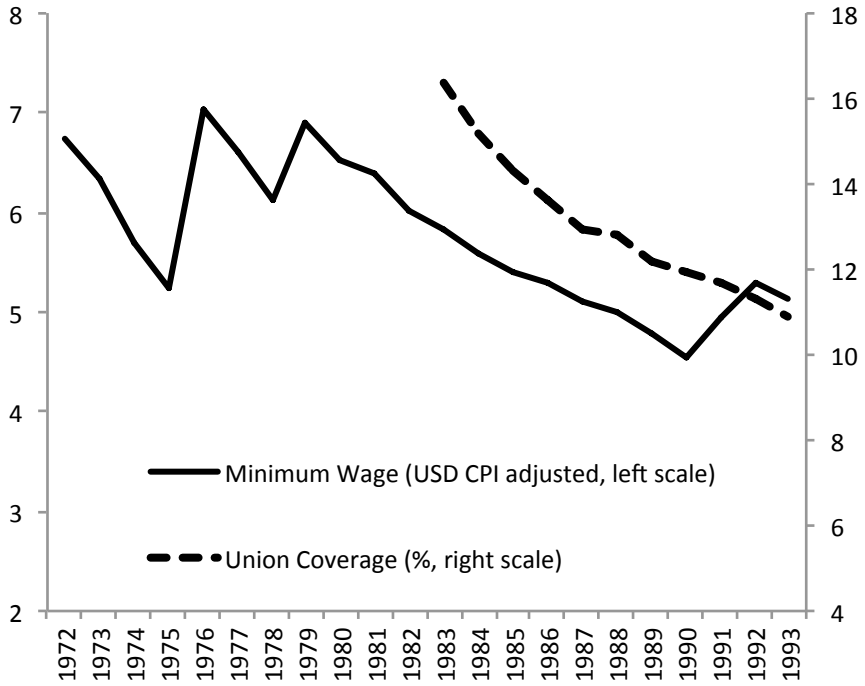


**Table 6a: Key Descriptive Statistics of Variables**

| | Observation | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| State-Year Institutional Changes | | | | | |
| Employment Protection | | | | | |
| (Exception for Wrongful Discharges) | | | | | |
| Public Policy | 990 | 0.448 | 0.498 | 0.000 | 1.000 |
| Good Faith | 990 | 0.071 | 0.256 | 0.000 | 1.000 |
| Contract | 990 | 0.407 | 0.492 | 0.000 | 1.000 |
| Earliest | 990 | 0.541 | 0.499 | 0.000 | 1.000 |
| Other Labor Protection | | | | | |
| Union Coverage Rate (%) | 1012 | 5.749 | 0.781 | 4.415 | 9.267 |
| Minimum Wage Level, Real | 506 | 13.022 | 5.458 | 3.700 | 28.000 |
| Financial Deregulation (Bank Branch Deregulation) | | | | | |
| M&A | 1012 | 0.494 | 0.500 | 0.000 | 1.000 |
| de novo | 1012 | 0.366 | 0.482 | 0.000 | 1.000 |
| Industry Characteristics | | | | | |
| Knowledge Dependency | | | | | |
| Intangible / Fixed Assets Rate | 59 | 0.621 | 0.604 | 0.004 | 2.870 |
| Sales / Fixed Assets Ratio | 59 | 6.004 | 5.702 | 0.333 | 27.842 |
| Schooling (Fraction of College Grad in 1940) | 49 | 0.139 | 0.076 | 0.017 | 0.352 |
| Schooling (Fraction of College Grad in 2005) | 49 | 0.440 | 0.177 | 0.186 | 0.831 |
| R&D / Sales Ratio | 59 | 0.006 | 0.018 | 0.000 | 0.075 |
| External Finance Dependence | 59 | -0.492 | 2.008 | -12.242 | 3.194 |
| Real Value Added Growth | | | | | |
| State-Year Growth Rate | 1012 | 2.479 | 4.880 | -34.920 | 35.442 |
| State-Inudstry-Year Growth Rate | 54706 | 2.432 | 19.668 | -310.228 | 380.759 |
| *(after taking out 3 standard-deviation outliers)* | *46945* | *1.770* | *13.066* | *-53.574* | *53.511* |

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 standard-deviation outliers.

**Table 6b: Correlations among State-Year Level Institutional Changes**

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

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 6c: Correlations among Industry-Level Characteristics**

| | Intangible Assets to Fixed Assets | Sales to Fixed Assets | Fraction of College Grad in 1940 | Fraction of College Grad in 2005 | R&D Expenditure over Sales | External Financial Dependence |
|---|---|---|---|---|---|---|
| Intangible / Fixed Assets Ratio | 1.000<br>*59* | | | | | |
| Sales / Fixed Assets Ratio | 0.708<br>*59* | 1.000<br>*59* | | | | |
| Schooling (Fraction of College Grad in 1940) | 0.381<br>*49* | 0.271<br>*49* | 1.000<br>*49* | | | |
| Schooling (Fraction of College Grad in 2005) | 0.544<br>*49* | 0.382<br>*49* | 0.715<br>*49* | 1.000<br>*49* | | |
| R&D / Sales Ratio | 0.132<br>*59* | 0.099<br>*59* | 0.235<br>*49* | 0.081<br>*49* | 1.000<br>*59* | |
| External Finance Dependence | -0.436<br>*59* | -0.524<br>*59* | -0.046<br>*49* | -0.120<br>*49* | 0.185<br>*59* | 1.000<br>*59* |

Note: Italics numbers show the observation numbers.

**Table 7: 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). WorkRight is a binary variable, taking the value of one in each state if public policy related exceptions for wrongful discharges is established. Knowledge is the industry average use of intangible assets relative to fixed assets. 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. 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:* | *Intangible / Fixed Assets* | | | | |
|---|---|---|---|---|---|
| | [1] | [2] | [3] | [4] | [5] |
| WorkRight*Knowledge | 1.212 | | | | 0.963 |
| | [5.416]*** | | | | [4.131]*** |
| FinLib*Knowledge | | 1.332 | | | 1.235 |
| | | [5.591]*** | | | [4.465]*** |
| WorkRight*ExtFinDep | | | -0.010 | | 0.072 |
| | | | [-0.195] | | [1.299] |
| FinLib*ExtFinDep | | | | 0.042 | 0.193 |
| | | | | [0.685] | [2.900]*** |
| N | 49204 | 50067 | 49204 | 50067 | 49204 |
| R-squared | 0.176 | 0.176 | 0.175 | 0.175 | 0.176 |

**Table 8:State-Industry Level Regressions with Alternative Definitions of Knowledge-intensity (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). WorkRight is a binary variable, taking the value of one in each state if public policy related exceptions for wrongful discharges is established. Knowledge is sales to fixed asset ratio, or employment share of college graduates. 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. 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:* | *Sales / Fixed Assets* | *College Grad Share* | *R&D / Sales* |
|---|---|---|---|
| | [1] | [2] | [3] |
| WorkRight*Knowledge | 0.089 | 2.753 | -10.371 |
| | [3.052]*** | [2.525]** | [-1.173] |
| FinLib*Knowledge | 0.126 | 1.816 | 13.059 |
| | [3.933]*** | [1.500] | [1.283] |
| WorkRight*ExtFinDep | 0.095 | -0.032 | -0.015 |
| | [1.334] | [-0.578] | [-0.242] |
| FinLib*ExtFinDep | 0.236 | 0.050 | 0.035 |
| | [2.599]*** | [0.734] | [0.506] |
| N | 49204 | 42484 | 49204 |
| R-squared | 0.176 | 0.177 | 0.176 |

## Table 9: 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). WorkRight is a binary variable, taking the value of one in each state if public policy related 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. 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. 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(2)* | *AR(1)* | *AR(2)* | *AR(1)* | *AR(2)* |
| | [1] | [2] | [4] | [5] | [7] | [8] |
| WorkRight | -0.092 | -0.374 | 0.136 | -0.120 | -1.878 | -1.946 |
| | [-0.406] | [-1.597] | [0.606] | [-0.525] | [-5.705]*** | [-5.697]*** |
| FinLib | -0.092 | -0.063 | 0.237 | 0.250 | -2.099 | -1.865 |
| | [-0.436] | [-0.286] | [1.133] | [1.144] | [-6.956]*** | [-5.950]*** |
| WorkRight*FinLib | 0.562 | 0.495 | 0.578 | 0.495 | 0.482 | 0.451 |
| | [2.273]** | [1.943]* | [2.329]** | [1.939]* | [1.896]* | [1.721]* |
| **WorkRight*Knowledge** | 1.213 | 1.236 | 0.090 | 0.090 | 8.016 | 8.180 |
| | [5.706]*** | [5.737]*** | [3.769]*** | [3.677]*** | [8.997]*** | [8.824]*** |
| **FinLib*Knowledge** | 1.436 | 1.217 | 0.095 | 0.075 | 9.138 | 8.636 |
| | [6.842]*** | [5.683]*** | [4.237]*** | [3.281]*** | [10.819]*** | [9.796]*** |
| **WorkRight*ExtFinDep** | 0.145 | 0.144 | 0.146 | 0.140 | 0.075 | 0.078 |
| | [2.636]*** | [2.587]*** | [2.659]*** | [2.503]** | [1.993]** | [2.018]** |
| **FinLib*ExtFinDep** | 0.090 | 0.087 | 0.080 | 0.069 | 0.005 | 0.019 |
| | [1.726]* | [1.657]* | [1.539] | [1.311] | [0.136] | [0.505] |
| N | 45958 | 42967 | 45958 | 42967 | 39705 | 37133 |
| N Groups | 2428 | 2417 | 2428 | 2417 | 2096 | 2086 |
| Sargan (p-value) | 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 |
| m2 (p-value) | 0.044 | 0.103 | 0.052 | 0.069 | 0.049 | 0.098 |

**Table 10: 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). WorkRight is a binary variable, taking the value of one in each state if public policy related 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. 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. 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] |
| | (1983-1993 data) | (1983-1993 data) | (1983-1993 data) | *(1972-1993 data)* |
| WorkRight*Knowledge | 0.897 | -0.171 | -1.649 | *-0.013* |
| | [2.004]** | [-2.963]*** | [-4.997]*** | *[-0.098]* |
| FinLib*Knowledge | 0.898 | 0.682 | 0.212 | *1.682* |
| | [2.592]*** | [1.679]* | [0.535] | *[5.710]**** |
| WorkRight*ExtFinDep | 0.445 | -0.043 | -0.315 | *-0.048* |
| | [4.061]*** | [-2.517]** | [-3.792]*** | *[-1.860]** |
| FinLib*ExtFinDep | 0.283 | 0.280 | 0.216 | *0.176* |
| | [2.600]*** | [2.217]** | [1.948]* | *[2.622]**** |
| N | 23536 | 23957 | 23957 | *50067* |
| R-squared | 0.212 | 0.211 | 0.211 | *0.176* |

## 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, 270–82.

Acharya, Viral V., Yakov Amihud, and Lubomir P. Litov, 2011, "Creditor Rights and Corporate Risk-Taking," *Journal of Financial Economics,* Vol. 102, No. 1, 150–66.

Acharya, Viral V., Ramin P. Baghai, and Krishnamurthy V. Subramanian, 2014, "Wrongful Discharge Laws and Innovation," *Review of Financial Studies,* Vol. 27, No. 1, 301–46.

Acharya, Viral V., Jean Imbs, and Jason Sturgess, 2011, "Finance and Efficiency: Do Bank Regulations Matter?" *Review of Finance,* Vol. 15, No. 1, 135–72.

Allen, Franklin, 2005, "Corporate Governance in Emerging Economies," *Oxford Review of Economic Policy,* Vol. 21, No. 2, 164–77.

Allen, Franklin, and Douglas Gale, 2004, "Competition and Financial Stability," *Journal of Money, Credit, and Banking,* Vol. 36, No. 3, 453–80.

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, 341–74.

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, 211–31.

Autor, David H., William R. Kerr, and Adriana D. Kugler, 2007, "Do Employment Protections Reduce Productivity? Evidence from US 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, 130–53.

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, 215–38.

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, Bernard S., Hasung Jang, and Woochan Kim, 2006, "Predicting Firms' Corporate Governance Choices: Evidence from Korea," *Journal of Corporate Finance,* Vol. 12. 660–91.

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, 814–31.

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, 115–43.

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, 1339–82.

Boyd, John H., and Gianni De Nicolo, 2005, "The Theory of Bank Risk Taking and Competition Revisited," *Journal of Finance,* Vol. 60, No. 3, 1329–43.

Buera, Francisco J., and Joseph P. Kaboski, 2012, "The Rise of the Service Economy," *American Economic Review,* Vol. 102, No. 6, 2540–69.

Caballero, Ricardo J., and Mohamad L. Hammour, 1998, "The Macroeconomics of Specificity," *Journal of Political Economy*, Vol. 106, No. 4, 724–67.

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,* Vol. 61, 117–63.

Claessens, Stijn, Kenichi Ueda, and Yishay Yafeh, 2014, "Institutions and Financial Frictions: Estimating with Structural Restrictions on Firm Value and Investment," *Journal of Development Economics*, Vol. 110, 107–22.

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, 309–39.

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.

Falato, Antonio, and Nellie Liang, 2016, "Do Creditor Rights Increase Employment Risk? Evidence from Loan Covenants," *Journal of Finance*, Vol. 71, No. 6, 2545–90.

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, 543–77.

Getler, Martin, 2009, "The Dark Side of Shareholder Influence: Managerial Autonomy and Stakeholder Orientation in Comparative Corporate Governance," *Harvard International Law Journal*, Vol. 50, No. 1, Winter.

———, Igor Livshits, and Césaire Meh, 2008, "Uncertainty and the Specificity of Human Capital," *Journal of Economic Theo*ry, Vol. 143, 469–98.

Gilson, Ronald J., 1999, "The Legal Infrastructure of High Technology Industrial Districts: Silicon Valley, Route 128, and Covenants Not to Compete," *New York University Law Review,* Vol. 74, No. 3, 575–629.

Hart, Oliver, 1995, *Firms, Contracts, and Financial Structure* (Oxford: Oxford University 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, 915–38.

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.

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, 367–82.

Kerr, William R., and Ramana Nanda, 2009, "Democratizing Entry: Banking Deregulations, Financing Constraints, and Entrepreneurship," *Journal of Financial Economics*, Vol. 94, 124–49.

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, 1131–50.

———, 1998," Law and Finance," *Journal of Political Economy,* Vol. 106, No. 6, 1113–55.

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.

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, 1005-30.

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, 1131–41.

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

Roe, Mark J., 1994, *Strong Managers, Weak Owners: The Political Roots of American Corporate Finance* (Princeton: Princeton University Press).

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

———, 2002, "Employment Protection, International Specialization, and Innovation," *European Economic Review*, Vol. 46, No. 2, 375–95.

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 (Washington: World Bank).

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, 801–28.

Strahan, Philip E., 2003, "The Real Effects of US Banking Deregulation," *Federal Reserve Bank of St. Louis Review*, Vol. 85, 111–28.

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: International Monetary Fund).

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

Townsend, Robert M., and Kenichi Ueda, 2010, "Welfare Gains from Financial Liberalization," *International Economic Review*, Vol. 51, No. 3, 553–97.

Ueda, Kenichi, 2013, "Banks as Coordinators of Economic Growth: Microfoundation for Macroeconomy with Externality," *Journal of Economic Theory*, Vol. 148, No. 1, 322–52.

———, 2017, "Costly State Verification and Negotiation: Debt Restructuring and Worker Layoff," mimeo, the University of Tokyo.