Wage-Setting Institutions and Corporate Governance*

Matthew Dimick† Neel Rao‡

January 4, 2016

Abstract

We present a model in which wage-setting structures explain cross-country variation in corporate governance. The model predicts a nonmonotonic relationship between the level of centralization in wage-bargaining institutions and the levels of firm ownership concentration and investor protection legislation. Low and high degrees of centralization yield less concentrated ownership and more investor protection than intermediate degrees. Like recent research, this paper highlights labor as a key constituent in shaping corporate governance. However, our theory can resolve an important puzzle this research confronts, namely, why Scandinavian countries with higher than average labor strength also have higher than average investor protection legislation.

Keywords: corporate governance, bargaining centralization, wage-setting institutions, legal origin, labor movements
JEL codes: G34, K22, K42

*Versions of this paper were presented at the 2014 annual meetings of the American Law and Economics Association and the Society for the Advancement of Socio-Economics. We would like to thank Kenneth Kim, Marco Pagano, Mark Roe, Holger Spamann, and two anonymous referees for insightful questions and comments.

†SUNY Buffalo Law School, 618 John Lord O'Brian Hall, Buffalo, NY 14260-1100. Email: `mdimick@buffalo.edu`. Phone: 716-645-7968.

‡Corresponding Author: University at Buffalo, SUNY, Department of Economics, 423 Fronczak Hall, Buffalo, NY 14260-1100. Email: `neelrao@buffalo.edu`. Phone: 716-645-8674.

1 Introduction

Why do corporate governance law and practice differ across countries? In this paper, we propose a new answer to this question. Our proposal highlights differences in wage-setting structures across countries. The key insight that emerges from our analysis is that there is a nonmonotonic relationship between wage-setting structures and the levels of corporate ownership concentration and investor protection legislation.

The argument runs briefly as follows. The causal thread moves through three steps: from bargaining structures to firm profits, from firm profits to ownership concentration, and then from ownership concentration to investor protection.

First, wage-setting institutions exert a nonmonotonic effect on firms' profits. At low levels of bargaining centralization, unions cannot coordinate their bargaining strategies, which keeps wages relatively low and profits high. At intermediate levels, unions coordinate and adjust wages to extract more rent from firms, which further reduces firms' profits. However, at very high levels of centralization, union coordination and wage compression favor high-productivity firms and penalize low-productivity firms, thereby increasing firms' profits on average.

Second, the level of profits influences the degree of ownership concentration. Lower profits make reorganization relatively more attractive to a controlling shareholder, who unlike outside shareholders, is uniquely positioned to capitalize on these opportunities. To do this, a dominant shareholder will increase its ownership stake when profits are lower.

Third, firms' ownership structures influence the level of investor protection. When there are outside investors, a controlling shareholder has an incentive to divert value from the firm for personal gain. Moreover, this incentive is largest for firms with dispersed ownership structures because a controlling shareholder with a relatively small stake bears a smaller share of the costs of diverting shareholder value.[1] Investor protection rules are therefore

[1] A further reason that concentrated ownership could reduce the incentive to steal from a firm is organizational damage caused by financial diversion. Because of such behavior, a corporation might suffer from a reputation for mismanagement or the misallocation of personnel. As the controller acquires an increasingly

most valuable to firms with dispersed ownership structures. Consequently, a social planner seeking to maximize the value of the firm will favor stronger investor protection laws when ownership is less concentrated.

Thus, as the centralization of wage-setting institutions rises, ownership concentration at first increases, but then decreases, while investor protections at first decrease, and then increase.

Two groups of explanations dominate the literature on the sources of differences in corporate governance and investor protection across countries. The first—the "legal-origin" hypothesis—suggests that cross-country differences in investor protection can be explained by each country's distinct and historically given legal system (La Porta et al., 1997, 1998, 2000). In particular, the legal-origin authors classify legal systems into four different types: the English-common-law system and the French-, German-, and Scandinavian-civil-law traditions. Their results show that "common-law countries generally have the strongest, and French-civil-law countries the weakest, legal protections of investors, with German- and Scandinavian-civil-law countries located in the middle" (La Porta et al., 1998, 1113).

While our argument is related, importantly, to this cross-country variation identified by the legal-origin authors, the shortcomings of the legal-origin hypothesis are by now well recognized. Among other reasons, there is a lack of a convincing causal mechanism: it is not clear exactly how broad legal traditions actually determine the content of corporate law and the level of investor protections (Pagano and Volpin, 2005a, 1006). Furthermore, the legal-origin argument disappoints as a predictive matter: a country's inherited legal system does not always account for actual change of investor-protective laws in the contemporary world (Pagano and Volpin, 2005a; Roe, 2006). Indeed, there is evidence that at different periods of history, civil-law countries have offered greater protection to investors than common-law countries (Rajan and Zingales, 2003).

The second main explanation for cross-country differences in corporate governance is a

large ownership stake in the firm, it also bears a greater share of this degradation cost, which discourages it from stealing.

story about politics, where the interests of employees feature prominently as an important determinant (Gourevitch and Shinn, 2005; Pagano and Volpin, 2005a; Perotti and von Thadden, 2006; Roe, 2000, 2003). Given the distinctive interests of managers, shareholders, and employees, the political process serves as a crucial mediating factor that transforms these divergent interests into law and policy. Various versions of this theory exist. One argument emphasizes the level of employment protection legislation and its impact on corporate governance and the demand for investor protection (Pagano and Volpin, 2005a). In another account, Perotti and von Thadden (2006) argue that when the median voter has low financial wealth but non-diversified human capital and risky labor rents, he or she will lend political support to low-risk financial institutions (e.g., banks rather than equity markets). More generally, the impact of social democratic politics is seen as injecting the interests of employees at the firm level, in ways that compound already existing conflicts between shareholders and managers (Roe, 2000).[2]

While agreeing with the emphasis on labor interests, our approach differs from the previous contributions to the politics of corporate governance in several important ways. To put the matter somewhat crudely, other arguments relating employee interests to investor protection are essentially dichotomous or linear: as labor interests become stronger, the level of investor protection or the quality of corporate governance will decrease. However, as we discuss more fully below, while Nordic countries have the highest rates of union membership and the most successful labor parties, they also have relatively high levels of investor protection. In other words, Nordic countries offer better legal protection to investors than some countries with weaker labor movements. This poses a puzzle for the labor politics approach. If strong labor interests are so bad for corporate governance, why is corporate governance so good in Nordic countries?

By good corporate governance, we do not necessarily mean diffuse ownership structures. For example, good corporate governance may prevent a large blockholder from extracting

[2]One concrete manifestation of employee voice analyzed by Roe and others is codetermination, which is the inclusion of labor representatives on the (supervisory) board of directors (Pistor, 1999; Roe, 2000).

private benefits, making concentrated ownership more attractive to small shareholders. Instead, we define good corporate governance as a high level of protection enjoyed by investors and the relative lack of private benefits of control exerted against minority shareholders. The empirical evidence regarding investor protection and ownership concentration in Nordic countries is discussed further in Section 2. Scandinavian countries exhibit comparatively low ownership concentration and strong investor protection despite a high level of bargaining centralization. This pattern motivates our analysis. We argue that wage-bargaining structure has a nonlinear effect on ownership concentration and investor protection. Our model can thereby account for this puzzle.

In addition, the role of wage-setting structures has been, so far as we are aware, entirely overlooked in corporate governance research. This is somewhat surprising, given the great deal of attention that both the political economy and political science literatures have given to this institutional variable. For both disciplines, the level of wage-bargaining centralization has important implications for the political economy of inflation, unemployment, and central bank independence (see, e.g., Cukierman and Lippi, 1999; Hall and Franzese, 1998; Iversen, 1998). Indeed, the "hump-shaped" expectation of the relationship between wage-bargaining centralization and unemployment that this literature has investigated is an important inspiration for the theory we advance in this paper (Calmfors and Driffill, 1988). The level of bargaining centralization is also a critical variable in the political science literature on the political economy of inequality and income distribution (Wallerstein, 1999; Pontusson, Rueda, and Way, 2002). Finally, a more recent line of economic research has examined the role of wage-bargaining structure on firms' incentives to innovate (Haucap and Wey, 2004).

Despite the limitations of existing work on comparative corporate law and governance, this paper complements previous research. With respect to the legal-origin hypothesis, our argument could be viewed as proposing an entirely independent explanation for variation in the quality of corporate law across countries. However, it is also possible that there could be some causal relationship between a country's legal origin and its prevailing (and history-dependent) structure of wage bargaining.[3] In this case, one can interpret our argument as supplying (at least part of) the missing causal thread in the legal-origin argument. As for the labor and politics line of research, our emphasis on wage-bargaining structure neither detracts from nor contradicts the existing literature. For instance, we have no reason to think that employment protection legislation and codetermination do not have the effects previous papers attribute to them. Rather, our goal in this paper is to highlight the effect of another important, but overlooked, labor institution, as well as to address more completely some of the paradoxes that arise from an investigation of the effects of labor interests on corporate governance and investor protection laws.

The remainder of the paper is sequenced as follows. In order to further motivate the theory we present, Section 2 provides a brief overview of the empirical evidence on corporate governance, ownership concentration, and structures of wage bargaining. Section 3 describes the model and timing of events. Section 4 solves the model, states the main results, and discusses the implications of these findings. Section 5 presents a regression analysis so as to assess the significance and robustness of the patterns observed in the data and predicted by the model. Section 6 concludes.

2 Empirical Background

A brief overview of the existing data motivates our focus on wage-bargaining institutions and underscores the paradox we introduced earlier between the strength of labor and the quality of corporate governance.

The literature on the political economy of labor and corporate governance tends to presume a simple linear or dichotomous relationship between the strength of labor interests and the quality of corporate governance, firm performance, or equity-based financing. For

[3]Legal origin could influence bargaining structure through several possible channels. For instance, an arguably important distinction between the common law and the civil law is that the former prioritizes property protection and contracting rights over the interests of the state, while the latter does the opposite (Beck et al., 2003). Perhaps, common law rules of free contract are inimicable to more centralized bargaining structures. Conversely, centralized bargaining could also reflect the redistributive goals of state officials in civil law countries.

instance, Pagano and Volpin (2005a) hypothesize and find empirical support for a negative, linear relationship between employee and shareholder protection legislation. Similarly, Pagano and Volpin (2005b) propose a model showing that when management has high private benefits and a small equity stake, "managers and workers are natural allies against takeover threats." In the model of Perotti and von Thadden (2006), when the median voter has labor rents from non-diversified human capital, he or she will oppose more risky, equity-based forms of financing. Empirically, Atanassov and Kim (2009) find evidence for the claims that "strong union laws protect not only workers but also underperforming managers" and that "[w]eak investor protection combined with strong union laws are conducive to worker-management alliances" that worsen corporate performance. Finally, Roe (2000) argues that in general "[s]ocial democracies weaken the ties between managers and dispersed shareholders" and exacerbate agency costs.

Even if true at an aggregate level, the view that labor interests are always hostile to shareholder interests encounters the paradox we identified previously: why do Nordic countries, with stronger than average labor movements, have better than average investor protections? Responding to the claim that labor interests and the social democratic parties they support will undermine the financial performance of firms, Högfeldt (2007, 552) observes that this claim "does not fit the history and politics of corporate ownership in Sweden, perhaps the quintessential Social Democratic society, very well." Likewise, Gourevitch and Shinn (2005, 140–41) observe that Sweden "fits many images of labor power in a democratic market economy," but that "private benefits of control extracted by blockholders at the expense of minority shareholders appear to be limited."

Roe (2000, 570–73) also mentions this puzzle, pointing out that Sweden "has been for quite some time the paradigm of the [labor-supported] social welfare state . . . ," but also that "by conventional measures, Swedish institutions protect minority stockholders well." According to Roe, labor insiders (via unions or codetermination) may make strong claims on the firm's cash flow, leading shareholders to concentrate ownership as a way to counterbalance power, *even if* the level of investor protection is high. Roe makes this argument specifically in his discussion of Sweden.

In our empirical analysis, Scandinavian countries display high bargaining centralization and strong investor protection. Nonetheless, ownership concentration in Nordic countries is seen to be lower than is typical for continental Europe. Therefore, the paradox we study involves comparatively diffuse ownership, good corporate governance, and centralized wage setting. Our model contributes to existing labor theories by providing a natural explanation for these three facts.

Note that the prior literature on labor politics can be reconciled with the observed patterns of investor protection and ownership structure in Scandinavian countries. Labor theories would predict that high labor power causes investors to consolidate ownership, resulting in a high prevalence of controlling shareholders. Nevertheless, corporate governance might be strong in Scandinavian nations for historical or political reasons.[4] Hence, small investors may be willing to hold stock, in which case the ownership structure is partly diffuse because a portion of equity is widely distributed. While the evidence does not contradict this argument, our model offers a more compendious explanation. We present a single narrative that relates wage bargaining structures to firm profits, which in turn influence corporate ownership and governance. Our framework applies not only to Nordic countries, but also to a wide range of nations with disparate legal origins.

To illustrate the puzzle in more detail, Tables 1 and 2 report several measures related to labor politics and corporate governance, respectively. Countries are grouped by their legal origin to facilitate comparison with previous research. The labor indicators in Table 1 include measures of wage-bargaining centralization, union density, and political partisanship. Bargaining centralization is defined as the level at which bargaining over employees' earnings primarily occurs in a given country. For example, in increasing order of centralization, wage

[4] Another possibility is that powerful labor unions encourage the adoption of strong corporate governance regimes. The extraction of value from a firm reduces the resources available to employ workers or pay wages. Hence, organized labor has an interest in monitoring or regulating the controller so as to prevent the diversion of funds from the corporation.

bargaining could take place between an individual employee and employer, between a labor union and an employer at the workplace or firm level, or between a union and an employers' association at the industry or national level. Higher values represent greater centralization. We report measures from both Iversen (1998) and Traxler et al. (2001) because Kenworthy (2001, 70) makes an extended argument for why these two "are the best existing bargaining centralization measures" among the many measures that are available.[5] Union density, employees who are union members as a proportion of wage and salary earners, is a key measure of the "strength" of a country's labor movement. The partisanship variable is an index standardized to range between 0 and 1 and reflects the partisan "center of gravity" of the government's cabinet. A lower value represents a more left-leaning government.

For all labor indicators, countries with a Scandinavian-civil-law legal origin are clearly on the far end of the spectrum. As Table 1 shows, Scandinavian-civil-law countries have on average the most centralized wage bargaining, the highest rates of union membership, and the most left-leaning governments. We pause here to note that while union membership and left-party government are relatively straightforward measures of labor "strength," bargaining centralization is less so. Indeed, in our static model presented below, employers prefer the most centralized bargaining regime to the next most centralized, while worker preferences have the reverse ranking. Correspondingly, employers historically were the main initiators of highly centralized bargaining in Scandinavia (Swenson, 1991, 2002). However, this employer response was itself largely constrained by highly strategic and effective union coordination (Swenson, 2002). Moreover, in a dynamic setting, workers as well as employers may well be net beneficiaries of a highly centralized bargaining regime (Moene and Wallerstein, 1997; Hibbs and Locking, 2000).

If strong labor movements are hostile to the interests of equity investors, then one would expect Scandinavian countries to perform poorly on measures of corporate governance and investor protection. However, this is not the case. As Table 2 shows, Scandinavian-civil-law

[5] Unfortunately, data on bargaining centralization do not exist for less developed countries.

countries perform better on corporate governance indicators than do countries with weaker labor movements, namely, French- and German-civil-law countries. In particular, shareholder protection is higher in Scandinavian-civil-law countries than in French- and German-civil-law countries, but lower than in common-law countries. Market capitalization of firms is higher in Scandinavian countries than in French- and German-civil-law countries (with the exception of Switzerland), but lower than in English-common-law countries. Finally, large shareholders in Scandinavian-civil-law countries do not appear to be able to extract significant private benefits, since a controlling block sells for a lower value than in French- and German-civil-law countries, and for about the same premium as in common-law countries. In summary, despite having strong labor movements, Scandinavian-civil-law countries protect equity investors relatively well.

Moreover, Table 2 indicates that ownership concentration is higher in Scandinavian-civil-law countries than in common-law countries, but lower than in French- and German-civil-law countries. As in La Porta et al. (1998), ownership concentration is measured as the average of the combined ownership stake of the three largest shareholders for the top ten publicly traded firms. Consistent with our results, those authors observe that "Scandinavian countries are also relatively low, with a 37 percent concentration." In fact, they find no significant difference in ownership concentration between the Nordic nations and countries with a basis in English common law. By contrast, French-civil-law countries are seen to have significantly higher ownership concentration. German-civil-law countries exhibit concentrated ownership, with the exception of East Asian nations, where corporate law has also been informed by the American system.

Another measure of ownership structure is the prevalence of controlling shareholders. La Porta et al. (1999) compile data on this variable for a sample of advanced economies. The evidence suggests that large firms in common-law countries are often widely held, whereas controlling shareholders are more prevalent in the Nordic nations as well as French- and German-civil-law countries. Nonetheless, this measure is less suitable for testing our model than the proportion of equity held by large shareholders. Our question is not whether companies have controlling shareholders. We instead focus on firms with a dominant shareholder, and we examine the behavior of large investors under different bargaining scenarios. A key theoretical variable in our analysis is the ownership share chosen by a large shareholder. The empirical counterpart to this quantity is the ownership stake of the biggest shareholders, which is the measure of ownership concentration adopted by La Porta et al. (1998).

The findings prompt us to ask whether there is some nonlinear association between labor market institutions and corporate governance. Some simple empirical investigations reveal just such a relationship between bargaining centralization and our two key corporate indicators. As seen in Figure 1, there is a fairly clear nonmonotonic relationship between bargaining centralization and ownership concentration.[6] Ownership concentration is lowest in decentralized bargaining regimes, highest for intermediate levels of centralization, and intermediate at high levels of centralization. A similar pattern emerges when we compare wage-setting centralization and shareholder protection.[7] As Figure 2 shows, shareholder protection tends to be highest at the lowest levels of wage-bargaining centralization, lowest for intermediate levels of centralization, and assumes an intermediate value at the highest levels of centralization. As explained in our model below, although the proposed causal effect of centralization on corporate governance is indirect, and occurs through its effect on ownership structure, we still observe something of a U-shaped relationship in this exercise.

The Nordic countries exemplify the puzzle we raise. However, it is clear from Figures 1 and 2 that other countries display similar patterns. For example, Australia and Ireland have high bargaining centralization along with relatively low ownership concentration and high investor protection. Specifically, bargaining centralization is 9.9 in both these nations,

[6] Ownership concentration is measured as in Djankov et al. (2008). For each country, the ten biggest privately owned non-financial domestic companies are identified, and the average percentage of common shares owned by the three largest shareholders is computed.

[7] The measure of shareholder protection derives from Pagano and Volpin (2005a), who correct and extend the anti-director rights index from La Porta et al. (1997, 1998). The analysis was also replicated using the revised anti-director rights and anti-self-dealing indices in Djankov et al. (2008) as well as the revisited anti-director rights index in Spamann (2010). Overall, the results are qualitatively similar, although statistical power is limited given the small sample size.

whereas average bargaining centralization is 6.0 for the whole sample. Ownership concentration is 0.38 on average but 0.28 and 0.39 for these nations, and shareholder protection is 3.2 on average but 4.0 for both these nations. Such observations support our argument that bargaining structure, rather than omitted factors such as geographic location, is driving ownership concentration and investor protection. Moreover, the regression analysis in Section 5 demonstrates that the nonmonotonic influence of bargaining centralization is robust to the inclusion of controls for economic, locational, and institutional variables.

3 Model

With this empirical overview serving as a backdrop, we propose a model to explain the relationships among wage-bargaining institutions, ownership structure, and investor protection laws. There are n ex-ante identical firms, indexed by $i \in \{1, 2, \ldots, n\}$, each initially and entirely owned by a single owner-manager, denoted S_i. As explained in more detail below, S_i will become the dominant, controlling shareholder after taking the firm public. Since firms are ex-ante identical, we will suppress the subscripts whenever possible to simplify notation. The initial event is the determination of the level of investor protections, denoted λ. If the level of investor protection is λ, then the government must pay the amount $h(\lambda)$ in law enforcement costs. We assume that a social planner chooses λ to maximize the expected value of a firm less the costs of law enforcement. Since S initially owns the entire firm, this choice largely tracks S's preferences for investor protection legislation. We think this assumption adequately captures the results, in a more simplified way, of a more involved political-economic model in which the preferences of large, controlling shareholders have heavy influence.

Following the determination of the level of investor protection, the owner-manager S chooses the ownership structure of the firm. In particular, S can sell shares to a competitive fringe of shareholders. That is, S commits to selling a certain fraction of the firm, and the price adjusts to make outside shareholders indifferent between selling and buying.[8] Let α denote the fraction of the firm that the owner-manager S retains. All parties are assumed to be risk neutral. After selling shares in the firm, S becomes the single, dominant shareholder of the firm. All other investors are assumed to remain atomistic.

In addition, S enjoys some private benefits of control. If S owns a fraction α of the firm, then S receives $w(\alpha)$ in private benefits. However, the exercise of private benefits reduces the value of the firm due to corruption or mismanagement. If S owns a fraction α of the firm, then the value of the firm decreases by $r(\alpha)$. These assumptions help ensure an interior solution to the controlling shareholder's choice of ownership structure, but are well grounded and reflect the standard approach in the literature.[9] To simplify matters, we assume a loss in value due to corruption or mismanagement, but, at the cost of tractability, we could also assume that a higher ownership share entails a loss of liquidity or risk diversification.[10]

Following a conventional practice in the literature, after the choices of the firm's ownership structure and the level of investor protection, we posit a fundamental problem of corporate control. This problem arises from the fact that after sale of the firm's shares, the firm is run by managers who are averse to reorganization. As a result, reorganization can only occur through outside intervention, which is costly in terms of both time and resources. Given the single large shareholder and the atomistic nature of the other investors, such interventions will only be undertaken by S.[11]

Thus, following the sale of the firm's shares, S can make a noncontractible investment in finding an opportunity for reorganization. If S chooses investment level I, then S incurs the cost $c(I)$, and the probability of finding a reorganization opportunity is I. Let Π denote the expected profits that the firm receives from its ordinary activities. If the firm is not

[8] For a similar assumption, see Bebchuk (1999).

[9] More generally, the private benefits $w(\alpha)$ and resulting costs $r(\alpha)$ might depend on the level of investor protection λ. However, the analysis would not change substantially if these terms are additively separable functions of α and λ.

[10] For the idea that owning a larger proportion of the firm is costly because of the lack of diversification, see Admati et al. (1994). Alternatively, for the idea that more concentrated ownership entails liquidity costs, see Bolton and von Thadden (1998).

[11] Bolton and von Thadden (1998) make a similar assumption.

reorganized, then the expected payout of the firm is simply Π. In the event that the firm is reorganized, let ψ denote the expected earnings that the firm would receive from new projects. The analysis assumes that ψ is unrelated to the wage-bargaining structure. This assumption is plausible if new projects simply involve liquidating a portion of the company. That is, reorganization requires dissolving a division of the firm, in which case part of the business ceases its operations and dismisses its workforce.

If S finds a reorganization opportunity, then ψ is distributed according to the density function f. It is assumed that f has full support on the real line and that ψ has a finite expectation. Let F denote the cumulative distribution function of ψ. If a reorganization opportunity is found and the firm is reorganized, then the expected payout of the firm is $\nu\psi + (1-\nu)\Pi$, where $\nu \in (0,1)$ is a parameter that measures the extent of restructuring and renovation. That is, the expected payout of the reorganized firm is a convex combination of the expected profits from ordinary activities and the expected earnings from new projects.

The firm is reorganized if an opportunity for reorganization is found and the expected payout is higher with reorganization. We omit the elaboration of a more detailed process by which S acquires some minimum stake $\alpha_{\min}$ necessary to reorganize the firm.[12] Since we have assumed perfect capital markets, any such transaction would be fully reflected in the market value of the shares. More critically, inclusion in the model of such a process would only obscure the central insights we are trying to establish.[13]

In addition to its search for a reorganization opportunity, as the dominant shareholder, S is in a position to divert funds from the firm, and has an incentive to do so following a sale of a portion of the firm. If S chooses diversion level R, then the value of the firm decreases by R, and S receives the amount R as a transfer. However, engaging in financial expropriation is costly. In order to divert money, S must suffer a penalty $d(R, \lambda)$, which depends on the diversion level R as well as the degree of investor protection λ.

[12]For a paper that investigates this problem in more detail, see Shleifer and Vishny (1986).

[13]Note also that such a process is unnecessary if the solution of the model is such that the large shareholder selects an ownership share no less than $\alpha_{\min}$.

Next, firms perform their ordinary activities. Wages are determined, and firms produce output. Each firm differs in terms of its unit labor cost, which is given by $1-\Delta_i$ for $\Delta_i \in [0, 1)$. Prior to wage setting and production, only the distribution of this cost parameter is known; Δ_i is identically distributed across firms. Firms produce a homogeneous good and compete with the other firms in a Cournot framework. Under these conditions, profits for firm i are given by:

$$\pi_i = [p - (1 - \Delta_i)w_i]q_i, \tag{1}$$

where the equilibrium market price for the homogeneous good is given by $p = A - Q$ for $A \geq Q$, $q_i \geq 0$ is the firm-specific quantity produced, $Q = \sum_{i=1}^{n} q_i$ is the total quantity produced, and w_i is the firm-specific wage. To simplify matters, we assume that managers choose q_i to maximize the profits of the firm taking wages as given. Thus, the only divergence of interests between managers and shareholders is over the decision to reorganize the firm. Given wage setting and production behavior, Π is simply the expectation of π_i over all possible realizations of the labor cost parameters.

Wages are determined in one of four different wage-bargaining scenarios, which we rank in order of increasing centralization. In the (1) "market" regime, denoted M, firms make take-it-or-leave-it offers to individual workers; in the (2) "decentralized" regime, denoted D, wages are chosen by a monopoly union independently at each firm; in the (3) "coordinated" regime, denoted C, an industry union chooses a different wage rate for each firm in the market; and in the (4) "centralized" regime, denoted U, an industry union chooses a uniform wage for all firms in the market. Consistent with the discussion in Section 2, our centralization ranking is based on the increasing independence of wages from local, market-based criteria, rather than some intuition about labor union "power." Furthermore, these categories track empirical differences well: scholars draw a distinction between "coordination" and "centralization" (Iversen et al., 2000), and an explicit goal of centralized wage-setting systems was to achieve wage uniformity irrespective of firms' productivity differences (Hibbs and Locking, 2000).

Under the market regime, firms hire workers and choose wages matching their outside option; so that, $w_{i,M} = w_0$. When unions set wages, their objective is to maximize the excess of the wage bill over the outside option of workers. Let $q_i(w_1, \ldots, w_n)$ and $L_i(w_1, \ldots, w_n)$ respectively denote the quantity of output produced and the amount of labor demanded by firm i when $(w_1, \ldots, w_n)$ is the vector of wages facing the firms. Note that $L_i(w_1, \ldots, w_n) = (1 - \Delta_i)q_i(w_1, \ldots, w_n)$. Unions choose wages taking into account the labor demands of the firms. Unions' optimal wage-setting strategy $w_{i,\rho}$ regarding firm i under each regime $\rho \in \{D, C, U\}$ can be defined as follows:

$$w_{i,D} = \arg\max_{w_i \geq w_0} L_i(w_{1,D}, \ldots, w_{i-1,D}, w_i, w_{i+1,D}, \ldots, w_{n,D}) \cdot (w_i - w_0), \tag{2}$$

$$(w_{1,C}, \ldots, w_{n,C}) = \arg\max_{(w_1,\ldots,w_n) \geq (w_0,\ldots,w_0)} \sum_{j=1}^{n} L_j(w_1, \ldots, w_n) \cdot (w_j - w_0), \tag{3}$$

$$w_{i,U} = \arg\max_{w \geq w_0} \sum_{j=1}^{n} L_j(w, \ldots, w) \cdot (w - w_0). \tag{4}$$

Given all of the above, we can write the expected value of the firm given I, R, α, and Π as:

$$V(I, R, \alpha, \Pi) = (1 - I) \cdot \Pi + I \cdot F(\Pi) \cdot \Pi + I \cdot \int_{\Pi}^{\infty} [\nu\psi + (1 - \nu)\Pi] f(\psi) d\psi - r(\alpha) - R, \tag{5}$$

where the first, second, and third terms represent the cases where a reorganization opportunity is not discovered, is discovered but unprofitable, and is discovered and profitable. The fourth term reflects the loss due to corruption or mismanagement. The fifth term captures the diversion of funds. The function $V(I, R, \alpha, \Pi)$ can be expressed as follows:

$$V(I, R, \alpha, \Pi) = \Pi + I \cdot \nu \int_{\Pi}^{\infty} (\psi - \Pi) f(\psi) d\psi - r(\alpha) - R = \Pi + I \cdot g(\Pi) - r(\alpha) - R, \tag{6}$$

where $g(\Pi) = \nu \int_{\Pi}^{\infty} (\psi - \Pi) f(\psi) d\psi$. Note that $g(\Pi)$ is positive and decreasing in Π.

To summarize the model, the timing of events is as follows:

1. A social planner chooses the level of investor protection λ to maximize total social

welfare, which is defined as the expected payoff to S minus law enforcement costs.

2. S sells a fraction $1-\alpha$ of the firm, while retaining the fraction α.

3. S makes an investment I to search for a reorganization opportunity and diverts funds in amount of R from the firm. Private benefits are paid.

4. If a reorganization opportunity is found, then S decides whether to reorganize the firm.

5. The productivity $1-\Delta_i$ of each individual firm is revealed.

6. Wages $w_{i,\rho}$ are set, by management in regime M or by unions in regimes D, C, and U.

7. Managers produce output q_i to maximize profits. Wages and dividends are paid.

See Figure 3 for a graphical timeline of the model.

4 Results

This section analyzes the model through backwards induction. We begin with a statement of the main theorem. We then solve the model in order to prove this result.

4.1 Wage Setting and Corporate Governance and Ownership

The theorem below states the main prediction of the model regarding the relationship of wage-setting institutions to ownership structure and investor protection. It is a direct implication of the results derived in the subsequent sections.

Theorem 1. *For each wage-bargaining regime $\rho \in \{M, D, C, U\}$, the equilibrium level of ownership concentration α is ranked as follows: $\alpha_C > \alpha_D > \alpha_M$ and $\alpha_C > \alpha_U$. In addition, the equilibrium level of investor protection λ is ranked as follows: $\lambda_M > \lambda_D > \lambda_C$ and $\lambda_U > \lambda_C$.*

The impact of bargaining centralization is shown to be nonmonotonic. The coordinated regime C entails an intermediate degree of centralization in wage setting. However, it exhibits higher ownership concentration and lower investor protection than the decentralized and centralized regimes D and U. Finally, shareholder protection is strongest in the market regime M, which is also characterized by the most diffuse ownership structure.

Theorem 1 is a corollary of the ensuing analysis. In particular, Proposition 1 establishes a U-shaped relationship between bargaining centralization and firm profits. From Propositions 3 and 4, the expected profit level has a negative impact on ownership concentration and a positive impact on investor protection. Consequently, bargaining centralization displays an inverted U-shaped effect on ownership concentration along with a U-shaped effect on investor protection.

The intuition for this result is as follows. Low bargaining centralization limits cooperation among unions at different firms and so impairs the ability of unions to raise wages without lowering employment. This keeps profits relatively high in the decentralized regime. The intermediate degree of bargaining centralization in the coordinated regime enables co-operation among different unions as well as flexibility in wage setting. This permits unions to extract as much rent as possible from firms, therefore resulting in low profit levels. Finally, in the centralized regime, uniform wages lower costs for more productive firms but raise costs for less productive firms. This induces more productive firms to increase output and less productive firms to decrease output. Noting that the profit level of each firm is a convex function of the quantity that it produces, average profits tend to be higher than in the coordinated regime. This is the logic behind Proposition 1, which is discussed further below.

In cases where profits are low, the value of the firm might be improved through reorganization. Hence, the controlling shareholder is induced to retain a large ownership stake, which enhances its incentive to invest in finding a profitable reorganization opportunity. Such reasoning underlies Proposition 3. Moreover, when ownership is concentrated in the hands of a controlling shareholder, there may be less need to legislate investor protection. A controlling shareholder with a bigger stake is less willing to steal from the firm and degrade the value of the business. This inverse relationship between ownership concentration and investor protection leads to Proposition 4.

In summary, an intermediate degree of bargaining centralization is associated with low profitability. Therefore, the incentive to reorganize the firm is high. This situation results in high ownership concentration and low investor protection.

4.2 Bargaining Structures and Expected Profits

We compare the average profits of firms under the four wage-setting regimes: M, D, C, and U. We assume that the parameters of the model are such that each firm $i \in \{1, 2, \ldots, n\}$ under each regime $\rho \in \{M, D, C, U\}$ produces a positive quantity $q_i > 0$. The following proposition establishes the fundamental result that profits are nonmonotonic in the level of centralization.[14]

Proposition 1. *For each wage-setting regime* $\rho \in \{M, D, C, U\}$*, average profits have the following rankings:* $\frac{1}{n}\sum_{i=1}^{n}\pi_{i,M} > \frac{1}{n}\sum_{i=1}^{n}\pi_{i,D} > \frac{1}{n}\sum_{i=1}^{n}\pi_{i,C}$ *and* $\frac{1}{n}\sum_{i=1}^{n}\pi_{i,U} > \frac{1}{n}\sum_{i=1}^{n}\pi_{i,C}$.

Proof. See Appendix.

Moving through the different wage-setting regimes in order of increasing centralization, average firm profits decrease from the market to the decentralized regime and from the decentralized to the coordinated regime. However, average profits increase as centralization increases by one more step between the coordinated and centralized regimes. The nonmonotonic relationship between wage-setting centralization and average profits is critical to the similar relationship we derive between bargaining structures and corporate governance characteristics.

The intuition for this result is as follows.[15] Under the market regime, the wages firms

[14] This claim is established using Lemma 1 in the appendix, which derives expressions for the equilibrium values of the quantities produced by every firm and the wages facing every firm under each wage-setting regime.

[15] In order to further motivate this finding, Proposition 5 in the appendix compares the average wage costs

pay are equal to workers' outside option, and this keeps wage costs as low as possible. By contrast, unions raise wages above the outside option. Hence, wage costs are higher under decentralized bargaining than in the market regime. This can explain why decentralized bargaining lowers profits relative to the market regime.

Moreover, unions have different impacts on profits under alternative bargaining structures. When wage setting is decentralized and a separate union negotiates wages independently at each firm, a substitution effect in the product market suppresses wages. Unable to coordinate across firms, decentralized unions are more sensitive to the effect of wage increases on the quantity produced by a firm and hence the amount of labor demanded. By contrast, the industry union under the coordinated regime fully internalizes this substitution effect. Indeed, the wage under coordinated bargaining is identical to what the union's optimal wage would be if the given firm were the only one in the market.[16] Accordingly, wage costs are higher and profit levels are lower under coordinated bargaining than under decentralized bargaining.

The analysis of profit levels under centralized bargaining is different. As under the coordinated regime, the industry union internalizes the substitution effect in the product market. However, centralized bargaining restricts the wage to be uniform across firms. Relative to the coordinated regime, this lowers wages and raises output for more productive firms while raising wages and lowering output for less productive firms. Since the profits of each firm are convex in the quantity of output it produces, the gain in profits for more productive firms normally outweighs the loss in profits for less productive firms. On average, wage costs are lower and profits levels are higher under centralized bargaining than in the coordinated regime.

Note that in a static setting, myopic unions would prefer the coordinated regime to

of firms under different bargaining structures. The average wage cost per unit of output is lowest under a market system M and highest under the coordinated regime C. The centralized and decentralized cases U and D display average wage costs between these two values. However, as Example 3 in the appendix illustrates, wage costs cannot be ranked between regimes U and D in general.

[16]This can be seen from equation (12) in the appendix.

the centralized regime. However, because greater firm profits can stimulate innovation and investment, farsighted unions may well prefer the centralized regime in a dynamic setting (Haucap and Wey, 2004; Hibbs and Locking, 2000; Moene and Wallerstein, 1997).[17]

The proposition above demonstrates that profits can be ranked between regimes M, D, and C and between regimes C and U. Nonetheless, we cannot in general rank all regimes. In particular, consider regimes D and U.[18] Depending on specific parameter values, the average wage cost per unit of output could be higher in regime D or in regime U. When firms have similar labor productivities, unions may be more effective at raising the wage bill under the centralized regime than under decentralized bargaining because centralization enables the industry union to coordinate the wage across firms. In this case, average profits tend to be lower in regime U. When firms have different labor productivities, unions may be less effective at raising the wage bill under the centralized regime than under decentralized bargaining because centralization prevents the industry union from adjusting the wage to each firm. In this case, average profits tend to be lower in regime D.

In addition, consider regimes M and U.[19] Because unions maximize the excess of the wage bill over workers' outside option, the centralized regime has a higher wage than the market regime. This suggests that average profits should be higher in regime M. Nonetheless, there are cases where regime U brings about higher average profits. Intuitively, an increase in the wage raises per unit labor costs more for firms with low labor productivity than for firms with high labor productivity. Hence, the higher wage under centralized bargaining amplifies the competitive advantage of firms with high labor productivity over firms with low labor productivity. It acts as a subsidy to industry leaders and a tax on laggards. If the increase in

[17] We make this point to anticipate the objection that our characterization of the centralized regime is inconsistent with the original formulation of our question. While patterns of corporate governance and *union power* (e.g., union density, left-party incumbency) raise a paradox, it is *bargaining centralization* that provides an answer. Bargaining centralization need not be a direct function of union power. Indeed, as previously noted, employers were the main initiators of centralized bargaining. Nevertheless, union power may still be indirectly relevant. For example, centralized bargaining may arise as an employer response to union power (e.g., high density or coordination). Alternatively, as we observe here, farsighted unions may prefer centralized bargaining.

[18] Example 1 in the appendix shows that profits cannot be ranked between regimes D and U in general.

[19] Example 2 in the appendix shows that profits cannot be ranked between regimes M and U in general.

profits for more productive firms outweighs the decrease in profits for less productive firms, then this effect raises average profits above those in the market regime.

Note that the profit level of each firm is nonnegative. This property of the model follows from equation (1), which specifies the profit function of each firm. An employer can always secure zero profits by producing a quantity of zero, in which case it does not utilize any labor or other inputs. Nonetheless, firms in the real world may sometimes earn negative profits. The framework above can be extended as follows in order to allow for such a situation.

In the paragraph containing equation (1), assume that the output demand parameter A is a random variable instead of a constant. Suppose that wages and quantities are chosen before the realization of A is observed. Then all the derivations and propositions in this paper remain unchanged, except that the term A is replaced by its expectation $\mathbb{E}(A)$. This result obtains because the price of each unit of output and thus the profits of each firm are linear in A. If the realization of the intercept A is sufficiently small, then the resulting price of output will be lower than the wage cost per unit of output. Consequently, the profit level will be negative.

Finally, we can give a loose empirical interpretation to the analysis in this section. Although our results do not depend on the legal-origin categories, they are a useful way to summarize cross-country differences. The market and decentralized regimes M and D largely correspond to English-common-law countries, with the exceptions of Australia and Ireland, which have higher centralization scores. In these countries, wage bargaining is largely firm- or workplace-based and, perhaps partly as a result, the share of workers covered by a collective agreement is low. Hence, wages are determined by a mix of union bargaining and market criteria. The coordinated regime C corresponds to French- and German-civil-law countries, which have industry-level unions and tools to extend industry agreements to nonsignatory employers. This results in most workers being covered by collective agreements, but these agreements are also narrower and less encompassing than in more centralized bargaining: wages are less uniform, coordination occurs by following a union wage-setting "leader," and unions in opportune situations attempt to "leapfrog" over other union agreements. Finally, the centralized regime U is most consistent with Scandinavian-civil-law countries, where wage setting has been most centralized, and where employers have at times explicitly favored centralization as a way to establish uniform wage rates and contain wage growth in the highest-paying sectors. This pattern appears to be largely consistent with the data reported in Table 1.

4.3 Choice of Diversion and Investment

We now turn to S's choices of diversion and investment. To ensure tractable interior solutions, we make the following additional assumptions for the expected profit level, the penalty-for-diversion function, and the cost-of-investment function.[20]

Assumption 1. *Assume the following conditions for expected profits, the penalty-for-diversion function, and the cost-of-investment function:*

1. *The set of all possible values for* Π *is* $[b_p, \infty)$, *where* $b_p > 0$; *the function* $r(\alpha)$, *defined for* $\alpha \in [0, 1]$, *has a supremum* $b_r < b_p$.

2. *The penalty for diversion has the multiplicatively separable form* $d(R, \lambda) = x(\lambda) \cdot z(R)$; $x(\lambda)$ *is defined for* $\lambda \geq 0$, $x(\lambda)$ *is increasing on the interval* $[0, \infty)$, *and* $x(0) > 0$; $z(R)$ *is a continuously differentiable function defined for* $R \geq 0$, *where* $z'(0) = 0$, $z'(b_p - b_r) > 1/x(0)$, *and* $z'(R)$ *is increasing on the interval* $[0, \infty)$.

3. *The cost of investment* $c(I)$ *is a continuously differentiable function defined for* $I \in [0, 1]$, *where* $c'(0) = 0$, $c'(1) > g(b_p)$, *and* $c'(I)$ *is increasing on the interval* $[0, 1]$.

The first part of the assumption implies that expected profits Π, as well as expected profits minus the loss due to corruption or mismanagement $\Pi - r(\alpha)$, are always positive

[20]Example 4 in the appendix describes specific functions that satisfy the regularity conditions in this section.

and bounded away from zero. The second part places some structure on the penalty-for-diversion function. It implies that $x(\lambda)$ is positive and bounded away from zero as well as increasing in the level of investor protection, that there is an interior solution for the diversion level if and only if $\alpha < 1$, that the diversion level is less than the value of the firm, and that the penalty for diversion is a convex function of the amount expropriated, holding constant the level of investor protection. Finally, the third part specifies our assumptions for the cost-of-investment function. These assumptions help ensure an interior solution for the investment decision if and only if $\alpha > 0$ and imply that the investment cost is a convex function.

With the preceding assumptions, we write S's expected payoff as:

$$\begin{aligned} Y(I, R, \alpha, \Pi) &= \alpha V(I, R, \alpha, \Pi) + w(\alpha) + R - c(I) - d(R, \lambda) \\ &= \alpha[\Pi + I \cdot g(\Pi) - r(\alpha) - R] + w(\alpha) + R - c(I) - x(\lambda) \cdot z(R). \end{aligned} \tag{7}$$

In the upper line, the first term represents the expected value of S's ownership stake in the firm. The other terms capture private benefits of control, investment in reorganization, and financial expropriation along with its penalty. In the lower line, equation (6) is used to substitute for the expected value of the firm, which appears in brackets. The penalty for diversion is also rewritten based on the second part of Assumption 1.

The expected value of the firm depends on both the expected profits Π from ordinary activities and the expected gain $I \cdot g(\Pi)$ from reorganization opportunities. Therefore, these terms enter the expression for S's expected payoff. In particular, the firm can secure expected profits of Π from its regular operations. Moreover, a reorganization opportunity is discovered with probability I, in which case the expected payout of the firm increases by $g(I)$. The firm either reorganizes or not, but the expected value of the firm reflects both of these possibilities.

For its choice of diversion, S chooses R to maximize its expected payoff, taking as given α and λ. For its choice of reorganization investment, S chooses I to maximize its expected payoff, taking α and Π as given.

Proposition 2. *S's choice of diversion $R(\alpha, \lambda)$ is decreasing in its ownership share α and in the level of investor protection λ. In addition, S's choice of investment $I(\alpha, \Pi)$ is increasing in its ownership share α and decreasing in the level of expected profits Π.*

Proof. See Appendix.

The intuition for this proposition is straightforward. Since S receives the entire value of the diversion R, but only bears the cost αR, the gain from a diversion increases as S's ownership share decreases. Naturally, the size of the diversion will decrease when there is higher investor protection. As for the choice of investment, S stands to secure more of the gains from a reorganization when its ownership stake is higher; hence, I increases with α. Finally, when expected profits are higher, there is less to gain from a reorganization, so I decreases with Π.

4.4 Corporate Ownership Structure

Having solved for S's choice of diversion and investment, we can determine how S chooses the firm's ownership structure. In order to solve this problem, we make the following further assumptions.[21]

Assumption 2. *Assume the following conditions for S's choice of ownership structure:*

1. *The continuously differentiable functions $w(\alpha)$ and $r(\alpha)$ are defined for $\alpha \in [0, 1]$. Assume that $w'(0) > r'(0)$ and $r'(1) > w'(1)$.*

2. *Given any $\lambda \in [0, \infty)$ and $\Pi \in [b_p, \infty)$, the expression $(1 - \alpha) \cdot g(\Pi) \cdot \partial I(\alpha, \Pi)/\partial\alpha - (1 - \alpha) \cdot \partial R(\alpha, \lambda)/\partial\alpha - r'(\alpha) + w'(\alpha)$ is decreasing in α for all $\alpha \in [0, 1]$.*

3. *Define $C(u)$ and $Z(v)$ as continuously differentiable functions, where $C(u) = c'^{-1}(u)$ for all u such that $0 \leq u \leq c'(1)$, and where $Z(v) = z'^{-1}(v)$ for all v such that $0 \leq v \leq 1/x(0)$.*

[21] Example 4 in the appendix describes specific functions that satisfy the regularity conditions in this section.

4. *Given any k such that $0 < k < 1$, the term $e^2 \cdot C'(k \cdot e)$ is increasing in e for all e such that $0 \leq e \leq c'(1)/k$.*

5. *Given any k such that $0 < k < 1$, the term $Z'(k/e)/e$ is decreasing in e for all e such that $e \geq x(0)$.*

The first part of this assumption helps guarantee an interior solution for the choice of ownership share. The second part assists in ensuring that the second-order condition for a global maximum with respect to S's choice of ownership share is satisfied. The final three parts are useful in deriving comparative statics for the effect of the profit level and investor protection on ownership concentration. Sufficient conditions for the last two assumptions are for C' and Z' to be constant on their domains.

Since S at this stage owns the entire firm, S's expected payoff can be written in the following way. If S retains a fraction α of the firm, then the value of the firm is expected to be $V[I(\alpha, \Pi), R(\alpha, \lambda), \alpha, \Pi]$. Hence, the expected payoff to S given α, λ, and Π is:

$$\begin{aligned} W(\alpha, \lambda, \Pi) = \alpha V[I(\alpha, \Pi), R(\alpha, \lambda), \alpha, \Pi] + (1 - \alpha) V[I(\alpha, \Pi), R(\alpha, \lambda), \alpha, \Pi] \\ + w(\alpha) + R(\alpha, \lambda) - c[I(\alpha, \Pi)] - d[R(\alpha, \lambda), \lambda], \end{aligned} \tag{8}$$

where the first term is the expected value of the shares retained, the second term is the revenue from the sale of shares, the third term is the private benefits of control, the fourth term is the financial diversion, the fifth term is the investment cost, and the sixth term is the penalty for financial diversion.

Given λ and Π, S chooses α to maximize the expected payoff $W(\alpha, \lambda, \Pi)$. We can now state the following proposition.

Proposition 3. *S's choice of ownership share $\alpha(\lambda, \Pi)$ is decreasing in the level of expected profits Π for a given level of investor protection λ. In addition, S's choice of ownership share $\alpha(\lambda, \Pi)$ is decreasing in the level of investor protection λ for a given level of expected profits Π.*

Proof. See Appendix.

This result can be understood in terms of the previous findings on S's choice of investment and diversion. If expected profits fall, then the expected gains from investing in a reorganization opportunity rise. Because reorganization is potentially more advantageous, S prefers a higher level of investment in searching for an opportunity to reorganize the firm. Recall that S's investment in reorganization is positively related to its ownership stake. By retaining a larger fraction of the firm, S captures more of the anticipated gains from reorganization, thereby increasing its incentive to invest in finding such an opportunity. Thus, S's ownership share is decreasing in the level of expected profits, with this effect occurring through S's incentive to invest in reorganization.

Observe that the expected profit level Π from ordinary activities affects the ownership share α entirely through its effect on the expected gain $g(\Pi)$ from reorganization. It was noted in Section 3 that $g(\Pi)$ is decreasing in Π. Consequently, the stake of the controlling shareholder, which is negatively related to expected regular profits, is increasing in the expected gains from reorganization. This special property holds because reorganization is more likely when expected regular profits are low, in which case expected earnings from new projects substitute for expected profits from ordinary activities. The following is the intuition behind the comparative statics in greater detail.

Suppose that expected regular profits are low. Because the ordinary activities of the firm are performing poorly, there is considerable potential for improving the profitability of the firm by pursuing new projects. The firm is likely to be reorganized if an opportunity arises, and the expected gains from reorganization are high. In this case, there is a large expected return to investment in finding a reorganization opportunity. Hence, the controlling shareholder chooses to retain a greater stake in the firm; so that, it receives a larger share of the gains from reorganization, giving it a greater incentive to invest in the search for more profitable new projects.[22]

In addition, stronger investor protection results in more diffuse ownership. Recall from the previous section that S's optimal choice of value diversion from the firm is decreasing in both the level of investor protection and the ownership stake of the controller. As a result, when the level of investor protection is high, S does not need to retain a large share of the firm in order to keep diversion low. Consequently, S can sell a greater share of the firm to outside investors without substantially increasing the losses from expropriation. Thus, S's choice of ownership concentration is decreasing in the level of investor protection.

Finally, the existence of private benefits of control $w(\alpha)$ provides an incentive for S to increase its ownership stake, while the costs of corruption or mismanagement $r(\alpha)$ accompanying these private benefits ensure that S does not retain total ownership of the firm.[23] Without the assumptions about private benefits and their incident costs, S would choose $\alpha = 1$; that is, S would prefer not to sell any portion of the company. The intuition is that by keeping the company private, S would receive all of the gains from a reorganization, and would subsequently choose the efficient investment level. Moreover, since S initially owns the entire company, it would completely internalize the impact of subsequent choices that affect the value of the firm when choosing the ownership structure. Retaining full ownership would eliminate any losses from diversion since S has no incentive to steal from itself. However, given the costs $r(\alpha)$ associated with the exercise of private benefits of control, S is compelled to sell at least some fraction of the company. By the same token, as long as this reduction in value is not too large initially, the existence of private benefits $w(\alpha)$ also implies that S retains ownership of some fraction of the firm.

[22]See Shleifer and Vishny (1986) for a model in which a large shareholder makes investments in identifying and implementing profitable changes in company operations. A big ownership stake increases the incentive of a shareholder to undertake costly activities that raise the value of the firm. Likewise, Bolton and von Thadden (1998) note that concentrated ownership can improve control over management, and Admati et al. (1994) argue that large shareholders play an important role in monitoring corporate performance.

[23]Alternatively, it could be assumed that concentrated ownership generates a value loss $r(\alpha)$ for the firm but no private benefits $w(\alpha)$ to the large investor. In this case, the condition $r'(0) = 0$ would ensure that S chooses a positive ownership share α. That is, the efficiency cost of additional concentration should initially be negligible.

Despite this particular way of modeling the choice of ownership structure, we readily agree that there are additional costs and benefits that influence this decision. For instance, risk aversion and the gains from diversification (Admati et al., 1994), as well as the loss of liquidity that accompanies concentrated ownership (Bolton and von Thadden, 1998), are convincing reasons previously studied in the literature. The relationship we identify between corporate profits and ownership structure is also consistent with a story about the costs and benefits of monitoring by a large shareholder (Roe, 2000; Burkart et al., 1997).[24] We emphasize again that our chosen approach is motivated primarily by reasons of simplicity, that our argument does not depend on this particular mechanism to explain ownership structure, and that our main focus is the impact of bargaining institutions on corporate governance, whatever channels through which it may occur.

4.5 Optimal Investor Protection

We now address the issue of the optimal level of investor protection. In order to solve this problem, we make the additional assumptions below.[25]

Assumption 3. *Assume the following conditions hold on the penalty-for-diversion function and the cost-of-enforcement function.*

1. *The two functions $x(\lambda)$ and $h(\lambda)$, defined for $\lambda \geq 0$, are continuously differentiable, and the following requirements are satisfied: $h'(0)/x'(0) = 0$, $\lim_{\lambda\to\infty} h'(\lambda)/x'(\lambda) = \infty$, and $h'(\lambda)/x'(\lambda)$ is increasing on the interval $[0, \infty)$.*

2. *Assume that $-z\Big(Z\{[1-\alpha(0, b_p)]/x(0)\}\Big)+\{[1-\alpha(0, b_p)]/x(0)\}^2\cdot Z'\{[1-\alpha(0, b_p)]/x(0)\} > 0$ and that $-z[Z(e)] + e^2 \cdot Z'(e)$ is increasing in e for all e such that $0 \leq e \leq 1/x(0)$.*

3. *Given any $\Pi \geq b_p$, the term $[1 - \alpha(\lambda, \Pi)]/x(\lambda)$ is decreasing in λ for all $\lambda \geq 0$.*

[24] Roe (2000) argues that social democracies encourage owners to maintain large, controlling blocks in order to improve monitoring of managers and counter the rise in agency costs caused by increases in labor strength. Similarly, with the tradeoffs between monitoring and managerial initiative, Burkart et al. (1997) show that a large shareholder's value-maximizing stake is decreasing in firm profits.

[25] Example 4 in the appendix describes specific functions that satisfy the regularity conditions in this section.

All together, the first part of this assumption means that the additional expenditure required to raise the difficulty of diversion by one unit continuously increases from zero to infinity as the level of investor protection rises. The second part helps ensure, respectively, an interior solution for the level of investor protection and that the second-order condition for a global maximum with respect to the level of investor protection is satisfied. The final part effectively means that greater investor protection lowers the degree of financial diversion.

As we have conceived of the problem, a social planner chooses λ to maximize total welfare, which is simply the payoff to S minus law enforcement costs $h(\lambda)$. Total welfare given λ is:

$$\Phi(\lambda, \Pi) = W[\alpha(\lambda, \Pi), \lambda, \Pi] - h(\lambda). \tag{9}$$

The optimal level of investor protection is solved by maximizing this expression with respect to λ, taking expected profits Π as given. This leads to the following proposition.

Proposition 4. *The social planner's choice of investor protection* $\lambda(\Pi)$ *is increasing in expected profits* Π*. This also implies that the equilibrium ownership share* $\alpha[\lambda(\Pi), \Pi]$ *is decreasing in expected profits* Π*.*

Proof. See Appendix.

Driving this result is a tradeoff between concentrated ownership and investor protection. When expected profits are high, there is little incentive for a controlling shareholder to maintain a big stake in the company or to make large investments in searching for a reorganization opportunity. At the same time, however, a smaller ownership stake creates a greater temptation for a controlling shareholder to divert funds from the firm. Under these conditions, the social value of investor protection is high. Since S has stronger interests in selling off the company than in retaining a large stake and investing in reorganization, the value of the firm is maximized by establishing high levels of investor protection.

By contrast, when expected profits are low, S prefers to own a greater share of the company in order to capture the large potential gains from reorganization. Moreover, when its ownership share is greater, S prefers to divert a smaller amount from the firm. In turn, when the diversion is smaller, higher investor protection contributes less to increasing the value of the company. In this case, the social value of high levels of investor protection is low. Social costs are reduced by decreasing the level of investor protection and hence expenses on law enforcement.

In effect, concentrated ownership acts as a substitute for investor protection legislation. Since the social welfare analysis for the choice of investor protection largely reflects the utility of controlling shareholders, the resulting laws are a function of controlling shareholders' preferences for diversification or concentration. Stated from this perspective, support for investor protections is a way for large shareholders to commit to not diverting investments by minority shareholders. Making such a commitment is particularly critical when the large shareholder has a strong interest in selling off most of the firm, and this occurs when profits are high. Otherwise, controlling shareholders maintain big ownership stakes when profits are low and there are greater opportunities to gain from reorganization. Since the incentive to divert is relatively low when the ownership stake is high, this ownership structure essentially becomes a replacement for robust investor protection laws.

Several other studies explain the level of ownership concentration as determined by exogenously given investor protection laws. For instance, in La Porta et al. (1998, 1145), ownership concentration becomes a substitute for legal protection either because large shareholders require more capital to exercise control rights to avoid being expropriated by managers or because poor legal protection lowers the demand for corporate shares. Similarly, in Bebchuk (1999, 1–2), concentrated, controlling ownership structures emerge because dominant shareholders want to maintain access to the private benefits of control that arise from poor investor protection. According to these arguments, a low level of investor protection is a cause of ownership concentration. In the explanation we propose here, when the owner-manager chooses the ownership structure, the social planner has already implemented a given level of investor protection. In this sense, the level of investor protection helps to determine the ownership structure.

However, because the social planner fully anticipates the ownership structure that the owner-manager chooses in the subsequent stage of the game, the prospective decisions of the owner-manager affect the socially optimal level of investor protection. For instance, foreseeing that the owner-manager will choose a diffuse ownership structure, which increases the incentive to steal from the firm, the social planner will choose a higher level of investor protection. Therefore, it can also be said that ownership structure influences the level of investor protection. This second causal channel—from ownership structure to investor protection laws—is consistent with the detailed comparative analysis of corporate law undertaken by Kraakman et al. (2009). Throughout that book, the authors observe that variation in ownership structures across countries can frequently account for differences in legal rules.

5 Regression Analysis

Our model has two key implications. First, ownership concentration initially increases and then decreases in wage-setting centralization. Second, shareholder protection initially decreases and then increases in wage-setting centralization. The patterns observed in Figures 1 and 2 support these predictions. However, we have not yet evaluated the statistical significance of the results, nor have we examined the robustness of the findings to the addition of covariates. This section formally tests for a nonlinear impact of bargaining centralization and controls for a number of potential confounding factors.

In order to assess statistical significance, a regression analysis is performed using the sample of countries from Figures 1 and 2.[26] Table 3 reports the results of regressing ownership concentration and shareholder protection on bargaining centralization. In the first

[26]Because the number of observations is not large, the standard normal distribution may not provide an accurate approximation to the sampling distribution for hypothesis testing. Therefore, a t-distribution with the appropriate number of degrees of freedom is used when calculating critical values to evaluate the statistical significance of the coefficients.

and third columns, a linear specification is estimated, but no significant effect is detected. The second and fourth columns display estimates for a quadratic model in order to test for a nonmonotonic influence of bargaining centralization. A U-shaped impact on shareholder protection is seen as well as an inverted U-shaped relationship with ownership concentration. The coefficients on the quadratic term are statistically significant, indicating that linearity is rejected against a quadratic alternative.

Because the analysis so far is basically univariate, it may not account for confounding variables related to economic institutions. In order to assess the role of these factors, we add several covariates to the specifications in the second and fourth columns of Table 3. Included are important measures of education, economic performance, infrastructure, legal origin, and geography. Specifically, the control variables are: the percentage completing high school, spending on educational institutions, per capita income and its growth rate, expenditure on transportation infrastructure, confidence in the judicial system, and indicator variables for being located in Europe and having a legal origin in English common law. Because of the small sample size, informative results cannot be obtained if all these regressors are included in a single specification. Therefore, each variable is separately inserted into the regressions.

Table 4 exhibits the resulting estimates. In all cases, there is significant evidence that wage-setting centralization is nonmonotonically related to ownership concentration and shareholder protection. A linear specification can be rejected in favor of a quadratic model. Furthermore, the control variables do not enter with a significant coefficient, except for English common law, which is associated with greater shareholder protection. Therefore, omitted factors appear unlikely to explain the fact that both high and low values of bargaining centralization are associated with diffuse ownership structures and strong investor protection.

The empirical results are robust to controlling for a number of observable variables. However, bargaining centralization may still be affected by unobservable country characteristics. In addition, wage-setting institutions could be simultaneously determined with investor protection. There may also be reverse causality from corporate governance to bargaining structures.

The possibility that legal origin may influence wage-setting institutions is mentioned in Section 1 and particularly footnote 3. Furthermore, bargaining structures may be a consequence of the same legislative and political forces that determine investor protections. For instance, Lee and Roemer (2005) develop a model where the legislated unionization of labor markets is a function of shifting political coalitions. Although they do not address the level of centralization per se, their framework could be extended in this direction. Alternatively, bargaining centralization may be the consequence rather than a cause of financial market characteristics. An "institutional complementarities" argument from the "varieties of capitalism" literature in political science (Hall and Soskice, 2001) might propose that coordinated and centralized labor markets are complementary to bank-based forms of "patient" capital. By contrast, more flexible, individualistic labor markets could be complementary to equity-based forms of finance in which investors have shorter time horizons.

Nevertheless, there are several reasons for treating bargaining centralization as an explanatory variable, as opposed to a dependent variable. While the level of bargaining centralization has changed within countries over time (for the example of Sweden in the 1980's, see Pontusson and Swenson, 1996), the overall story has not been one of change, but rather of relative stability (Wallerstein et al., 1997) and robust differences between countries. Within the social sciences broadly, bargaining centralization is frequently taken as a predetermined factor (see, e.g., Barth et al., 2014; Oskarsson, 2003; Pontusson, Rueda, and Way, 2002; Scheve and Stasavage, 2009).

Across developed countries, trade unions and employer associations vigorously defend the principle of collective bargaining autonomy against encroachments from state and legal regulation.[27] Studies of crucial cases, such as those of Denmark (Galenson, 1952) and Sweden

[27]For instance, Thelen (2014, 56) cites "Germany's hallowed and constitutionally anchored principle of collective bargaining autonomy, *Tarifautonomie*: 'The state must stay out of wage formation . . . . Any government intervention . . . compromises collective bargaining autonomy and puts the traditional system of wage formation at risk . . . '." Another example comes from Sweden, where the legal principle of "self-regulation is perhaps strongest and most institutionalized within labor law" (Carlson, 2009, 361).

(Swenson, 2002), reveal that the construction of wage-bargaining structures was primarily the work of unions and employer associations, with little direct involvement or interference by the state.[28] Thus, an explanation predicated on wage-bargaining institutions seems more plausible than distinct but related stories linking politics to both corporate governance and union centralization. In sum, wage-setting structures are a good example of a "big, slow-moving" institution that can influence other aspects of law and practice.

6 Conclusion

Introducing different wage-setting institutions into the study of corporate governance can help explain variation in investor protection laws across developed countries. Our main insight is that key measures of corporate governance and ownership are nonmonotonic in the degree of bargaining centralization. As wage setting becomes increasingly centralized, average firm profits initially decrease but eventually increase. In turn, expected profits affect ownership structure and shareholder protection. Lower profits induce a large, controlling shareholder to search for an opportunity to reorganize the firm. To encourage investment in reorganization, a controlling shareholder maintains a bigger ownership stake when profits are lower. Because a controller with a larger stake has a weaker incentive to divert value from the firm, outside investors face a lower risk of expropriation when ownership is more concentrated. Thus, a controlling shareholder planning to retain a greater fraction of the firm has a smaller demand for legislation to protect outside investors. Given the effect of labor market institutions on firm profits, ownership concentration first increases and then decreases, and investor protection first decreases and then increases, as the level of bargaining centralization rises.

[28]Recent work by Meisenzahl (2015) comparing Germany and Great Britain is consistent with this perspective. Centralization within union and employer organizations is complementary. Union centralization is explained as a response to future expectations of employer centralization, and vice versa. In that paper, wartime circumstances force unions to bargain with centralized governments instead of ordinary employers. However, war is treated as a transitory, exogenous shock that does not affect the structure of trade unions.

A Appendix

The appendix contains proofs of the theoretical results cited in the main text as well as relevant analyses and examples.

A.1 Statement and Proof of Lemma 1

The lemma below expresses the equilibrium output of every firm in terms of the wage of each employer. It also presents a closed-form solution for the wage of each employer under the different wage-setting regimes.

Lemma 1. *For every regime $\rho \in \{M, D, C, U\}$, the equilibrium quantity produced by each firm i is given by:*

$$q_i = \frac{A + \sum_{j=1}^{n}(1-\Delta_j)w_j}{n+1} - (1-\Delta_i)w_i. \tag{10}$$

In addition, for each wage-setting regime, the equilibrium wage $w_{i,\rho}$ for each firm i is given by:

$$w_{i,U} = \frac{A\sum_{j=1}^{n}(1-\Delta_j)}{2(n+1)\sum_{j=1}^{n}(1-\Delta_j)^2 - 2[\sum_{j=1}^{n}(1-\Delta_j)]^2} + \frac{w_0}{2}, \tag{11}$$

$$w_{i,C} = \frac{A}{2(1-\Delta_i)} + \frac{w_0}{2}, \tag{12}$$

$$w_{i,D} = \frac{A}{(n+1)(1-\Delta_i)} + \frac{n[(n+1)(1-\Delta_i) + \sum_{j=1}^{n}(1-\Delta_j)]w_0}{(n+1)(2n+1)(1-\Delta_i)}, \tag{13}$$

$$w_{i,M} = w_0. \tag{14}$$

This result is derived as follows. First, to find the equilibrium quantity for each firm i, we choose q_i to maximize the profits of firm i in equation (1), taking the quantities of all other firms as given. Assuming an interior solution, the first-order condition for this problem is:

$$-q_i + A - Q - (1-\Delta_i)w_i = 0 \quad \text{for each} \quad i \in \{1, 2, \dots, n\}. \tag{15}$$

Summing the preceding equation across all i and rearranging the result, we find an expression for the total quantity produced:

$$Q = \frac{An - \sum_{j=1}^{n}(1-\Delta_j)w_j}{n+1}. \tag{16}$$

Substituting this expression back into the first-order condition and solving for q_i, one obtains the result for the equilibrium quantity of each firm stated in equation (10).

Next, we find the equilibrium wage for every firm under each wage-setting regime. Recall that the amount of labor employed is related to the quantity of output produced through the equation $L_i = (1-\Delta_i)q_i$. In regime M, we simply set $w_{i,M} = w_0$ for all i.

In regime D, we choose $w_{i,D}$ to maximize the union's objective function subject to firm i's optimal quantity choice. Substituting firm i's optimal quantity choice from equation (10) into the union's objective function in expression (2) gives:

$$\phi_{i,D} = (1-\Delta_i)\left(\frac{A + \sum_{j=1}^{n}(1-\Delta_j)w_j}{n+1} - (1-\Delta_i)w_i\right)(w_i - w_0). \tag{17}$$

The first-order condition for an interior maximum with respect to w_i is:

$$(1-\Delta_i)\left(\frac{(1-\Delta_i)}{n+1}-(1-\Delta_i)\right)(w_i-w_0) + (1-\Delta_i)\left(\frac{A+\sum_{j=1}^{n}(1-\Delta_j)w_j}{n+1}-(1-\Delta_i)w_i\right)=0. \quad (18)$$

If firm i's optimal quantity q_i in equation (10) is positive, then $\partial\phi_{i,D}/\partial w_i > 0$ at $w_i = w_0$. Hence, in an equilibrium where firm i's optimal quantity q_i is positive, the union must choose $w_i > w_0$ to maximize its objective function. After some rearrangement and simplification, the first-order condition can be rewritten as:

$$-(2n+1)(1-\Delta_i)w_i + A + \sum_{j=1}^{n}(1-\Delta_j)w_j + n(1-\Delta_i)w_0 = 0. \quad (19)$$

Adding the preceding equation across all i and rearranging, we find an expression for the sum of the wage costs per unit of output:

$$\sum_{j=1}^{n}(1-\Delta_j)w_j = \frac{An + n\sum_{j=1}^{n}(1-\Delta_j)w_0}{n+1}. \quad (20)$$

Substituting this result back into the first-order condition and solving for w_i yields the expression for $w_{i,D}$ in equation (13).

In regime C, we choose $(w_{1,C},\ldots,w_{n,C})$ to maximize the union's objective function subject to the optimal quantity choices of all the firms. Substituting each firm's optimal quantity choice from equation (10) into the union's objective function in expression (3) gives:

$$\phi_C = \sum_{k=1}^{n}(1-\Delta_k)\left(\frac{A+\sum_{j=1}^{n}(1-\Delta_j)w_j}{n+1}-(1-\Delta_k)w_k\right)(w_k-w_0). \quad (21)$$

The first-order condition for an interior maximum with respect to w_i is:

$$(1-\Delta_i)\left(\frac{(1-\Delta_i)}{n+1}-(1-\Delta_i)\right)(w_i-w_0) + (1-\Delta_i)\left(\frac{A+\sum_{j=1}^{n}(1-\Delta_j)w_j}{n+1}-(1-\Delta_i)w_i\right) + \sum_{j\neq i}(1-\Delta_j)\left(\frac{1-\Delta_i}{n+1}\right)(w_j-w_0)=0. \quad (22)$$

If firm i's optimal quantity q_i in equation (10) is positive, then $\partial\phi_C/\partial w_i > 0$ at $w_i = w_0$, noting that $w_j - w_0$ is restricted to be nonnegative. Hence, in an equilibrium where firm i's optimal quantity q_i is positive, the union must choose $w_i > w_0$ to maximize its objective function. After some rearrangement and simplification, the first-order condition can be rewritten as:

$$-2(n+1)(1-\Delta_i)w_i + A + 2\sum_{j=1}^{n}(1-\Delta_j)w_j - \sum_{j=1}^{n}(1-\Delta_j)w_0 + (n+1)(1-\Delta_i)w_0 = 0. \quad (23)$$

Adding the preceding equation across all i and rearranging and simplifying the result, one finds an expression for the sum of the wage costs per unit of output:

$$\sum_{j=1}^{n}(1-\Delta_j)w_j = \frac{An + \sum_{j=1}^{n}(1-\Delta_j)w_0}{2}. \tag{24}$$

After substituting this expression back into the first-order condition and solving for w_i, one obtains the expression for $w_{i,C}$ in equation (12).

In regime U, we choose $w_{i,U}$ to maximize the union's objective function subject to the optimal quantity choices of all the firms, where $w_{i,U}$ is restricted to be the same across all firms. Substituting each firm's optimal quantity choice from equation (10) into the union's objective function in expression (4) gives:

$$\phi_U = \sum_{i=1}^{n}(1-\Delta_i)\left(\frac{A + \sum_{j=1}^{n}(1-\Delta_j)w}{n+1} - (1-\Delta_i)w\right)(w - w_0), \tag{25}$$

where w is the uniform wage facing all the firms. The first-order condition for an interior maximum with respect to w is:

$$\sum_{i=1}^{n}\left[(1-\Delta_i)\left(\frac{\sum_{j=1}^{n}(1-\Delta_j)}{n+1} - (1-\Delta_i)\right)(w-w_0) + (1-\Delta_i)\left(\frac{A + \sum_{j=1}^{n}(1-\Delta_j)w}{n+1} - (1-\Delta_i)w\right)\right] = 0. \tag{26}$$

If firm i's optimal quantity q_i in equation (10) is positive for all i, then $\partial\phi_U/\partial w > 0$ at $w = w_0$. Hence, in an equilibrium where every firm i's optimal quantity q_i is positive, the union must choose $w > w_0$ to maximize its objective function. After some simplifying and rearranging, the first-order condition can be written as:

$$\sum_{i=1}^{n}\left[-2w\left((n+1)(1-\Delta_i)^2 - (1-\Delta_i)\sum_{j=1}^{n}(1-\Delta_j)\right) + w_0\left((n+1)(1-\Delta_i)^2 - (1-\Delta_i)\sum_{j=1}^{n}(1-\Delta_j)\right) + A(1-\Delta_i)\right] = 0. \tag{27}$$

After distributing the summation operator, we can write:

$$-2w\left[(n+1)\sum_{j=1}^{n}(1-\Delta_j)^2 - \left(\sum_{j=1}^{n}(1-\Delta_j)\right)^2\right] + w_0\left[(n+1)\sum_{j=1}^{n}(1-\Delta_j)^2 - \left(\sum_{j=1}^{n}(1-\Delta_j)\right)^2\right] + A\sum_{j=1}^{n}(1-\Delta_j) = 0. \tag{28}$$

Solving for w gives the expression for $w_{i,U}$ in equation (11). □

A.2 Proof of Proposition 1

Substituting equations (11), (12), (13), and (14) into equation (10), the respective quantities produced by firm i in cases U, C, D, and M are as follows after some simplification:

$$\begin{aligned} q_{i,U} = {} & \frac{A}{n+1}\left(1+\frac{[\sum_j(1-\Delta_j)]^2-(n+1)(1-\Delta_i)\sum_j(1-\Delta_j)}{2(n+1)\sum_j(1-\Delta_j)^2-2[\sum_j(1-\Delta_j)]^2}\right) \\ & +\frac{w_0}{2}\left(\frac{\sum_j(1-\Delta_j)}{n+1}-(1-\Delta_i)\right), \end{aligned} \tag{29}$$

$$q_{i,C} = \frac{A}{2(n+1)}+\frac{w_0}{2}\left(\frac{\sum_j(1-\Delta_j)}{n+1}-(1-\Delta_i)\right), \tag{30}$$

$$q_{i,D} = \frac{nA}{(n+1)^2}+\frac{nw_0}{2n+1}\left(\frac{n\sum_j(1-\Delta_j)}{(n+1)^2}-(1-\Delta_i)\right), \tag{31}$$

$$q_{i,M} = \frac{A}{n+1}+w_0\left(\frac{\sum_j(1-\Delta_j)}{n+1}-(1-\Delta_i)\right). \tag{32}$$

The respective profits of each firm i in cases U, C, D, and M are given by:

$$\pi_{i,U} = q_{i,U}^2,\ \pi_{i,C} = q_{i,C}^2,\ \pi_{i,D} = q_{i,D}^2,\ \pi_{i,M} = q_{i,M}^2. \tag{33}$$

The result below shows that the average profits of the firms are higher in case U than in case C.

Lemma 2. *If $q_{i,U} > 0$ and $q_{i,C} > 0$ for all i, then $\frac{1}{n}\sum_i \pi_{i,U} > \frac{1}{n}\sum_i \pi_{i,C}$.*

Proof. Assume that $q_{i,U} > 0$ and $q_{i,C} > 0$ for all i. Define a_C, $a_{i,U}$, and b_i as follows:

$$a_C = \frac{A}{2(n+1)}, \tag{34}$$

$$a_{i,U} = \frac{A}{n+1}\left(1+\frac{[\sum_j(1-\Delta_j)]^2-(n+1)(1-\Delta_i)\sum_j(1-\Delta_j)}{2(n+1)\sum_j(1-\Delta_j)^2-2[\sum_j(1-\Delta_j)]^2}\right), \tag{35}$$

$$b_i = \frac{w_0}{2}\left(\frac{\sum_j(1-\Delta_j)}{n+1}-(1-\Delta_i)\right). \tag{36}$$

Given these definitions, the quantities produced by firm i in cases U and C can be expressed as:

$$q_{i,U} = a_{i,U}+b_i \text{ and } q_{i,C} = a_C+b_i. \tag{37}$$

Hence, the average profits of the firms in cases U and C can be written as:

$$\frac{1}{n}\sum_i \pi_{i,U} = \frac{1}{n}\sum_i (a_{i,U}+b_i)^2 = \frac{1}{n}\sum_i a_{i,U}^2 + 2\frac{1}{n}\sum_i a_{i,U}b_i + \frac{1}{n}\sum_i b_i^2, \tag{38}$$

$$\frac{1}{n}\sum_i \pi_{i,C} = \frac{1}{n}\sum_i (a_C+b_i)^2 = a_C^2 + 2a_C\frac{1}{n}\sum_i b_i + \frac{1}{n}\sum_i b_i^2. \tag{39}$$

From equations (38) and (39), it suffices to show that $\frac{1}{n}\sum_i a_{i,U}^2 > a_C^2$ and that $2\frac{1}{n}\sum_i a_{i,U}b_i \geq 2a_C\frac{1}{n}\sum_i b_i$, in order to prove that $\frac{1}{n}\sum_i \pi_{i,U} > \frac{1}{n}\sum_i \pi_{i,C}$.

We begin by showing that $\frac{1}{n}\sum_i a_{i,U}^2 > a_C^2$. From Jensen's inequality for convex functions, we know that $\frac{1}{n}\sum_i a_{i,U}^2 > (\frac{1}{n}\sum_i a_{i,U})^2$, where the inequality is strict as long as there exist firms p and

q with $\Delta_p \neq \Delta_q$ and so $a_{p,U} \neq a_{q,U}$. Noting that $a_C > 0$, it suffices to show that $\frac{1}{n}\sum_i a_{i,U} \geq a_C$, in order to prove that $\frac{1}{n}\sum_i a_{i,U}^2 > a_C^2$. Applying the Cauchy-Schwarz inequality, the terms $\sum_i(1-\Delta_i)^2$ and $[\sum_i(1-\Delta_i)]^2$ can be compared as follows:

$$\begin{aligned}\sum_i (1-\Delta_i)^2 &= \sum_i \left(\frac{1}{\sqrt{n}}\right)^2 \sum_i (1-\Delta_i)^2 \\ &\geq \left(\sum_i \left(\frac{1}{\sqrt{n}}\right)(1-\Delta_i)\right)^2 = \frac{1}{n}\left(\sum_i (1-\Delta_i)\right)^2.\end{aligned} \tag{40}$$

Using equation (35) to substitute for $a_{i,U}$ in $\frac{1}{n}\sum_i a_{i,U}$, we obtain the following after some simplification:

$$\begin{aligned}&\frac{1}{n}\sum_i a_{i,U} = \frac{A}{n+1}\left(1 - \frac{[\sum_i(1-\Delta_i)]^2}{2n(n+1)\sum_i(1-\Delta_i)^2 - 2n[\sum_i(1-\Delta_i)]^2}\right) \\ &\geq \frac{A}{n+1}\left(1 - \frac{[\sum_i(1-\Delta_i)]^2}{2n(n+1)\frac{1}{n}[\sum_i(1-\Delta_i)]^2 - 2n[\sum_i(1-\Delta_i)]^2}\right) = \frac{A}{2(n+1)} = a_C,\end{aligned} \tag{41}$$

where the second step follows from applying the inequality in expression (40). Thus, we have $\frac{1}{n}\sum_i a_{i,U}^2 > a_C^2$ as desired.

We end by showing that $2\frac{1}{n}\sum_i a_{i,U} b_i \geq 2a_C\frac{1}{n}\sum_i b_i$. Using equations (34) and (36) to substitute for a_C and b_i in $2a_C\frac{1}{n}\sum_i b_i$, we obtain the following after some simplification:

$$2a_C\frac{1}{n}\sum_i b_i = -\frac{Aw_0\sum_i(1-\Delta_i)}{2n(n+1)^2}. \tag{42}$$

Using equations (35) and (36) to substitute for $a_{i,U}$ and b_i in $2\frac{1}{n}\sum_i a_{i,U} b_i$, we obtain the following after some simplification:

$$\begin{aligned}2\frac{1}{n}\sum_i a_{i,U} b_i &= \frac{Aw_0\sum_i(1-\Delta_i)}{2n(n+1)} - \frac{Aw_0\sum_i(1-\Delta_i)}{n(n+1)^2} \\ &\quad - \frac{Aw_0\sum_i(1-\Delta_i)}{n(n+1)^2}\frac{[\sum_i(1-\Delta_i)]^2}{2(n+1)\sum_i(1-\Delta_i)^2 - 2[\sum_i(1-\Delta_i)]^2} \\ &\geq \frac{Aw_0\sum_i(1-\Delta_i)}{2n(n+1)} - \frac{Aw_0\sum_i(1-\Delta_i)}{n(n+1)^2} \\ &\quad - \frac{Aw_0\sum_i(1-\Delta_i)}{n(n+1)^2}\frac{[\sum_i(1-\Delta_i)]^2}{2(n+1)\frac{1}{n}\left[\sum_i(1-\Delta_i)\right]^2 - 2[\sum_i(1-\Delta_i)]^2} \\ &= \frac{Aw_0\sum_i(1-\Delta_i)}{2n(n+1)} - \frac{Aw_0\sum_i(1-\Delta_i)}{n(n+1)^2} - \frac{Aw_0\sum_i(1-\Delta_i)}{2(n+1)^2} \\ &= -\frac{Aw_0\sum_i(1-\Delta_i)}{2n(n+1)^2} = 2a_C\frac{1}{n}\sum_i b_i,\end{aligned} \tag{43}$$

where the second step follows from applying the inequality in expression (40). Thus, we have $2\frac{1}{n}\sum_i a_{i,U} b_i \geq 2a_C\frac{1}{n}\sum_i b_i$ as desired. □

The result below shows that the average profits of the firms are higher in case D than in case C.

Lemma 3. *If $q_{i,C} > 0$ and $q_{i,D} > 0$ for all i, then $\frac{1}{n}\sum_i \pi_{i,D} > \frac{1}{n}\sum_i \pi_{i,C}$.*

Proof. Assume that $q_{i,C} > 0$ and $q_{i,D} > 0$ for all i. Let $\Delta_{\min}$ and $\Delta_{\max}$ respectively denote the minimum and maximum of the Δ_i. In case C, the quantity $q_{i,C}$ produced by firm i is positive if and only if:

$$\frac{A}{2(n+1)} + \frac{w_0}{2}\left(\frac{\sum_j(1-\Delta_j)}{n+1} - (1-\Delta_i)\right) > 0. \tag{44}$$

The inequality in expression (44) holds for all i if and only if:

$$\frac{A}{2(n+1)} + \frac{w_0}{2}\left(\frac{\sum_j(1-\Delta_j)}{n+1} - (1-\Delta_{\min})\right) > 0, \tag{45}$$

which is equivalent to:

$$A > w_0\big[(n+1)(1-\Delta_{\min}) - \sum_j(1-\Delta_j)\big]. \tag{46}$$

By definition, $\frac{1}{n}\sum_i \pi_{i,D} = \frac{1}{n}\sum_i q_{i,D}^2$ and $\frac{1}{n}\sum_i \pi_{i,C} = \frac{1}{n}\sum_i q_{i,C}^2$. Given that $q_{i,C} > 0$ and $q_{i,D} > 0$ for all i, it suffices to show that $q_{i,D} > q_{i,C}$ for all i, in order to prove that $\frac{1}{n}\sum_i \pi_{i,D} > \frac{1}{n}\sum_i \pi_{i,C}$. The statement $q_{i,D} > q_{i,C}$ is equivalent to:

$$\begin{aligned}\frac{nA}{(n+1)^2} &+ \frac{nw_0}{2n+1}\left(\frac{n\sum_j(1-\Delta_j)}{(n+1)^2} - (1-\Delta_i)\right)\\ &> \frac{A}{2(n+1)} + \frac{w_0}{2}\left(\frac{\sum_j(1-\Delta_j)}{n+1} - (1-\Delta_i)\right).\end{aligned} \tag{47}$$

Because $n/(2n+1) < 1/2$, the inequality in expression (47) is satisfied whenever the following inequality holds:

$$\begin{aligned}\frac{nA}{(n+1)^2} &+ \frac{nw_0}{2n+1}\left(\frac{n\sum_j(1-\Delta_j)}{(n+1)^2} - (1-\Delta_{\max})\right)\\ &> \frac{A}{2(n+1)} + \frac{w_0}{2}\left(\frac{\sum_j(1-\Delta_j)}{n+1} - (1-\Delta_{\max})\right).\end{aligned} \tag{48}$$

Given the inequality in expression (46) as well as the fact that $n/(n+1)^2 > 1/[2(n+1)]$, the inequality in expression (48) is satisfied whenever the following inequality holds:

$$\begin{aligned}&\frac{nw_0}{(n+1)^2}\big[(n+1)(1-\Delta_{\min}) - \sum_j(1-\Delta_j)\big]\\ &\qquad + \frac{nw_0}{2n+1}\left(\frac{n\sum_j(1-\Delta_j)}{(n+1)^2} - (1-\Delta_{\max})\right)\\ &\geq \frac{w_0}{2(n+1)}\big[(n+1)(1-\Delta_{\min}) - \sum_j(1-\Delta_j)\big]\\ &\qquad + \frac{w_0}{2}\left(\frac{\sum_j(1-\Delta_j)}{n+1} - (1-\Delta_{\max})\right)\end{aligned}, \tag{49}$$

which is equivalent to:

$$w_0\{2n[n - \sum_j (1-\Delta_j)] - (1+n)\Delta_{\max} + (1+n-2n^2)\Delta_{\min}\} \geq 0. \tag{50}$$

The inequality in expression (50) is satisfied whenever the following inequality holds:

$$2n\{n - [(n-1)(1-\Delta_{\min}) + (1-\Delta_{\max})]\} - (1+n)\Delta_{\max} + (1+n-2n^2)\Delta_{\min} \geq 0, \tag{51}$$

which reduces to:

$$(n-1)(\Delta_{\max} - \Delta_{\min}) \geq 0. \tag{52}$$

The inequality in expression (52) clearly holds. It follows that $q_{i,D} > q_{i,C}$ for all i as desired. □

The result below shows that the average profits of the firms are higher in case M than in case D.

Lemma 4. *If $q_{i,D} > 0$ and $q_{i,M} > 0$ for all i, then $\frac{1}{n}\sum_i \pi_{i,M} > \frac{1}{n}\sum_i \pi_{i,D}$.*

Proof. Assume that $q_{i,D} > 0$ and $q_{i,M} > 0$ for all i. Let $\Delta_{\min}$ denote the minimum of the Δ_i. In case M, the quantity $q_{i,M}$ produced by firm i is positive if and only if:

$$\frac{A}{n+1} + w_0\left(\frac{\sum_j(1-\Delta_j)}{n+1} - (1-\Delta_i)\right) > 0. \tag{53}$$

The inequality in expression (53) holds for all i if and only if:

$$\frac{A}{n+1} + w_0\left(\frac{\sum_j(1-\Delta_j)}{n+1} - (1-\Delta_{\min})\right) > 0, \tag{54}$$

which is equivalent to:

$$A > w_0[(n+1)(1-\Delta_{\min}) - \sum_j (1-\Delta_j)]. \tag{55}$$

Define f_D, f_M, and g_i as follows:

$$f_D = \frac{nA}{(n+1)^2} - \frac{w_0\sum_j(1-\Delta_j)}{(n+1)^2}, \tag{56}$$

$$f_M = \frac{A}{n+1} - \frac{w_0(1+n^{-1})\sum_j(1-\Delta_j)}{(n+1)^2}, \tag{57}$$

$$g_i = \frac{(n+2+n^{-1})\sum_j(1-\Delta_j)}{(n+1)^2} - (1-\Delta_i). \tag{58}$$

Given these definitions, the quantities produced by firm i in cases D and M can be expressed as:

$$q_{i,D} = f_D + \frac{nw_0}{2n+1}g_i \ \text{ and } \ q_{i,M} = f_M + w_0 g_i. \tag{59}$$

Hence, the average profits of the firms in cases D and M can be written as:

$$\frac{1}{n}\sum_i \pi_{i,D} = \frac{1}{n}\sum_i \left(f_D + \frac{nw_0}{2n+1}g_i\right)^2 = f_D^2 + \frac{2w_0}{2n+1}f_D\sum_i g_i + \frac{nw_0^2}{(2n+1)^2}\sum_i g_i^2, \tag{60}$$

$$\frac{1}{n}\sum_i \pi_{i,M} = \frac{1}{n}\sum_i (f_M + w_0 g_i)^2 = f_M^2 + \frac{2w_0}{n}f_M\sum_i g_i + \frac{w_0^2}{n}\sum_i g_i^2. \tag{61}$$

Noting that $w_0^2/n \geq nw_0^2/(2n+1)^2$, it must be that:

$$\frac{w_0^2}{n}\sum_i g_i^2 \geq \frac{nw_0^2}{(2n+1)^2}\sum_i g_i^2. \tag{62}$$

Moreover, we obtain $\sum_i g_i = 0$ after some simplification. It follows that:

$$\frac{2w_0}{2n+1}f_D\sum_i g_i = \frac{2w_0}{n}f_M\sum_i g_i = 0. \tag{63}$$

Therefore, it suffices to show that $f_M > f_D > 0$, in order to prove that $f_M^2 > f_D^2$ and so $\frac{1}{n}\sum_i \pi_{i,M} > \frac{1}{n}\sum_i \pi_{i,D}$.

We begin by showing that $f_D > 0$. The statement $f_D > 0$ is equivalent to:

$$\frac{nA}{(n+1)^2} - \frac{w_0\sum_j(1-\Delta_j)}{(n+1)^2} > 0. \tag{64}$$

Given the inequality in expression (55), the inequality in expression (64) is satisfied whenever the following inequality holds:

$$\frac{nw_0}{(n+1)^2}\left[(n+1)(1-\Delta_{\min}) - \sum_j(1-\Delta_j)\right] - \frac{w_0\sum_j(1-\Delta_j)}{(n+1)^2} \geq 0. \tag{65}$$

The inequality in expression (65) reduces to:

$$w_0(1-\Delta_{\min}) \geq \frac{w_0}{n}\sum_j(1-\Delta_j), \tag{66}$$

which clearly holds. It follows that $f_D > 0$.

We end by showing that $f_M > f_D$. The statement $f_M > f_D$ is equivalent to:

$$\frac{A}{n+1} - \frac{w_0(1+n^{-1})\sum_j(1-\Delta_j)}{(n+1)^2} > \frac{nA}{(n+1)^2} - \frac{w_0\sum_j(1-\Delta_j)}{(n+1)^2}. \tag{67}$$

Given the inequality in expression (55) as well as the fact that $1/(n+1) > n/(n+1)^2$, the inequality in expression (67) is satisfied whenever the following inequality holds:

$$\begin{aligned}\frac{w_0}{n+1}\left[(n+1)(1-\Delta_{\min}) - \sum_j(1-\Delta_j)\right] - \frac{w_0(1+n^{-1})\sum_j(1-\Delta_j)}{(n+1)^2} \\ \geq \frac{nw_0}{(n+1)^2}\left[(n+1)(1-\Delta_{\min}) - \sum_j(1-\Delta_j)\right] - \frac{w_0\sum_j(1-\Delta_j)}{(n+1)^2}.\end{aligned} \tag{68}$$

The inequality in expression (68) reduces to:

$$w_0(1-\Delta_{\min}) \geq \frac{w_0}{n}\sum_j (1-\Delta_j), \tag{69}$$

which clearly holds. It follows that $f_M > f_D$. □

We next show that in general average profits between regimes D and U and between regimes M and U cannot be ranked. Two simple examples will suffice to demonstrate this conclusion. The following example shows that average profits under regimes D and U cannot in general be ranked.

Example 1. We consider the model with two firms. Assume that the parameters are $\Delta_1 = \Delta$, $\Delta_2 = 0$, $A = 1$, and $w_0 = 0$. In case U, the respective quantities $q_{1,U}$ and $q_{2,U}$ produced by firms 1 and 2 are:

$$q_{1,U} = \frac{1}{6} + \frac{\Delta}{4[1-\Delta(1-\Delta)]} \quad \text{and} \quad q_{2,U} = \frac{5}{12} - \frac{1}{4[1-\Delta(1-\Delta)]}. \tag{70}$$

Note that $q_{1,U} > 0$ and $q_{2,U} > 0$ for all $\Delta \in [0,1]$. In case D, the respective quantities $q_{1,D}$ and $q_{2,D}$ produced by firms 1 and 2 are simply:

$$q_{1,D} = q_{2,D} = \frac{2}{9}. \tag{71}$$

The average profits $\overline{\pi}_U$ of the two firms in case U can be expressed as:

$$\overline{\pi}_U = \tfrac{1}{2}(\pi_{1,U} + \pi_{2,U}) = \tfrac{1}{2}(q_{1,U}^2 + q_{2,U}^2) = \frac{8 + \Delta\{-16 + \Delta[54 - \Delta(46 - 29\Delta)]\}}{288[1-\Delta(1-\Delta)]^2}. \tag{72}$$

The average profits $\overline{\pi}_D$ of the two firms in case D are simply:

$$\overline{\pi}_D = \tfrac{1}{2}(\pi_{1,D} + \pi_{2,D}) = \tfrac{1}{2}(q_{1,D}^2 + q_{2,D}^2) = \frac{4}{81}. \tag{73}$$

The difference between the average profits in cases U and D is given by:

$$\overline{\pi}_U - \overline{\pi}_D = \frac{[-2 + \Delta(2 + 7\Delta)][28 - \Delta(28 - 19\Delta)]}{2592[1-\Delta(1-\Delta)]^2}. \tag{74}$$

Note that $28 - \Delta(28 - 19\Delta)$ is positive for all $\Delta \in [0,1]$. Observe that $-2 + \Delta(2 + 7\Delta)$ is negative for $\Delta = 0$, positive for $\Delta = 1$, and increasing in Δ. It follows that there exists $\kappa \in (0,1)$ such that $\overline{\pi}_U < \overline{\pi}_D$ for $\Delta < \kappa$, $\overline{\pi}_U > \overline{\pi}_D$ for $\Delta > \kappa$, and $\overline{\pi}_U = \overline{\pi}_D$ for $\Delta = \kappa$.

The next example shows that average profits under regimes M and U cannot in general be ranked.

Example 2. We again consider the model with two firms. Assume that the parameters are $\Delta_1 = \frac{2}{3}$, $\Delta_2 = 0$, and $A = 1$. In case U, the respective quantities $q_{1,U}$ and $q_{2,U}$ produced by firms 1 and 2 are:

$$q_{1,U} = \tfrac{8}{21} + \tfrac{1}{18}w_0 \quad \text{and} \quad q_{2,U} = \tfrac{2}{21} - \tfrac{5}{18}w_0. \tag{75}$$

Note that $q_{1,U} > 0$ and $q_{2,U} > 0$ for $w_0 \in [0, \frac{12}{35})$. In case M, the respective quantities $q_{1,M}$ and $q_{2,M}$ produced by firms 1 and 2 are:

$$q_{1,M} = \tfrac{1}{3} + \tfrac{1}{9}w_0 \quad \text{and} \quad q_{2,M} = \tfrac{1}{3} - \tfrac{5}{9}w_0. \tag{76}$$

Note that $q_{1,M} > 0$ and $q_{2,M} > 0$ for $w_0 \in [0, \frac{3}{5})$. The average profits $\overline{\pi}_U$ of the two firms in case U are given by:

$$\overline{\pi}_U = \tfrac{1}{2}(\pi_{1,U} + \pi_{2,U}) = \tfrac{1}{2}(q_{1,U}^2 + q_{2,U}^2) = \frac{1224 + 7w_0(-12 + 91w_0)}{15876}. \tag{77}$$

The average profits $\overline{\pi}_M$ of the two firms in case M are given by:

$$\overline{\pi}_M = \tfrac{1}{2}(\pi_{1,M} + \pi_{2,M}) = \tfrac{1}{2}(q_{1,M}^2 + q_{2,M}^2) = \frac{9 + w_0(-12 + 13w_0)}{81}. \tag{78}$$

The difference between the average profits in cases U and M is given by:

$$\overline{\pi}_U - \overline{\pi}_M = \frac{(6 - 7w_0)(91w_0 - 30)}{5292}. \tag{79}$$

It follows that $\overline{\pi}_U < \overline{\pi}_M$ for $w_0 \in [0, \frac{30}{91})$, $\overline{\pi}_U > \overline{\pi}_M$ for $w_0 \in (\frac{30}{91}, \frac{12}{35})$, and $\overline{\pi}_U = \overline{\pi}_M$ for $w_0 = \frac{30}{91}$.

A.3 Statement and Proof of Proposition 5

The result below ranks the different bargaining regimes according to the average wage cost of firms. The lowest and highest wage costs respectively occur in regimes M and C, whereas regimes D and U feature intermediate values of the average wage cost per unit of output.

Proposition 5. *For each wage-setting regime $\rho \in \{M, D, C, U\}$, define wage costs per unit of output for firm i as $v_{i,\rho} = (1 - \Delta_i)w_{i,\rho}$. Then, average wage costs per unit of output under each wage-setting regime have the following rankings: $\frac{1}{n}\sum_{i=1}^n v_{i,C} > \frac{1}{n}\sum_{i=1}^n v_{i,D} > \frac{1}{n}\sum_{i=1}^n v_{i,M}$ and $\frac{1}{n}\sum_{i=1}^n v_{i,C} > \frac{1}{n}\sum_{i=1}^n v_{i,U} > \frac{1}{n}\sum_{i=1}^n v_{i,M}$.*

The following is the proof. Recall the quantities for each firm and for each regime from equations (29), (30), (31), and (32). The respective wage costs per unit of output for firm i in cases U, C, D, and M are given by:

$$v_{i,U} = (1 - \Delta_i)w_{i,U},\ v_{i,C} = (1 - \Delta_i)w_{i,C},\ v_{i,D} = (1 - \Delta_i)w_{i,D},\ v_{i,M} = (1 - \Delta_i)w_{i,M}. \tag{80}$$

The result below shows that the average wage cost per unit of output is lower in case U than in case C.

Lemma 5. *If $q_{i,U} > 0$ and $q_{i,C} > 0$ for all i, then $\frac{1}{n}\sum_i v_{i,U} < \frac{1}{n}\sum_i v_{i,C}$.*

Proof. Applying the Cauchy-Schwarz inequality, the terms $\sum_i(1 - \Delta_i)^2$ and $[\sum_i(1 - \Delta_i)]^2$ can be compared as follows:

$$\begin{aligned}\sum_i (1 - \Delta_i)^2 &= \sum_i \left(\frac{1}{\sqrt{n}}\right)^2 \sum_i (1 - \Delta_i)^2 \\ &> \left(\sum_i \left(\frac{1}{\sqrt{n}}\right)(1 - \Delta_i)\right)^2 = \frac{1}{n}\left(\sum_i (1 - \Delta_i)\right)^2,\end{aligned} \tag{81}$$

where the inequality is strict as long as there exist firms p and q with $\Delta_p \neq \Delta_q$. The statement $\frac{1}{n}\sum_i v_{i,U} < \frac{1}{n}\sum_i v_{i,C}$ is equivalent to:

$$\frac{A[\sum_j(1 - \Delta_j)]^2}{2(n+1)n\sum_j(1 - \Delta_j)^2 - 2n[\sum_j(1 - \Delta_j)]^2} + \frac{w_0\sum_j(1 - \Delta_j)}{2n} < \frac{A}{2} + \frac{w_0\sum_j(1 - \Delta_j)}{2n}. \tag{82}$$

Using expression (81), condition (82) is satisfied whenever:

$$\frac{A[\sum_j(1-\Delta_j)]^2}{2(n+1)n\frac{1}{n}[\sum_j(1-\Delta_j)]^2-2n[\sum_j(1-\Delta_j)]^2}+\frac{w_0\sum_j(1-\Delta_j)}{2n} \leq \frac{A}{2}+\frac{w_0\sum_j(1-\Delta_j)}{2n}, \tag{83}$$

which reduces to the true statement $1 \leq 1$. □

The result below shows that the average wage cost per unit of output is lower in case M than in case U.

Lemma 6. *If $q_{i,M} > 0$ and $q_{i,U} > 0$ for all i, then $\frac{1}{n}\sum_i v_{i,M} < \frac{1}{n}\sum_i v_{i,U}$.*

Proof. Let $\Delta_{\min}$ denote the minimum of the Δ_i. The condition $q_{i,U} > 0$ is satisfied for all i if and only if:

$$\frac{A}{n+1}\Big(1+\frac{[\sum_j(1-\Delta_j)]^2-(n+1)(1-\Delta_{\min})\sum_j(1-\Delta_j)}{2(n+1)\sum_j(1-\Delta_j)^2-2[\sum_j(1-\Delta_j)]^2}\Big) + \frac{w_0}{2}\Big(\frac{\sum_j(1-\Delta_j)}{n+1}-(1-\Delta_{\min})\Big) > 0, \tag{84}$$

which is equivalent to:

$$A\Big(\frac{2\sum_j(1-\Delta_j)}{(n+1)\sum_j(1-\Delta_{\min})(1-\Delta_j)-[\sum_j(1-\Delta_j)]^2} - \frac{\sum_j(1-\Delta_j)}{(n+1)\sum_j(1-\Delta_j)^2-[\sum_j(1-\Delta_j)]^2}\Big) > w_0. \tag{85}$$

Expression (85) implies that the following inequality holds:

$$A\Big(\frac{2\sum_j(1-\Delta_j)}{(n+1)\sum_j(1-\Delta_j)^2-[\sum_j(1-\Delta_j)]^2} - \frac{\sum_j(1-\Delta_j)}{(n+1)\sum_j(1-\Delta_j)^2-[\sum_j(1-\Delta_j)]^2}\Big) > w_0, \tag{86}$$

which reduces to:

$$\frac{A\sum_j(1-\Delta_j)}{(n+1)\sum_j(1-\Delta_j)^2-[\sum_j(1-\Delta_j)]^2} > w_0. \tag{87}$$

The statement $\frac{1}{n}\sum_i v_{i,M} < \frac{1}{n}\sum_i v_{i,U}$ is equivalent to:

$$\frac{w_0\sum_j(1-\Delta_j)}{n} < \frac{A[\sum_j(1-\Delta_j)]^2}{2(n+1)n\sum_j(1-\Delta_j)^2-2n[\sum_j(1-\Delta_j)]^2}+\frac{w_0\sum_j(1-\Delta_j)}{2n}, \tag{88}$$

which reduces to:

$$w_0 < \frac{A\sum_j(1-\Delta_j)}{(n+1)\sum_j(1-\Delta_j)^2-[\sum_j(1-\Delta_j)]^2}. \tag{89}$$

Expression (89) is the same as the true statement (87). □

The result below shows that the average wage cost per unit of output is lower in case D than in case C.

Lemma 7. *If $q_{i,D} > 0$ and $q_{i,C} > 0$ for all i, then $\frac{1}{n}\sum_i v_{i,D} < \frac{1}{n}\sum_i v_{i,C}$.*

Proof. It follows from $q_{i,C} > 0$ for all i that $\frac{1}{n}\sum_i q_{i,C} > 0$. The condition $\frac{1}{n}\sum_i q_{i,C} > 0$ can be expressed as:

$$\frac{A}{2(n+1)} + \frac{w_0}{2}\left(\frac{\sum_j(1-\Delta_j)}{n+1} - \frac{1}{n}\sum_j(1-\Delta_j)\right) > 0, \tag{90}$$

which reduces to:

$$A > w_0\frac{1}{n}\sum_j(1-\Delta_j). \tag{91}$$

The statement $\frac{1}{n}\sum_i v_{i,D} < \frac{1}{n}\sum_i v_{i,C}$ is equivalent to:

$$\frac{A}{n+1} + \frac{w_0\sum_j(1-\Delta_j)}{n+1} < \frac{A}{2} + \frac{w_0\sum_j(1-\Delta_j)}{2n}, \tag{92}$$

which reduces to:

$$w_0\frac{1}{n}\sum_j(1-\Delta_j) < A. \tag{93}$$

Expression (93) is the same as the true statement (91). □

The result below shows that the average wage cost per unit of output is lower in case M than in case D.

Lemma 8. *If $q_{i,M} > 0$ and $q_{i,D} > 0$ for all i, then $\frac{1}{n}\sum_i v_{i,M} < \frac{1}{n}\sum_i v_{i,D}$.*

Proof. It follows from $q_{i,M} > 0$ for all i that $\frac{1}{n}\sum_i q_{i,M} > 0$. The condition $\frac{1}{n}\sum_i q_{i,M} > 0$ can be expressed as:

$$\frac{A}{n+1} + w_0\left(\frac{\sum_j(1-\Delta_j)}{n+1} - \frac{1}{n}\sum_j(1-\Delta_j)\right) > 0, \tag{94}$$

which reduces to:

$$A > w_0\frac{1}{n}\sum_j(1-\Delta_j). \tag{95}$$

The statement $\frac{1}{n}\sum_i v_{i,M} < \frac{1}{n}\sum_i v_{i,D}$ is equivalent to:

$$w_0\frac{1}{n}\sum_j(1-\Delta_j) < \frac{A}{n+1} + \frac{w_0\sum_j(1-\Delta_j)}{n+1}, \tag{96}$$

which reduces to:

$$w_0\frac{1}{n}\sum_j(1-\Delta_j) < A. \tag{97}$$

Expression (97) is the same as the true statement (95). □

Finally, the following example shows that in general, the average wage costs per unit of output under regimes D and U cannot be ranked.

Example 3. We consider the model with two firms. Assume that the parameters are $\Delta_1 = \Delta$, $\Delta_2 = 0$, $A = 1$, and $w_0 = 0$. In case U, the wages $w_{1,U}$ and $w_{2,U}$ faced by firms 1 and 2 are:

$$w_{1,U} = \frac{2-\Delta}{4[1-(1-\Delta)\Delta]} \ \text{ and } \ w_{2,U} = \frac{2-\Delta}{4[1-(1-\Delta)\Delta]}; \tag{98}$$

so that, the respective wage costs $v_{1,U}$ and $v_{2,U}$ per unit of output for firms 1 and 2 are:

$$v_{1,U} = (1-\Delta)w_{1,U} = \frac{(2-\Delta)(1-\Delta)}{4[1-(1-\Delta)\Delta]} \ \text{ and } \ v_{2,U} = w_{2,U} = \frac{2-\Delta}{4[1-(1-\Delta)\Delta]}. \tag{99}$$

In case D, the respective wages $w_{1,D}$ and $w_{2,D}$ faced by firms 1 and 2 are:

$$w_{1,D} = \frac{1}{3(1-\Delta)} \ \text{ and } \ w_{2,D} = \frac{1}{3}; \tag{100}$$

so that, the wage costs $v_{1,D}$ and $v_{2,D}$ per unit of output for firms 1 and 2 are:

$$v_{1,D} = (1-\Delta)w_{1,D} = \frac{1}{3} \ \text{ and } \ v_{2,D} = w_{2,D} = \frac{1}{3}. \tag{101}$$

Moreover, it can be verified that the quantity produced by each firm in cases U and D is positive for all $\Delta \in [0,1]$. The average wage cost $\overline{v}_U$ per unit of output in case U is given by:

$$\overline{v}_U = \tfrac{1}{2}(v_{1,U} + v_{2,U}) = \frac{(2-\Delta)^2}{8[1-(1-\Delta)\Delta]}. \tag{102}$$

The average wage cost $\overline{v}_D$ per unit of output in case D is simply:

$$\overline{v}_D = \tfrac{1}{2}(v_{1,D} + v_{2,D}) = \frac{1}{3}. \tag{103}$$

The difference between the average wage costs per unit of output in cases U and D can be expressed as:

$$\overline{v}_U - \overline{v}_D = \frac{4-\Delta(4+5\Delta)}{24[1-(1-\Delta)\Delta]}. \tag{104}$$

Note that $4-\Delta(4+5\Delta)$ is positive for $\Delta = 0$, negative for $\Delta = 1$, and continuously decreasing in Δ. It follows that there exists $\chi \in (0,1)$ such that $\overline{v}_U > \overline{v}_D$ for $\Delta < \chi$, $\overline{v}_U < \overline{v}_D$ for $\Delta > \chi$, and $\overline{v}_U = \overline{v}_D$ for $\Delta = \chi$.

A.4 Proof of Proposition 2

The result follows straightforwardly from the first-order conditions for, respectively, the choice of diversion R and the choice of investment I. For S's choice of diversion, the first-order condition for a maximum gives $R(\alpha,\lambda) = z'^{-1}[(1-\alpha)/x(\lambda)]$. The second-order condition for a global maximum is satisfied. As can be seen, R is decreasing in α and λ. For S's choice of investment, the first-order condition for a maximum gives $I(\alpha,\Pi) = c'^{-1}[\alpha \cdot g(\Pi)]$. The second-order condition for a global maximum is satisfied. As can be seen, I is increasing in α and decreasing in Π. □

A.5 Proof of Proposition 3

Observe that $C(u)$ is by definition increasing and satisfies $C(0) = 0$ and $C[g(b_p)] < 1$. Further note that $I(\alpha, \Pi) = C[\alpha \cdot g(\Pi)]$ for all $\alpha \in [0,1]$ and $\Pi \in [b_p, \infty)$. Likewise, $Z(v)$ is by definition increasing with $Z(0) = 0$ and $Z[1/x(0)] < b_p - b_r$. Further note that $R(\alpha, \lambda) = Z[(1-\alpha)/x(\lambda)]$ for all $\alpha \in [0,1]$ and $\lambda \in [0, \infty)$.

To facilitate the proof, it will be convenient to rearrange S's expected payoff. After some substitution and simplification, the expected payoff to S given α, λ, and Π can be expressed as:

$$\begin{aligned} W(\alpha, \lambda, \Pi) &= \Pi + I(\alpha, \Pi) \cdot g(\Pi) - r(\alpha) + w(\alpha) - c[I(\alpha, \Pi)] - x(\lambda) \cdot z[R(\alpha, \lambda)] \\ &= W_1(\alpha, \Pi) + W_2(\alpha, \Pi) + W_3(\alpha, \lambda), \end{aligned} \tag{105}$$

where the functions $W_1(\alpha, \Pi)$, $W_2(\alpha, \Pi)$, and $W_3(\alpha, \lambda)$ are defined as follows:

$$W_1(\alpha, \Pi) = \Pi - r(\alpha) + w(\alpha), \tag{106}$$

$$W_2(\alpha, \Pi) = I(\alpha, \Pi) \cdot g(\Pi) - c[I(\alpha, \Pi)], \tag{107}$$

$$W_3(\alpha, \lambda) = -x(\lambda) \cdot z[R(\alpha, \lambda)]. \tag{108}$$

We begin by calculating the partial derivative of $W(\alpha, \lambda, \Pi)$ with respect to α. The partial derivative of $W_1(\alpha, \Pi)$ with respect to α is simply:

$$\frac{\partial W_1(\alpha, \Pi)}{\partial \alpha} = w'(\alpha) - r'(\alpha). \tag{109}$$

The partial derivative of $W_2(\alpha, \Pi)$ with respect to α can be calculated as follows:

$$\begin{aligned} \frac{\partial W_2(\alpha, \Pi)}{\partial \alpha} &= \frac{\partial}{\partial \alpha}\{\alpha \cdot I(\alpha, \Pi) \cdot g(\Pi) - c[I(\alpha, \Pi)]\} + \frac{\partial}{\partial \alpha}[(1-\alpha) \cdot I(\alpha, \Pi) \cdot g(\Pi)] \\ &= [I(\alpha, \Pi) \cdot g(\Pi)] + [(1-\alpha) \cdot \frac{\partial I(\alpha, \Pi)}{\partial \alpha} \cdot g(\Pi) - I(\alpha, \Pi) \cdot g(\Pi)] \\ &= (1-\alpha) \cdot \frac{\partial I(\alpha, \Pi)}{\partial \alpha} \cdot g(\Pi), \end{aligned} \tag{110}$$

where the envelope theorem is used to compute the derivative of the expression inside braces after the first equality. The partial derivative of $W_3(\alpha, \lambda)$ with respect to α can be calculated as follows:

$$\begin{aligned} \frac{\partial W_3(\alpha, \lambda)}{\partial \alpha} &= \frac{\partial}{\partial \alpha}\{(1-\alpha) \cdot R(\alpha, \lambda) - x(\lambda) \cdot z[R(\alpha, \lambda)]\} + \frac{\partial}{\partial \alpha}[-(1-\alpha) \cdot R(\alpha, \lambda)] \\ &= [-R(\alpha, \lambda)] + [R(\alpha, \lambda) - (1-\alpha) \cdot \frac{\partial R(\alpha, \lambda)}{\partial \alpha}] = -(1-\alpha) \cdot \frac{\partial R(\alpha, \lambda)}{\partial \alpha}, \end{aligned} \tag{111}$$

where the envelope theorem is used to compute the derivative of the expression inside braces after the first equality. Hence, the partial derivative of $W(\alpha, \lambda, \Pi)$ with respect to α is given by:

$$\begin{aligned} \frac{\partial W(\alpha, \lambda, \Pi)}{\partial \alpha} &= \frac{\partial W_1(\alpha, \Pi)}{\partial \alpha} + \frac{\partial W_2(\alpha, \Pi)}{\partial \alpha} + \frac{\partial W_3(\alpha, \lambda)}{\partial \alpha} \\ &= (1-\alpha) \cdot \frac{\partial I(\alpha, \Pi)}{\partial \alpha} \cdot g(\Pi) - (1-\alpha) \cdot \frac{\partial R(\alpha, \lambda)}{\partial \alpha} - r'(\alpha) + w'(\alpha). \end{aligned} \tag{112}$$

It follows from $r'(1) > w'(1)$ that $\partial W(1, \lambda, \Pi)/\partial \alpha < 0$ for all $\lambda \geq 0$ and $\Pi \geq b_p$. It follows from $r'(0) < w'(0)$, $\partial I(0, \Pi)/\partial \alpha > 0$, and $\partial R(0, \lambda)/\partial \alpha < 0$ that $\partial W(0, \lambda, \Pi)/\partial \alpha > 0$ for all $\lambda \geq 0$ and

$\Pi \geq b_p$. Moreover, given any $\lambda \in [0, \infty)$ and $\Pi \in [b_p, \infty)$, the term $\partial W(\alpha, \lambda, \Pi)/\partial\alpha$ is continuously decreasing in α for all $\alpha \in [0, 1]$.

Hence, given any $\lambda \geq 0$ and $\Pi \geq b_p$, there exists a unique ownership share $\alpha \in (0, 1)$ that maximizes the expected payoff $W(\alpha, \lambda, \Pi)$ to agent S. The maximizer $\alpha(\lambda, \Pi)$ is implicitly defined by the first-order condition:

$$
\begin{aligned}
[1 - \alpha(\lambda, \Pi)] \cdot \frac{\partial I[\alpha(\lambda, \Pi), \Pi]}{\partial \alpha} \cdot g(\Pi) - [1 - \alpha(\lambda, \Pi)] \cdot \frac{\partial R[\alpha(\lambda, \Pi), \lambda]}{\partial \alpha} \\
- r'[\alpha(\lambda, \Pi)] + w'[\alpha(\lambda, \Pi)] = 0.
\end{aligned}
\tag{113}
$$

We next describe how changes in the profit level Π affect the ownership share $\alpha(\lambda, \Pi)$ at a given level of investor protection λ. Recall that given any k such that $0 < k < 1$, the term $e^2 \cdot C'(k \cdot e)$ is increasing in e for all e such that $0 \leq e \leq c'(1)/k$. The only term in the first-order condition that depends directly on Π is:

$$
[1 - \alpha(\lambda, \Pi)] \cdot \frac{\partial I[\alpha(\lambda, \Pi), \Pi]}{\partial \alpha} \cdot g(\Pi) = [1 - \alpha(\lambda, \Pi)] \cdot C'[\alpha(\lambda, \Pi) \cdot g(\Pi)] \cdot [g(\Pi)]^2. \tag{114}
$$

If $\alpha(\lambda, \Pi)$ is constant, an increase in Π will decrease the preceding expression, thereby lowering the left-hand side of the first-order condition. In order to offset this change, $\alpha(\lambda, \Pi)$ must decrease, thereby raising the left-hand side of the first-order condition. This implies that the ownership share $\alpha(\lambda, \Pi)$ is decreasing in the profit level Π at a given level of investor protection λ.

We now describe how changes in investor protection λ affect the ownership share $\alpha(\lambda, \Pi)$ at a given profit level Π. By assumption, $x(\lambda)$ is increasing in λ for all $\lambda \geq 0$. Recall that given any k such that $0 < k < 1$, the term $Z'(k/e)/e$ is decreasing in e for all e such that $e \geq x(0)$. The only term in the first-order condition that depends directly on λ is:

$$
-[1 - \alpha(\lambda, \Pi)] \cdot \frac{\partial R[\alpha(\lambda, \Pi), \lambda]}{\partial \alpha} = [1 - \alpha(\lambda, \Pi)] \cdot Z'\{[1 - \alpha(\lambda, \Pi)]/x(\lambda)\}/x(\lambda). \tag{115}
$$

If $\alpha(\lambda, \Pi)$ is constant, an increase in λ will decrease the preceding expression, thereby lowering the left-hand side of the first-order condition. In order to offset this change, $\alpha(\lambda, \Pi)$ must decrease, thereby raising the left-hand side of the first-order condition. This implies that the ownership share $\alpha(\lambda, \Pi)$ is decreasing in investor protection λ at a given profit level Π. □

A.6 Proof of Proposition 4

Applying the envelope theorem, the partial derivative of $\Phi(\lambda, \Pi)$ with respect to λ can be calculated as follows:

$$
\begin{aligned}
\frac{\partial \Phi(\lambda, \Pi)}{\partial \lambda} &= \frac{\partial W[\alpha(\lambda, \Pi), \lambda, \Pi]}{\partial \lambda} - h'(\lambda) = \frac{\partial}{\partial \lambda}(-x(\lambda) \cdot z\{R[\alpha(\lambda, \Pi), \lambda]\}) - h'(\lambda) \\
&= \frac{\partial}{\partial \lambda}\left\{-x(\lambda) \cdot z\left[Z\left(\frac{1 - \alpha(\lambda, \Pi)}{x(\lambda)}\right)\right]\right\} - h'(\lambda) \\
&= x'(\lambda) \cdot \left\{-z\left[Z\left(\frac{1 - \alpha(\lambda, \Pi)}{x(\lambda)}\right)\right] + \left(\frac{1 - \alpha(\lambda, \Pi)}{x(\lambda)}\right)^2 \cdot Z'\left(\frac{1 - \alpha(\lambda, \Pi)}{x(\lambda)}\right)\right\} - h'(\lambda).
\end{aligned}
\tag{116}
$$

For any $\Pi \geq b_p$, the regularity conditions stated in the text imply that $[\partial \Phi(0, \Pi)/\partial \lambda]/x'(0) > 0$, $\lim_{\lambda \to \infty}[\partial \Phi(\lambda, \Pi)/\partial \lambda]/x'(\lambda) < 0$, and $[\partial \Phi(\lambda, \Pi)/\partial \lambda]/x'(\lambda)$ is decreasing in λ for all $\lambda \geq 0$. Note that $\partial \Phi(\lambda, \Pi)/\partial \lambda$ has the same sign as $[\partial \Phi(\lambda, \Pi)/\partial \lambda]/x'(\lambda)$ for all $\lambda \geq 0$. It follows that there exists a unique maximizer $\lambda(\Pi)$, which is defined by the first-order condition:

$$-z\left[Z\left(\frac{1-\alpha[\lambda(\Pi),\Pi]}{x[\lambda(\Pi)]}\right)\right]+\left(\frac{1-\alpha[\lambda(\Pi),\Pi]}{x[\lambda(\Pi)]}\right)^2\cdot Z'\left(\frac{1-\alpha[\lambda(\Pi),\Pi]}{x[\lambda(\Pi)]}\right)=\frac{h'[\lambda(\Pi)]}{x'[\lambda(\Pi)]}. \tag{117}$$

We now describe how changes in the profit level Π affect the level of investor protection $\lambda(\Pi)$. If $\lambda(\Pi)$ is constant, then an increase in Π lowers $\alpha[\lambda(\Pi),\Pi]$, which raises $\{1-\alpha[\lambda(\Pi),\Pi]\}/x[\lambda(\Pi)]$, thereby increasing the left-hand side of the first-order condition. In order to offset this change, $\lambda(\Pi)$ must rise, thereby decreasing the left-hand side and increasing the right-hand side of the first-order condition. This implies that investor protection $\lambda(\Pi)$ is increasing in the profit level Π. Along with the results above, it also implies that the ownership share $\alpha[\lambda(\Pi),\Pi]$ is decreasing in the profit level Π. □

Example 4. We provide an example of functions that satisfy the regularity conditions in assumptions 1, 2, and 3. Let $\lambda \geq 0$ denote the level of investor protection. The cost-of-enforcement function is given by $h(\lambda)=\lambda^2$. Let $\alpha \in [0,1]$ signify the fraction of the firm that the large shareholder S retains. The private benefits of control are specified as $w(\alpha)=1/2-(1-\alpha)^2/2$, and the loss due to corruption or mismanagement is assumed to be $r(\alpha)=\alpha^2/2$. Let $I \in [0,1]$ represent the investment level that agent S chooses. The cost-of-investment function is given by $c(I)=I^2/2$. Assume that the expected payout of the firm without reorganization is $\Pi \geq 1$. As in equation (6), the term $g(\Pi)$ denotes the predicted increase in the expected value of the firm when a reorganization opportunity is discovered. Assume that $g(\Pi)$ is a decreasing function with $0<g(\Pi)<1$ for all $\Pi \geq 1$. Let $R \geq 0$ be the amount of funds diverted from the firm. The penalty-for-diversion function has the form $d(R,\lambda)=x(\lambda)\cdot z(R)$, where $x(\lambda)=1+\lambda$, and $z(R)=2R^2$.

It is straightforward to confirm that the conditions in assumption 1 are satisfied given the functions above. In this case, the expected payoff to agent S in equation (7) can be expressed as:

$$Y(I,R,\alpha,\Pi)=\alpha[\Pi+I\cdot g(\Pi)-\alpha^2/2-R]+[1/2-(1-\alpha)^2/2]+R-I^2/2-2(1+\lambda)R^2. \tag{118}$$

It can easily be shown that the diversion amount R that maximizes the expected payoff $Y(I,R,\alpha,\Pi)$ is given by:

$$R(\alpha,\lambda)=(1-\alpha)/[4(1+\lambda)] \tag{119}$$

and that the investment level I that maximizes the expected payoff $Y(I,R,\alpha,\Pi)$ is given by:

$$I(\alpha,\Pi)=\alpha\cdot g(\Pi). \tag{120}$$

Define $C(u)=c'^{-1}(u)=u$ for $0\leq u\leq 1$. Define $Z(v)=z'^{-1}(v)=v/4$ for $0\leq v\leq 1$. It is straightforward to check that this example satisfies assumption 2. The expected payoff to agent S in equation (8) can be written as follows after some simplification:

$$W(\alpha,\lambda,\Pi)=\{\Pi+\alpha\cdot[g(\Pi)]^2-\alpha^2/2\}+[1/2-(1-\alpha)^2/2]-\alpha^2\cdot[g(\Pi)]^2/2-(1-\alpha)^2/[8(1+\lambda)]. \tag{121}$$

It can easily be shown that the ownership share α that maximizes the expected payoff $W(\alpha,\lambda,\Pi)$ is:

$$\alpha(\lambda,\Pi)=\{5+4\lambda+4(1+\lambda)[g(\Pi)]^2\}/\{9+8\lambda+4(1+\lambda)[g(\Pi)]^2\}. \tag{122}$$

It is simple to see that these functions satisfy the requirements of assumption 3.

References

Admati, Anat R., Paul Pfleiderer, and Josef Zechner (1994). "Large Shareholder Activism, Risk Sharing, and Financial Market Equilibrium." *Journal of Political Economy* 102(6):1097–1130.

Atanassov, Julian, and E. Han Kim (2009). "Labor and Corporate Governance: International Evidence from Restructuring Decisions." *Journal of Finance* 64(1):341–374.

Barth, Erling, Karl O. Moene, and Fredrik Willumsen (2014). "The Scandinavian Model—An Interpretation." *Journal of Public Economics* 117:60–72.

Bebchuk, Lucian Arye (1999). "A Rent-Protection Theory of Corporate Ownership and Control." National Bureau of Economic Research, Working Paper 7203, `http://www.nber.org/papers/w7203`.

Beck, Thorsten, Asli Demirgüç-Kunt, and Ross Levine (2003). "Law and Finance: Why Does Legal Origin Matter?" *Journal of Comparative Economics* 31(4):653–675.

Bolton, Patrick and Ernst-Ludwig von Thadden (1998). "Blocks, Liquidity, and Corporate Control." *Journal of Finance* 53(1):1–25.

Burkart, Mike, Denis Gromb, and Fausto Panunzi (1997). "Large Shareholders, Monitoring, and the Value of the Firm." *Quarterly Journal of Economics* 112(3):693–728.

Calmfors, Lars and John Driffill (1988). "Bargaining Structure, Corporatism, and Macroeconomic Performance." *Economic Policy* 3(6):14–61.

Carlson, Laura (2009). *Fundamentals of Swedish Law*. Lund, Sweden: Studentlitteratur.

Cukierman, Alex and Francesco Lippi (1999). "Central Bank Independence, Centralization of Wage Bargaining, Inflation and Unemployment: Theory and Some Evidence." *European Economic Review* 43(7):1395–1434.

Cusack, Thomas R. and Lutz Engelhardt (2002). *Parties, Governments, and Legislatures Data Set*, `www.wzb.eu/alt/ism/people/misc/cusack/d_sets.en.htm`, accessed June 3, 2014.

Djankov, Simeon, Rafael La Porta, Florencio Lopez-de-Silanes, and Andrei Shleifer (2008). "The Law and Economics of Self-Dealing." *Journal of Financial Economics* 88(3):430–465.

Ferner, Anthony, and Richard Hyman (1998). *Changing Industrial Relations in Europe*. Oxford, UK: Blackwell.

Galenson, Walter (1952). *The Danish System of Labor Relations: A Study in Industrial Peace*. Cambridge, MA: Harvard University Press.

Gourevitch, Peter A. and James Shinn (2005). *Political Power and Corporate Control: The New Global Politics of Corporate Governance*. Princeton: Princeton University Press.

Haber, Stephen, Douglass North, and Barry Weingast (2007). *Political Institutions and Financial Development*. Redwood City, CA: Stanford University Press.

Hall, Peter A. and Robert J. Franzese, Jr. (1998). "Mixed Signals: Central Bank Independence, Coordinated Wage Bargaining, and European Monetary Union." *International Organization* 52(3):505–535.

Hall, Peter A. and David Soskice (2001). "An Introduction to Varieties of Capitalism." In Peter Hall, ed., *Varieties of Capitalism: The Institutional Foundations of Comparative Advantage*, 50–51. Oxford: Oxford University Press.

Haucap, Justus, and Christian Wey (2004). "Unionisation Structure and Innovation Incentives." *Economic Journal* 114(494):C149–C165.

Hibbs, Douglas A., Jr. and Håkan Locking, "Wage Dispersion and Productive Efficiency: Evidence for Sweden." *Journal of Labor Economics* 18(4):755–782.

Högfeldt, Peter (2007). "The History and Politics of Corporate Ownership in Sweden." In Randall K. Morck, ed., *A History of Corporate Governance around the World: Family Business Groups to Professional Managers*. Chicago: National Bureau of Economic Research.

Iversen, Torben (1998). "Wage Bargaining, Central Bank Independence, and the Real Effects of Money." *International Organization* 52(3):469–504, data available at `http://www.people.fas.harvard.edu/~iversen/centralization.htm`.

Iversen, Torben, Jonas Pontusson, and David Soskice (2000). *Unions, Employers, and Central Banks: Macroeconomic Coordination and Institutional Change in Social Market Economies*. Cambridge: Cambridge University Press.

Kenworthy, Lane (2001). "Wage-Setting Measures." *World Politics* 54(1):57–98.

Kraakman, Reinier, John Armour, Paul Davies, Luca Enriques, Henry Hansmann, Gerard Hertig, Klaus Hopt, Hideki Kanada, and Edward Rock (2009). *The Anatomy of Corporate Law: A Comparative and Functional Approach*. 2nd ed. Oxford: Oxford University Press.

La Porta, Rafael, Florencio Lopez-de-Silanes, and Andrei Shleifer (1999). "Corporate Ownership Around the World." *Journal of Finance* 54(2):471–517.

La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert W. Vishny (1997). "Legal Determinants of External Finance." *Journal of Finance* 52(3):1131–1150.

La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert W. Vishny (1998). "Law and Finance." *Journal of Political Economy* 106(6):1113–1155.

La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert W. Vishny (2000). "Investor Protection and Corporate Governance." *Journal of Financial Economics* 58(1):3–27.

Lee, Woojin and John E. Roemer (2005). "The Rise and Fall of Unionised Labour Markets: A Political Economy Approach." *Economic Journal* 115(500):28–67.

Meisenzahl, Ralf R. (2015). "Organization Matters: Trade Union Behavior during Peace and War." *Journal of Comparative Economics*. Forthcoming.

Moene, Karl Ove, and Michael Wallerstein (1997). "Pay Inequality." *Journal of Labor Economics* 15(3):403–430.

Oskarsson, Sven (2003). "Institutional Explanations of Union Strength: An Assessment." *Politics & Society* 31(4):609–635.

Pagano, Marco, and Paolo F. Volpin (2005a). "The Political Economy of Corporate Governance." *American Economic Review* 95(4):1005–1030.

Pagano, Marco, and Paolo F. Volpin (2005b). "Managers, Workers, and Corporate Control." *Journal of Finance* 60(2):841–868.

Perotti, Enrico, and Ernst-Ludwig von Thadden (2006). "The Political Economy of Corporate Control and Labor Rents." *Journal of Political Economy* 114(1):145–175.

Pistor, Katharina (1999). "Codetermination: A Sociopolitical Model with Governance Externalities." In Margaret M. Blair and Mark J. Roe, eds., *Employees and Corporate Governance*. Washington, DC: Brookings Institution Press.

Pontusson, Jonas, and Peter Swenson (1996). "Labor Markets, Production Strategies, and Wage Bargaining Institutions: The Swedish Employer Offensive in Comparative Perspective." *Comparative Political Studies* 29(2):223–250.

Pontusson, Jonas, David Rueda, and Christopher Way (2002). "Comparative Political Economy of Wage Distribution: The Role of Partisanship and Labour Market Institutions." *British Journal of Political Science* 32(2):281–308.

Rajan, Raghuram G. and Luigi Zingales (2003). "The Great Reversals: The Politics of Financial Development in the Twentieth Century." *Journal of Financial Economics* 69(1):5–50.

Roe, Mark (2000). "Political Preconditions to Separating Ownership from Corporate Control." *Stanford Law Review* 53:539–606.

Roe, Mark (2003). *Political Determinants of Corporate Governance: Political Context, Corporate Impact*. Oxford: Oxford University Press.

Roe, Mark (2006). "Legal Origins, Politics, and Modern Stock Markets." *Harvard Law Review* 120:460–527.

Scheve, Kenneth and David Stasavage (2009). "Institutions, Partisanship, and Inequality in the Long Run." *World Politics* 61(2):215–253.

Shleifer, Andrei, and Robert W. Vishny (1986). "Large Shareholders and Corporate Control." *Journal of Political Economy* 94(3):461–488.

Spamann, Holger (2010). “The ‘Antidirector Rights Index’ Revisited.” *Review of Financial Studies* 23(2):467–486.

Swenson, Peter (1991). “Bringing Capital Back in, or Social Democracy Reconsidered: Employer Power, Cross-Class Alliances, and Centralization of Industrial Relations in Denmark and Sweden.” *World Politics* 43(4):513–544.

Swenson, Peter A. (2002). *Capitalists against Markets: The Making of Labor Markets and Welfare States in the United States and Sweden*. Oxford: Oxford University Press.

Thelen, Kathleen (2014). *Varieties of Liberalization and the New Politics of Social Solidarity*. Cambridge: Cambridge University Press.

Traxler, Franz, Sabine Blaschke, and Bernhard Kittel (2001). *National Labour Relations in Internationalized Markets: A Comparative Study of Institutions, Change, and Performance*. Oxford: Oxford University Press.

Visser, Jelle (2009). *Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts in 34 Countries between 1960 and 2007*, `http://www.uva-aias.net/208`, accessed April 16, 2013.

Wallerstein, Michael (1999). “Wage-Setting Institutions and Pay Inequality in Advanced Industrial Societies.” *American Journal of Political Science* 43(3):649–680.

Wallerstein, Michael, Miriam Golden, and Peter Lange (1997). “Unions, Employers’ Associations, and Wage-Setting Institutions in Northern and Central Europe, 1950–1992.” *Industrial and Labor Relations Review* 50(3):379–401.

Table 1: Labor Indicators

Legal origin Country	Centralization (Traxler et al.)	Centralization (Iversen)	Union density	Partisanship
English	**4.9**	**0.206**	**35.35**	**0.41**
Australia	9.9	0.499	36.48	0.46
Canada	1	0.071	32.10	0.35
Ireland	9.9	.	45.62	0.43
New Zealand	5	.	42.39	0.41
United Kingdom	2.6	0.182	38.08	0.42
United States	1	0.071	17.41	0.38
French	**5.83**	**0.242**	**32.68**	**0.37**
Belgium	3.9	0.309	50.08	0.35
France	4	0.127	12.96	0.37
Italy	9.4	0.167	40.13	0.40
Netherlands	6	0.366	27.55	0.34
German	**4.5**	**0.315**	**31.28**	**0.42**
Austria	5	0.439	46.11	0.31
Germany	6	0.334	29.64	0.34
Japan	2	0.240	26.26	0.78
Switzerland	5	0.248	23.23	0.23
Scandinavian	**9.43**	**0.488**	**69.29**	**0.25**
Denmark	7.3	0.482	73.26	0.36
Finland	11	0.428	70.69	0.28
Norway	11	0.517	55.72	0.20
Sweden	8.4	0.525	77.49	0.15
Mean	**6.02**	**0.31**	**41.39**	**0.37**
(S.D.)	**(3.33)**	**(0.16)**	**(18.63)**	**(0.22)**

Notes: Bargaining centralization measures are from Traxler et al. (2001) and Iversen (1998). See those papers for details on the methodology. Union density is from Visser (2009) and is the net union membership rate as a proportion of wage and salary earners. Partisanship is from Cusack and Engelhardt (2002) and is an index of the partisan left-right "center of gravity" of the cabinet based on the average of three expert classifications of government parties' placement on a left-right scale. The index is standardized to vary between 0 and 1, with lower values indicating a more left-leaning partisan direction.

Table 2: Corporate Indicators

Legal origin Country	Ownership concentration	Shareholder protection	Market capitalization	Block premium
English	**0.32**	**4.5**	**102.62**	**0.02**
Australia	0.28	4	101.97	0.01
Canada	0.40	5	106.18	0.01
Ireland	0.39	4	67.65	.
New Zealand	0.48	4	40.10	0.04
United Kingdom	0.19	5	157.70	0.00
United States	0.20	5	142.14	0.02
French	**0.46**	**2.0**	**85.29**	**0.07**
Belgium	0.54	2	67.16	.
France	0.34	3	89.49	0.01
Italy	0.58	1	52.77	0.16
Netherlands	0.39	2	131.74	0.03
German	**0.41**	**2.5**	**97.30**	**0.14**
Austria	0.58	2	16.39	0.38
Germany	0.48	2	54.69	0.11
Japan	0.18	4	69.17	-0.01
Switzerland	0.41	2	248.96	0.07
Scandinavian	**0.37**	**3.0**	**96.92**	**0.02**
Denmark	0.45	2	58.60	0.04
Finland	0.37	3	177.11	0.01
Norway	0.36	4	39.69	0.01
Sweden	0.28	3	112.27	0.03
Mean	**0.38**	**3.17**	**96.32**	**0.06**
(S.D.)	**(0.12)**	**(1.25)**	**(58.21)**	**(0.10)**

Notes: The shareholder protection index is from Pagano and Volpin (2005a). All other measures are from Djankov et al. (2008). See the respective papers for details on the methodology.

Figure 1: Bargaining Centralization and Ownership Concentration

Quadratic specification. Sources: bargaining centralization, Traxler et al. (2001); ownership concentration, Djankov et al. (2008).

Figure 2: Bargaining Centralization and Shareholder Protection

Quadratic specification. Sources: bargaining centralization, Traxler et al. (2001); shareholder protection, Pagano and Volpin (2005a).

Figure 3: Timeline of Decision Making

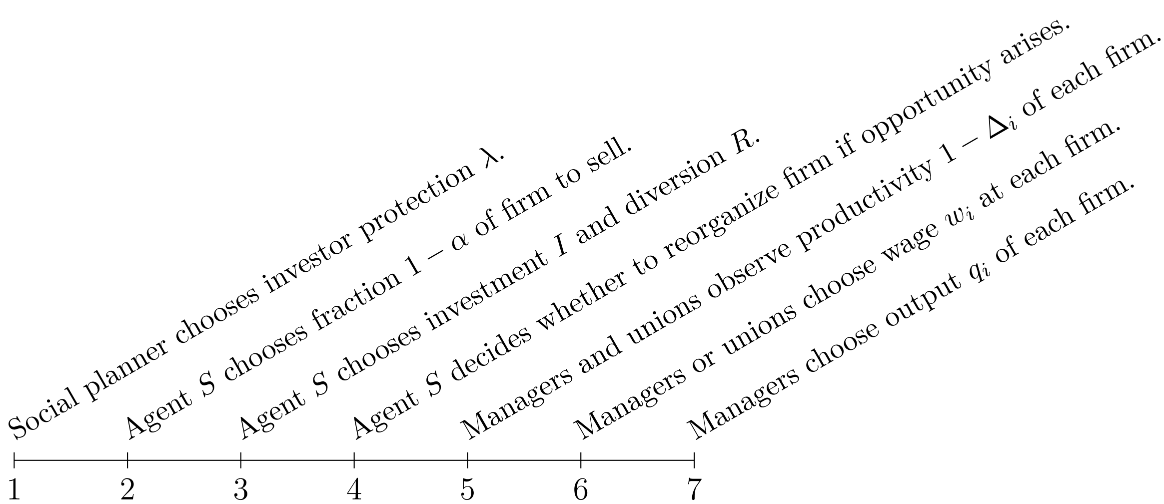

Table 3: Relationship of Bargaining Centralization to Ownership Concentration and Shareholder Protection

	Ownership Concentration		**Shareholder Protection**	
Centralization	0.010	0.082*	-0.117	-0.993*
	(0.008)	(0.028)	(0.077)	(0.239)
$(\text{Centralization})^2$	——	-0.006*	——	0.067*
		(0.002)		(0.018)
Constant	0.325*	0.166*	3.88*	5.81*
	(0.056)	(0.077)	(0.552)	(0.653)
R^2	0.084	0.379	0.125	0.552
Observations	18	18	18	18

Notes: The variables for ownership concentration and shareholder protection are respectively obtained from Djankov et al. (2008) and Pagano and Volpin (2005a). The bargaining centralization measure in Traxler et al. (2001) is used. Standard errors are in parentheses. An asterisk denotes statistical significance at the 5 percent level.

Table 4: Relationship of Bargaining Centralization to Ownership Concentration and Shareholder Protection after Controlling for Country Characteristics

	Ownership Concentration								Shareholder Protection							
Centralization	.082*	.079*	.082*	.081*	.075*	.082*	.104*	.085*	-.971*	-.978*	-.993*	-.991*	-1.02*	-1.00*	-.773	-.581*
	(.029)	(.029)	(.029)	(.028)	(.027)	(.029)	(.044)	(.036)	(.244)	(.248)	(.237)	(.247)	(.246)	(.248)	(.372)	(.241)
(Centralization)^2	-.006*	-.005*	-.006*	-.006*	-.005*	-.006*	-.007*	-.006*	.066*	.066*	.066*	.068*	.069*	.069*	.055*	.041*
	(.002)	(.002)	(.002)	(.002)	(.002)	(.002)	(.003)	(.003)	(.018)	(.019)	(.018)	(.018)	(.018)	(.019)	(.024)	(.017)
High School Completion	-.000	—	—	—	—	—	—	—	-.016	—	—	—	—	—	—	—
	(.003)								(.022)							
Educational Spending	—	-.027	—	—	—	—	—	—	—	.115	—	—	—	—	—	—
		(.032)								(.281)						
GDP per Capita	—	—	.005	—	—	—	—	—	—	—	-.261	—	—	—	—	—
			(.029)								(.235)					
Economic Growth Rate	—	—	—	.023	—	—	—	—	—	—	—	-.045	—	—	—	—
				(.029)								(.253)				
Transport Infrastructure	—	—	—	—	-.105	—	—	—	—	—	—	—	-.421	—	—	—
					(.066)								(.599)			
Confidence in Judiciary	—	—	—	—	—	-.000	—	—	—	—	—	—	—	-.006	—	—
						(.003)								(.022)		
European Location	—	—	—	—	—	—	-.068	—	—	—	—	—	—	—	-.686	—
							(.104)								(.882)	
English Common Law	—	—	—	—	—	—	—	.011	—	—	—	—	—	—	—	1.36*
								(.069)								(.468)
Constant	.177	.321	.186	.114	.281*	.177	.144	.152	6.47*	5.15*	6.97*	5.91*	6.27*	6.15*	5.59*	4.17*
	(.133)	(.202)	(.150)	(.100)	(.102)	(.166)	(.085)	(.115)	(1.11)	(1.75)	(1.23)	(.874)	(.933)	(1.42)	(.718)	(.776)
R^2	.379	.408	.380	.406	.475	.379	.397	.380	.569	.557	.588	.553	.567	.554	.570	.721
Observations	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18

Notes: The variables for ownership concentration and shareholder protection are respectively obtained from Djankov et al. (2008) and Pagano and Volpin (2005a). The bargaining centralization measure in Traxler et al. (2001) is used. European location is a dummy variable for countries in Europe. English common law is an indicator for countries whose legal origin is English common law. Information on other covariates is extracted from the OECD statistical database. The earliest available observation is used. High school completion is the percentage of individuals aged 25-64 in the year 2000 who completed secondary education. Educational spending is the expenditure on educational institutions in 2005 as a percentage of GDP. GDP per capita is measured for the year 1970, denominated in thousands of dollars, and adjusted for purchasing power parity. The economic growth rate is the annual average growth rate of real GDP per capita from 1970 to 1980. Transport infrastructure is the total investment in inland transportation infrastructure as a percentage of GDP for the year 1995. Confidence in the judiciary is the percentage of citizens surveyed in the year 2007 who reported having confidence in the judicial system. Standard errors are in parentheses. An asterisk denotes statistical significance at the 5 percent level.