Commitment and Discretion in Contracts: Theory and Evidence from Retirement Plans

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Commitment and discretion in contracts: theory and evidence from retirement plans*

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Abstract

We consider a firm’s problem of incentivizing its workforce through relational contracts, when workers effectively face a shorter time horizon due to possible separation shocks. Commitment issues then generate a trade-off between efficiency and distribution, which affects both performance and profits. Profits under relational contracting can exceed those under formal contracting, despite lower performance, when discounting is moderate, firm bargaining power is weak, and shocks are likely. Using a matched employer–retirement plan dataset, and interpreting discretionary profit-sharing plans and employee stock ownership plans as relational and formal contracting, respectively, we find some support for our predictions.

Keywords: Employee stock ownership; profit sharing; relational contracts; retirement plans

JEL classification: D86; J32; J54

1. Introduction

The choice between formal and informal (or relational) contracts is a ubiquitous feature of business and society. For instance, in employment relationships, the hiring party can explicitly commit to performance pay via a bonus scheme or by granting an ownership share to the worker, or it can informally promise to share profits. In relationships between firms, suppliers and distributors can use formal contracts to govern product delivery and payment but might sometimes choose to do without. Within organizations, managers can formally delegate decision-making authority to subordinates or

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just do so informally. This paper considers the choice between these types of contractual forms, both theoretically and empirically.

To examine this choice, we develop a repeated agency model where a firm looks to motivate a worker, using a base wage and a possible benefit payment based on performance. The firm can commit to the benefit payment under formal contracting but not under relational contracting. We depart from the canonical model of relational contracting by assuming that parties engage in Nash bargaining over the worker’s effort and compensation, and that the worker discounts future payoffs more heavily than the firm. Our preferred interpretation of this difference in discounting, which we follow throughout the paper, is in terms of separation shocks: at the end of each period, with some positive probability, an exogenous shock ends the employment relationship, and the worker has more difficulty than the firm in rematching with a new partner. Such shocks would lead the worker to place a smaller weight on future payoffs, which we capture in a reduced-form fashion by assuming a difference in discounting.

Exogenous separation shocks are a common feature of search-and-matching models of labor markets (see, e.g., Mortensen and Pissarides, 1994, 1999a; Shimer, 2005) and can represent different reasons why an employment relationship might end, unrelated to (mis)behavior of the two parties. For example, these can include changes in the worker–firm match value due to shocks to productivity or preferences, changes in worker circumstances, or exogenous job destruction. Data and empirical work suggest that, indeed, workers can be more exposed to separations, in that they take longer to move from unemployment to employment than it takes firms to fill vacancies. For example, Bureau of Labor Statistics (2021) shows that the mean unemployment duration ranged between 12 and 41 weeks during 2001 to 2011. In contrast, using vacancy data for US employers from the Job Openings and Labor Turnover (JOLT) Survey, Davis et al. (2013) show that the mean vacancy duration for non-farm employment ranged between 14 and 25 days over roughly the same time period.

Incorporating the notion of separation shocks into our model of relational contracting generates a trade-off between efficiency and distribution, which affects contract terms, performance, and profits. Specifically, we show that possible future shocks push down the workers’ effort and their share of surplus but can drive up firm profits, whereas the effect of changes to the common discount factor on profits is non-monotonic. We also show that profits under relational contracting can exceed those under formal contracting, in particular

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1 Also using JOLT data, Elsby et al. (2015) show that unemployment-to-employment outflow rates tend to be markedly lower than vacancy-filling rates: approximately 0.5 per month for the former and 0.05 per day for the latter between 2000 and 2013 (see their figure 3).

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when discounting is moderate, shocks are likely, and the firm has relatively little bargaining power. It follows that, under these circumstances, a firm will prefer to use relational contracting to motivate the worker. Hence, the model predicts that if a firm can freely choose between using formal and relational contracting, then observed relational contracts should be associated with lower effort and higher profits.

The force driving the results is that under relational contracting, the more surplus the parties agree to give the worker, the lower the effort they can implement. The agreed-upon contract must satisfy a dynamic enforcement constraint that limits the strength of incentive pay the firm can credibly promise to the worker, as is standard in models of relational contracting. In particular, a contract that gives the worker a large share of surplus must reward him primarily via the fixed wage, because the firm has little incentive to honour a promise to pay a discretionary benefit. Because the worker is compensated mainly by the wage, his current work incentives depend mainly on his continuation payoff (i.e., wages paid in future periods). The effective weight the worker places on this continuation payoff is reduced by his exposure to separation shocks. As a result, the parties may be unable to implement a contract that both grants a large share of surplus to the worker and implements high effort.

We show that, in such situations, the parties will instead agree on a contract with lower effort and a lower share of worker surplus than in the absence of separation shocks, in order to loosen the relevant dynamic enforcement constraints. Compared with formal contracting, relational contracting generates a standard effort effect (lower performance), which hurts the firm by reducing total surplus. However, it also generates a novel bargaining effect, which helps the firm by limiting the share of surplus given to the worker, because transferring more surplus would depress performance further still. The net impact of the two effects on profits depends on the model parameters. In the absence of separation shocks, corresponding to no difference in discounting, the bargaining effect vanishes, so that formal contracting is always at least weakly more profitable.2

We then carry out an empirical analysis to explore the model predictions in a setting that has yet to receive attention in studies of relational contracting: employer-sponsored retirement plans. We focus on the distinction between employee stock ownership plans (ESOPs) and profit-sharing (PS) plans. In what follows, we explain more about these plans, and point out the features of

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2While our model involves a firm and a worker, the mechanism driving our results should also apply to inter-firm relationships. Take, for example, a supplier and a distributor who bargain over the terms of their relationship, where one party has a longer effective time horizon than the other (e.g., because of potential demand shocks in local markets).

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ESOPs that are associated with firm commitment in regards to compensation, and those of PS plans that relate to discretion.

ESOPs and PS plans are the two primary forms of so-called defined contribution plans, in which the employer, rather than the employee, contributes to the individual employee’s retirement account. The European Commission has taken a substantial interest in related employee financial participation (EFP) since the early 1990s. It has also published policy recommendations for the promotion and encouragement of EFP, saying: “[i]f these prospective firms actually decided to offer an ESO [Employee Stock Ownership] or PS [Profit-Sharing] scheme, there would be a significant improvement in both productivity and employment—and thereby competitiveness—of these firms” (European Commission, 2014).3

Contributions to employee’s tax-deferred retirement accounts, such as ESOP and PS plans, provide incentives to a large segment of the labor force, including those in non-executive roles. As such, while models of relational contracting have commonly assumed a cash bonus paid in each period, tax-deferred contributions can motivate employees in a similar way. For instance, given a perfectly functioning capital market, an employee’s life-cycle consumption/savings problem should not crucially depend on the deferral of accrued cash payments or the timing of distribution.4

ESOP consists of a qualified stock bonus plan, or a stock bonus and a money purchase plan, designed to invest primarily in employer securities (Internal Revenue Service, 2021).5 Being a money purchase plan, Internal Revenue Service (2020a) says this means that “the plan states the contribution percentage that is required. For example, let’s say that your money purchase plan has a contribution of 5% of each eligible employee’s pay. You, as the employer, need to make a contribution of 5% of each eligible employee’s pay to their separate account.” In this sense, the required employer contribution is not discretionary, but rather specified in the plan. Compensation in terms of stock also entails commitment, in that employees cannot be denied access to the vested stocks allocated to their ESOP accounts when they leave their current employer or retire. Additionally, the US Internal Revenue Code § 411(d) prohibits the reduction of any accrued benefits by a retrospective

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3In 2014, the European Parliament adopted a resolution (P7_TA(2014)0013), which says “there are three main EFP models for a company to choose from: profit sharing (PS), individual employee share ownership (e.g., stock options) and employee stock ownership plans (ESOPs).”
4ESOP participants who are 55 (60) or older have the option of diversifying up to 25 (50) percent of their ESOP accounts, which are primarily invested in the employer stocks. We abstract from this issue, which pertains to individual employee preference rather than the employer’s choice.
5Qualified plans give employers a tax break for their contributions to the employees’ retirement plans. The plans that allow employees to defer a portion of their salaries into the plan can also reduce the employees’ taxable income while their investment income grows tax-deferred.

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amendment of an ESOP plan. Stock ownership implies that the employee will receive a share of future firm profits to the extent that they are reflected in the stock price and/or dividend payments.

In contrast, Internal Revenue Service (2020b) says that a PS plan is a qualified defined contribution plan that “accepts discretionary employer contributions. There is no set amount that the law requires you to contribute. If you can afford to make some amount of contributions to the plan for a particular year, you can do so. Other years, you do not need to make contributions.” Unlike ESOPs, there is no requirement to pay any particular amount, so the employer is not obligated to honor its promises to compensate for the employees’ efforts by sharing a certain amount of profits.6

The discretionary nature of PS plans is in fact similar to the more familiar cash bonuses, although the former is tax-deferred while the latter is subject to ordinary income taxes. Indeed, “many employers like the fact that contributions are discretionary in a PS plan. Discretionary PS plans do not commit them to certain dollar amounts, which is important if the company had a volatile year” (Human Interest Team, 2019). Hence, in PS, the link between work effort and incentive pay is less formal and less certain, because the employer can renege ex post without legal consequences. (Employee lawsuits we have found only involve the eligibility for PS plans, but not the amount of firm contributions.)

The premise for our empirical analysis is that this difference in commitment between ESOPs and PS plans allows us to cautiously interpret the former as formal contracts and the latter as relational contracts. Following this interpretation, we consider a matched employer-retirement plan dataset among publicly traded US firms from 2009 to 2017, and present correlative evidence in line with our theoretical predictions.

In particular, we show that firms with ESOPs have, on average, lower operating profits but higher revenue efficiency than those adopting PS plans. These results are consistent with our prediction that observed relational contracts should be associated with lower effort and higher profits than formal contracts. We also find some evidence that firms with ESOPs have lower worker–firm separation rates and a stronger bargaining position than firms with PS plans, consistent with the prediction that firms might prefer formal contracting when separation shocks are unlikely and when they can capture a large share of surplus.7

6 A sample PS plan document puts it this way. “The Employer may contribute an amount to be determined from year to year. The Employer may, in its sole discretion, make contributions without regard to current or accumulated earnings or profits.”

7 We acknowledge that firm preference over employer-sponsored retirement plans can depend on other factors that are not captured by our model, and our empirical results should therefore be viewed as suggestive. We comment further on this issue at the end of the empirical analysis.
Commitment and discretion in contracts

The rest of this paper is organized as follows. In Section 2, we discuss the relevant literature. In Sections 3 and 4, we lay out the model and present the theoretical results, respectively. In Sections 5 and 6, we describe the dataset and give the empirical evidence, respectively. We conclude in Section 7. The proofs of all theoretical results can be found in the Online Appendix.

2. Literature

Our main theoretical contribution lies in pointing out a novel trade-off between efficiency and distribution under relational contracting, driven by the presence of separation shocks. A typical feature of relational contracts (e.g., Bull, 1987; Levin, 2003; Malcomson, 2012, to name just a few) is that dynamic enforcement constraints limit performance but in a way that is unrelated to the division of surplus. For example, in Levin (2003), for any given implementable effort level, the parties can always transfer slightly more surplus to the agent, while maintaining incentives, by slightly increasing the wage and decreasing the benefit. We show that doing so may no longer be possible in the presence of separation shocks. The bargaining effect we identify also implies that a shock to the discounted value of the parties’ long-term relationship (changes to the discount factor or separation probability), or to their relative bargaining positions (changes to the Nash bargaining weights), should affect both performance and bargaining outcomes.

Our paper also relates to the work that explicitly incorporates bargaining into models of relational contracting. Researchers have considered private information about the principal’s outside option (Halac, 2012) and about the interactions with short-lived agents (Barron and Guo, 2021), uncertainty about parties’ bargaining power (Halac, 2015), or how contract renegotiation can induce non-stationarity (Watson et al., 2020). We instead analyze a model with symmetric information and stationary contracts, where incentive constraints restrict the set of agreements that the parties can implement ex post, which can help the principal when bargaining with the agent ex ante.

Our paper complements earlier work looking at both formal and informal contracting (see, e.g., Baker et al., 1994, 2001; Battigalli and Maggi, 2008; Kvaløy and Olsen, 2009), which has focused on the interaction between contracting forms. We instead consider the choice between either relational or formal contracts, and demonstrate that, even in the absence of explicit contracting costs, firms might prefer the former to the latter.

A growing number of empirical studies have demonstrated the relevance of relational contracting in a variety of inter-firm settings, such as public procurement (Gil and Marion, 2013; Coviello et al., 2018), franchising (Zanarone, 2013), Kenyan flower exports (Macchiavello and Morjaria, 2015), Rwandan coffee production (Macchiavello and Morjaria, 2021), along with...
the automobile industry (Calzolari et al., 2021), the movie industry (Barron et al., 2020), and the airline industry (Gil et al., 2022). There are also studies in which formal and informal contracts are directly compared. For instance, Gil (2013) finds that whether a formal contract is or is not used between movie distributors and exhibitors depends on the reneging temptations under informal agreements.

For intra-firm (employment) relationships, Gillan et al. (2009) show that whether chief executive officers (CEOs) have formal or informal employment agreements depends on the uncertainty of the relationship as well as the expected loss from reneging. Also, DeVaro et al. (2018) argue that CEOs’ incentive pay changes over time in a manner that is consistent with relational contracting. Our paper contributes to this literature by considering a novel intra-firm setting – that of employer-sponsored retirement plans – and suggests when employers might prefer one type of plan over the other.

Our work also contributes to the long-standing literature on retirement benefits and plans. The prior work that is perhaps the closest to ours is Kruse (1992), which examines whether PS plans and ESOPs are positively associated with higher labor productivity as measured by firm revenue per employee, and finds a stronger correlation with PS plans than with ESOPs. There, the comparison is made between firms with either a PS plan or an ESOP and those without, so in this sense PS plans and ESOPs are broadly seen as substitutes. Similarly, Blasi et al. (1996) compare the profitability and productivity of firms in which employees own more than 5 percent of the company’s stock through ESOPs, and all other (public) firms, which include firms with PS plans and those without a retirement plan. In contrast, our analysis focuses on comparing the firms that have ESOPs with those that instead have PS plans, as we want to highlight the relative appeal of the two types of retirement contribution plans.

Contracting models have thus far received little attention in the literature on shared capitalism, which argues that sharing profits with a broad base of workers can raise their productivity (e.g., Kruse et al., 2010). However, this phenomenon can also be understood from an agency theory standpoint as providing work incentives when individual performances are difficult to measure and/or costly to monitor. For instance, Kovenock and Sparks (1990)

8See also Gil and Zanarone (2017, 2018) for an overview and more references. The law literature on relational contracts shares the feature that any arrangements that are at the discretion of the contracting parties must rely on trust, and that only informal sanctions would effectively constrain the parties’ incentives to behave opportunistically ex post (e.g., Macneil, 1985; Bird, 2005).

9The literature on broad-based (group or team) incentive plans often finds that such incentive schemes tend to raise firm performance despite the apparent threat of free riding, because employees can monitor one another (e.g., Kandel and Lazear, 1992; Knez and Simester, 2001).
analyze ESOPs in a setting where courts can verify and enforce wage-share contracts, consistent with formal contracting, and they show that an ESOP can form a part of an optimal incentive contract. Our paper builds on this contracting approach to understanding shared capitalism.

3. Model

We consider a principal–agent problem that consists of a bargaining phase at \( t = 0 \) and an employment relationship in periods \( t = 1, 2, \ldots, \infty \). In the bargaining phase, the players agree on a contract that specifies the output the agent should produce, and the transfers the principal should make, in the employment relationship that follows. We distinguish between formal contracting, where the principal is obliged to make these transfers, and relational contracting, where this is not the case.

More specifically, at \( t = 0 \), the principal and agent bargain over a contract \((w_t, b_t, y_t)_{t \geq 1}\). The contract specifies a base wage \( w_t \), along with benefit \( b_t \) conditional on a particular output \( y_t \), for each period \( t = 1, 2, \ldots, \infty \). Any benefits that are conditional on employee output are captured by \( b_t \); for instance, this could be a cash bonus, but also an employer contribution to an employee retirement account. Any non-performance-contingent employment benefits (e.g., subsidized insurances and other perks) are wrapped into the base wage. We assume that the players reach an agreement via Nash bargaining, which we return to below.

After agreeing on a contract at \( t = 0 \), play moves on to period \( t = 1 \). The timing in each period \( t \geq 1 \) is as follows. At the beginning of the period, the principal pays the wage \( w_t \) specified in the contract. The agent then chooses effort \( e_t \geq 0 \) and incurs private cost \( c(e_t) \). The relationship between effort and output is deterministic, where for tractability we assume \( y_t = e_t \) and \( c(e_t) = e_t^2 \). We assume that output (equivalently effort) is observable. Hence, while the bargaining can pertain to the effort level \( e \), we can simply write it in terms of the output level \( y \).

Under formal contracting, the principal must pay the benefit \( b_t \) specified in the contract as long as the agent produced the required output, \( y_t \). Under relational contracting, the principal has discretion, and can freely choose between paying \( b_t \) or paying nothing. The principal and agent then both decide whether to terminate or continue the relationship. If at least one player decides to terminate, then the relationship ends, and both receive zero in

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10 If the agent’s effort choice was private information and the relationship between effort and output stochastic, then the agent would be able to capture rents due to an informational advantage. In our analysis, we abstract from private information to more clearly illustrate how the agent’s share of surplus depends on the parties’ relative bargaining power and the contractual forms.
subsequent periods. If both players decide to continue, then they move on to the next period $t+1$.

We look for a subgame perfect Nash equilibrium played as of $t = 1$ that implements the contract agreed upon at $t = 0$, where players are assumed to punish each other using an optimal (grim trigger) strategy if anyone deviates from the equilibrium path. For instance, if there is a period in which the principal does not pay the promised benefit, or the agent does not exert the required effort, then the players end the relationship off the equilibrium path. Players’ outside options are equal to zero.

Importantly, we assume that the principal discounts future payoffs with factor $\delta \in (0, 1)$ whereas the agent discounts future payoffs with factor $\delta \delta_0$, where $\delta_0 \in [0, 1)$. While $\delta_0 < 1$ might capture agent impatience, our preferred interpretation is that players have a common discount factor, but that an exogenous separation shock can occur at the end of each period, to which the agent is particularly exposed. Informally, consider a shock that ends the employment relationship, after which both principal and agent earn zero in subsequent periods until they succeed in rematching with new partners. The assumption that $\delta_0 < 1$ corresponds to the agent being, on average, slower to rematch than the principal.\(^{11}\)

For ease of interpretation, we refer to $\delta$ as the common discount factor and to $1 - \delta_0$ as the probability of a separation shock. Given this discount factor and shock probability, the principal will effectively discount future payoffs according to $\delta$, and the agent according to $\delta \delta_0$, in the following situation: the agent can never rematch, whereas the principal rematches immediately following a period-$t$ shock and then bargains over a new contract $(w_{t'}, b_{t'}, y_{t'})_{t'\geq t+1}$ for periods $t + 1, t + 2, \ldots, \infty$.

At $t = 0$, players engage in Nash bargaining, and agree on the contract that maximizes the weighted Nash product $\pi^\alpha u^{1-\alpha}$, where

$$\pi = \sum_{t=1}^{\infty} \delta^{t-1} (y(e_t) - b_t - w_t),$$

is the principal’s payoff and

$$u = \sum_{t=1}^{\infty} (\delta_0 \delta)^{t-1} (b_t + w_t - c(e_t)),$$

\(^{11}\)See the discussion in Section 1. Similar shocks are common in models of labor market search and matching. For instance, “at the individual level, the main cause of job turnover is idiosyncratic shocks, i.e. shocks that do not appear correlated with common economy-wide or sector-specific shocks, or with other common characteristics across firms” (Mortensen and Pissarides, 1999b).
is the agent’s payoff, conditional on \((w_t, b_t, y_t)_{t \geq 1}\) being implementable. The parameter \(\alpha \in (0, 1)\) captures the bargaining weight of the principal relative to the agent. We restrict attention to stationary contracts, \((w, b, y)\), where the base wage, benefit, and required output are all independent of \(t\).\(^{12}\) Although we do not impose limited liability, the relevant contracts the players bargain over will all involve a non-negative wage, \(w \geq 0\), and benefit, \(b \geq 0\).

Informally, Nash bargaining can be thought of as negotiations that take place between a delegated representative of the workforce and the employer at the start of the employment relationship. Given stationarity, it can also be interpreted as negotiations that take place at the start of each period. The bargaining solution need not represent a formal agreement reached by the players, but can instead reflect their understanding of what particular subgame perfect equilibrium to play (i.e., shared expectations of output and transfers) in subsequent periods.

### 4. Analysis

We first derive the optimal contract under formal contracting, before turning to relational contracting. For this part of the analysis, we assume that the principal and agent take the contracting form (formal versus relational) as given. We comment later on how our theoretical results translate into testable empirical hypotheses if the principal is able to choose between the two contracting forms.

At the end of each period \(t = 1, 2, \ldots\), the principal must pay the benefit \(b\) specified in the contract, as long as the agent produced the specified output \(y\). Given a stationary contract \((w, b, y)\), or equivalently \((w, b, e)\) with \(y = y(e)\), we can write the Nash product as

\[
\left( \frac{1}{1 - \delta} (y(e) - b - w) \right)^{\alpha} \left( \frac{1}{1 - \delta \delta_0} (b + w - c(e)) \right)^{1-\alpha},
\]

where both output \(y(e)\) and effort cost \(c(e)\) depend on the agent’s effort \(e\).

The principal and agent choose \((w, b, y)\) to maximize equation (1), subject to the agent’s incentive constraint

\[
c(e) - b \leq \frac{\delta \delta_0}{1 - \delta \delta_0} (b + w - c(e)),
\]

\(^{12}\)The assumption of stationarity gives tractability and yields results that are relatively straightforward to interpret, but it is not necessarily without loss of generality. Notice, however, that our approach covers the case where \(\delta_0 = 0\), where the principal effectively faces a sequence of short-run players. These players are only interested in the current period wage and benefit, which would rule out non-stationary dynamics.

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where the agent’s future gains from continuing the relationship must exceed the current effort cost less the expected benefit.\footnote{The agent’s incentive constraint is tighter than his participation constraint, $b + w \geq c(e)$, whenever $w > 0$, which reflects that the agent receives the period-$t$ wage before choosing his period-$t$ effort.}

We can rewrite the agent’s incentive constraint as

$$b + \delta \delta_0 w \geq c(e). \quad (2)$$

Under formal contracting, we can restrict attention to contracts with a zero base wage, because equation (2) and $\delta \delta_0 < 1$ show that the benefit $b$ is more effective at providing the agent with incentives. When $w = 0$, the agent’s incentive constraint reduces to $b - c(e) \geq 0$, which just says that the agent’s payoff must exceed the outside option.

We can now solve for the optimal formal contract. Taking the first-order condition of the Nash product (equation (1)), evaluated at $w = 0$, with respect to the benefit $b$, implies $b = \alpha c(e) + (1 - \alpha)y(e)$.\footnote{The second-derivative of equation (1) evaluated at $w = 0$, with respect to $b$, is strictly negative for any $b \in (c(e), y(e))$.} The parties therefore agree on the benefit that gives a share $\alpha$ of the surplus to the principal, $\pi = \alpha (y(e) - c(e))$, and a share $1 - \alpha$ of the surplus to the agent, $u = (1 - \alpha)(y(e) - c(e))$.

Thus, the benefit comprises a payment of $c(e)$ that covers effort costs and a fraction $1 - \alpha$ ownership of the firm’s surplus. Given this benefit, the parties agree on the efficient effort level $e$, in order to maximize total surplus $y(e) - c(e)$. Given our functional form assumptions $y(e) = e$ and $c(e) = e^2$, the contract specifies $b^f = (2 - \alpha)/4$ and effort $e^f = 1/2$, with resulting profits $\pi^f = \alpha/4$, where the superscript $f$ stands for formal.

We now derive the optimal relational contract. The principal promises to pay the benefit $b$, conditional on the agent producing the specified output level $y$, but can now choose between paying the benefit or reneging on her promise. As in a PS plan, the principal’s choice of whether to pay is discretionary. The principal is under no obligation to pay what was promised, and the agent has no formal recourse to force her to do so.

The principal and agent bargain over the set of possible contracts $(w, b, y)$ that maximize the weighted Nash product, (equation (1)), but now subject to the following principal’s incentive constraint (or dynamic enforcement constraint), in addition to the agent’s incentive constraint (2),

$$b \leq \frac{\delta}{1 - \delta} (y(e) - b - w),$$
where the principal’s discounted future profits as of period $t + 1$ must exceed the size of the benefit she should pay in period $t$.

We can rewrite the principal’s incentive constraint as

$$b + \delta w \leq \delta y(e).$$

(3)

The following result shows that for certain values of the discount factor, the optimal relational contract will differ from the optimal formal contract and may also involve higher profits.

**Proposition 1.** Relational contracting can sometimes result in strictly higher profits than formal contracting. Specifically, for any $(\alpha, \delta_0) \in (0, 1) \times [0, 1)$, there exist critical values $\delta < \delta^*$ and $\delta > \delta^*$, with $0 < \delta < \delta^* < 1$, such that $e^r < e^f$ and $\pi^r < \pi^f$ for $\delta \in (0, \delta)$; $e^r < e^f$ and $\pi^r > \pi^f$ for $\delta \in (\delta, \delta^*)$; $e^r = e^f$ and $\pi^r = \pi^f$ for $\delta \in (\delta^*, 1)$.

Proposition 1 shows that relational contracting and formal contracting result in the same effort and profits when the discount factor $\delta$ is sufficiently high. Otherwise, relational contracting results in lower effort than formal contracting, but it can give the principal higher profits for intermediate values of the discount factor, $\delta \in (\delta, \delta^*)$, the precise range of which will depend on parameters $\alpha$ and $\delta_0$.

To understand this result, the only difference between relational and formal contracting lies in the principal’s incentive constraint. A high value of the discount factor $\delta$ implies that both the principal and agent place a larger weight on continuing the productive relationship compared with the current gains from opportunistic behavior. For sufficiently high $\delta$, it is possible to implement the efficient effort $e = 1/2$, with the same total compensation as under formal contracting, $b + w = (2 - \alpha)/4$. Both the agent’s incentive constraint (2) and the principal’s incentive constraint (3) are then slack under the agreed-upon contract.

For lower values of the discount factor, both constraints will bind and effectively restrict the set of feasible contracts the players can bargain over. In particular, for a given total compensation $b + w$, the agent’s incentive constraint can be satisfied for higher effort levels when the bonus is large relative to the base wage, whereas the opposite is true for the principal’s incentive constraint. There might be no benefit $b$ and base wage $w$ that implements the efficient effort level $e = 1/2$, gives a fraction $(1 - \alpha)$ of surplus to the agent, and satisfies both constraints.

Unsurprisingly, the parties’ incentive constraints can make it difficult to implement high effort. More interesting is that this difficulty increases with the share of surplus transferred to the agent. A contract giving the agent high surplus must compensate him largely via the base wage, as the principal would be tempted to renege on a discretionary benefit. As a result, the
agent’s incentives in any period $t$, after receiving the wage $w_t$, will depend mainly on his continuation payoff. The agent’s exposure to separation shocks reduces this continuation payoff and can thereby destroy his incentive to exert effort.

When bargaining over the agent’s effort and compensation, the parties therefore face a trade-off between efficiency and distribution: the more surplus given to the agent, the lower the effort they can implement. The parties agree on a contract with both lower effort and agent share of surplus than under formal contracting. They prefer this to an alternative contract that would give the same share of surplus to the agent as under formal contracting, but that would drive down effort further still.

Whether the principal earns higher profits under relational contracts than under formal contracts depends on the relative size of two effects. A standard effort effect under relational contracts results in inefficiently low effort and reduces total surplus. However, there is also a bargaining effect, which limits the set of contracts the parties can implement, and enables the principal to capture a larger share of surplus.

The effort effect dominates when the discount factor is sufficiently low, resulting in lower profits than under formal contracting. The bargaining effect instead dominates when the discount factor takes on an intermediate value. Finally, if the discount factor is sufficiently large, then the players’ incentive constraints do not bind, and do not affect the bargaining outcome.\(^\text{15}\)

It can also be instructive to compare our results to those in the canonical model of Levin (2003). In that model, there exists a threshold value $\delta(e)$ such that players can find a contract implementing effort $e$ and giving any share $\alpha \in [0, 1]$ of surplus to the principal if and only if $\delta \geq \delta(e)$. In our setting, the corresponding threshold values are higher and depend both on the shock probability and the agent’s share of surplus: $\delta(e, \delta_0, \alpha) > \delta(e)$, whenever $\delta_0 < 1$ and $\alpha < 1$. Only in the absence of shocks, or if the principal receives all surplus, do the threshold values coincide: $\delta(e, \delta_0 = 1, \alpha) = \delta(e, \delta_0, \alpha = 1) = \delta(e)$. Intuitively, a contract giving the principal all surplus will only compensate the agent for period-$t$ effort via the period-$t$ benefit, so the possibility of future shocks will not affect agent work incentives.

Our next result is that relational contracting tends to give higher profits than formal contracting when the principal’s bargaining power is relatively low and when separation shocks are relatively likely.

\(^{15}\)The presence of an effort effect and a bargaining effect does not depend on our specific functional form assumptions about output and effort costs. More generally, given concave output $y(e)$ and convex effort costs $c(e)$, the parties will face a trade-off between increasing effort and transferring surplus to the agent, whenever both the principal’s and the agent’s incentive constraints bind.

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Proposition 2. For any \((\delta, \delta_0) \in (0, 1) \times (0, 1)\), there exists \(\tilde{\alpha} \in [0, 1]\) such that \(\pi^r > \pi^f\) for \(\alpha < \tilde{\alpha}\) and \(\pi^r \leq \pi^f\) for \(\alpha > \tilde{\alpha}\). Similarly, for any \((\delta, \alpha) \in (0, 1) \times (0, 1)\), there exists \(\delta_0 \in [0, 1]\) such that \(\pi^r > \pi^f\) for \(\delta_0 < \delta_0\) and \(\pi^r \leq \pi^f\) for \(\delta_0 > \delta_0\).

The principal tends to benefit from relational contracting when her Nash bargaining weight is small, as the bargaining effect then outweighs the effort effect. Intuitively, the principal benefits little from high effort under formal contracting if low bargaining power leaves her unable to capture much of the resulting surplus. Consider the limiting case where the principal’s Nash bargaining weight approaches zero, that is, as \(\alpha \to 0\). She will then earn zero profits under formal contracting, despite efficient worker effort, whereas the proof of Proposition 2 shows that profits under relational contracting can remain strictly positive, specifically whenever \(\delta_0 < 1/2\). In contrast, in the limiting case where the principal’s Nash bargaining weight approaches one, the principal can capture all surplus under formal contracting. Relational contracting then only serves to drive down effort and reduce profits.

The principal also benefits from relational contracting when separation shocks are likely, because it is these shocks that generate the trade-off between efficiency and distribution. This trade-off in turn drives our bargaining effect. The larger the probability of a shock, the more difficult it is to transfer surplus to the agent while respecting the parties’ incentives, which in turn can push up profits under relational contracting.

To translate Propositions 1 and 2 into empirical predictions relating to employer-sponsored retirement plans, we identify the principal with a firm and the agent with its workforce, and associate formal contracting with ESOPs and relational contracting with PS plans. Moreover, we assume that the firm is able to choose between formal contracting (ESOPs) and relational contracting (PS), depending on which of the two is more profitable. Finally, we assume that amongst firms that are indifferent between formal and relational contracting, at least some will opt for the former (or both).

Proposition 1 then implies that the relationship between the discount factor and the firm’s choice of retirement plan is non-monotonic, because ESOPs are associated with both sufficiently high and sufficiently low discount factors. Strictly speaking, this can be a counterfactual prediction for each particular firm, holding everything else except for the discount factor constant. Given the difficulty of observing counterfactual outcomes, however, we apply our hypothesis to a cross-section of firms, whereby firms with sufficiently high or low discount factors tend to adopt ESOPs rather than PS plans, controlling for other firm characteristics. Similarly, from Proposition 2, we expect that firms adopting PS plans are associated with lower firm bargaining power and higher worker–firm separation rates, compared with those adopting ESOPs.
Proposition 1 also implies that a firm that finds it optimal to adopt a PS plan (given the values of the discount factor and shock probability) will earn higher profits and have lower effort than in the counterfactual situation where it would be optimal to adopt an ESOP (for different values of these parameters). Once again, applying our hypothesis to a cross-section of firms, we expect that firms adopting PS plans, rather than ESOPs, tend to have higher profits and lower effort or efficiency.

5. Dataset

Our dataset merges the sample universe of all publicly traded US companies in Compustat Annual (provided by Wharton Research Data Services) to the Form 5500 Annual Report (provided by the US Department of Labor), disclosed under the Employee Retirement Income Security Act of 1974, a federal law that sets various standards for most private-sector retirement plans. There are two types of benefit plans in the Form 5500 filings: a Pension (Retirement) Plan and a Welfare Plan (such as health, disability, and life benefits). Pension Plans are further classified into defined benefit (DB) and defined contribution (DC) plans. We do not use data on DB or Welfare plans because the benefits accruing to the employees under these plans are not dependent on the employee’s work or effort, and the comparison across all plan types is beyond the scope of our model. Instead, we focus on DC plans in which employers, rather than employees, make contributions to individual retirement accounts.

One of the most well-known forms of DC plans is a 401(k) plan. Such plans involve “a feature allowing an employee to elect to have the employer contribute a portion of the employee’s wages to an individual account under the plan” (Internal Revenue Service, 2020c). That is, a 401(k) plan allows employees to make tax-deferred contributions (the employer may or may not provide a matching contribution). Hence, a 401(k) plan can exist together with PS plans or ESOPs where in the latter two, the employer makes contributions to the individual employee’s accounts. Because we are interested in studying how the employer shares profits with the employees, rather than how the employees set aside their own wages for retirement, our samples do not include standalone 401(k) plans, but we do include the PS plans or ESOPs that are combined with a 401(k) feature.

We also clarify our treatment of a stock bonus plan and an ESOP. Federal regulation (26 CFR §1.401) says that a stock bonus plan is “to provide employees or their beneficiaries benefits similar to those of PS plans, except

\[\ldots\]

We note that there has been a shift from DB to DC plans in the private sector over the past few decades in many countries, for multiple reasons (e.g., increased workforce mobility, increasing regulatory burden, and pension under-funding; see, e.g., Broadbent et al., 2006).

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that such benefits are distributable in stock of the employer”. That is, in a PS plan, distributions can be in cash or stock, but in a stock bonus plan, distributions must be in the form of company stock. Thus, apart from the form of distribution, both PS and stock bonus plans represent the same discretionary employer contribution. As such, we treat a non-ESOP stock bonus plan as a PS plan.

We make use of the pension feature codes associated with Form 5500 filings. We focus on the codes starting with the number 2, which pertains to the defined contribution plans, and ignore the codes belonging to other types of plans (i.e., DB, other pension, and welfare plans). There are 20 feature codes available for DC plans; however, we only use the four relevant codes to test the predictions of our theory, and ignore the rest (such as the code for a 401(k) plan): these are Profit sharing [2E], Stock bonus [2I], ESOP other than a leveraged ESOP [2O], and Leveraged ESOP [2P]. The first two are what we refer to as the discretionary PS plans in this paper, because the employer has full discretion over whether and how much to contribute, while the latter two are the ESOPs.

Our sample period runs from 2009 to 2017. It starts from 2009 because electronic filing became a requirement effective from 1 January 2010. Only data from Form 5500, not Form 5500-SF or Form 5500-EZ, are included in our sample.17 We note that an employer can sponsor multiple pension plans, which might not all have the same set of pension feature codes. In such cases, we collect all pension feature codes for a given employer in a reporting year. Also, in some cases, the feature codes of a plan do not stay the same across years, which could be due to reporting errors. For instance, it is unlikely that a plan stops being an ESOP in one year and then becomes an ESOP again in the following year. We found that signatories on Form 5500 filings often change; thus, we ignore some apparent inconsistencies/omissions in the codes and override them with consistent features.

We then merge our Form 5500 data to Compustat Annual by using the plan sponsor’s Employer Identification Number (EIN). We only use single-employer filings. That is, we drop multi-employer retirement plans (e.g., co-ops and unions) and multiple-employer retirement plans (sponsored by unrelated employers).18 Nonetheless, a single employer can have more

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17 Form 5500-SF is used for plans with fewer than 100 participants, and Form 5500-EZ is for a one-participant plan covering the owner and owner’s spouse or one or more partners, so they are unlikely to be filed by publicly traded firms, which is where the other part of the data comes from.

18 Plans can also hold assets directly, or indirectly via pooled investment arrangements. Sponsors of such pooled arrangements are called Direct Filing Entities (DFE), and they can also file a separate Form 5500. Thus, we drop DFE filings because they are redundant given the sponsor filings.
than one EIN for various reason (e.g., ownership and tax issues), so joining the two databases is imperfect. Consequently, we were able to match about 22,000 Compustat firm–years to Form 5500 filing data having the same EIN, in which there are 3,734 unique firms.

We then use the variables in the combined dataset to construct our empirical proxies that can represent theoretical counterparts of our model parameters. First, we proxy for the firm’s discount factor using the distance-to-default measure, which is based on the structural model of default by Merton (1974) and has been widely used in the finance literature.19 We do so because a discount factor in an infinitely repeated game can be interpreted as the probability that the interaction will continue into the next period (rather than end, for example in our setting due to bankruptcy).

Second, we proxy for the employee’s separation probability using the ratio of the “number of participants that terminated employment during the plan year with accrued benefits that were less than 100% vested” and the “total number of participants at the beginning of the plan year”. Both are line items in Form 5500, and we aggregate these numbers across plans at the firm level, before taking the ratio. Similarly to the firm’s discount factor, the idea here is that the employee’s discount factor would additionally take into account employee mobility, where separation shocks can occur independent of the firm’s conditions.

Third, we proxy for the employee’s bargaining power using multiple measures. One is the number of firms in the same state–year–sector cell. The rationale is that the more potential employers in the relevant labor market, the stronger the employee’s relative bargaining power. The other is the imputed labor expense share at the firm level (e.g., Hartman-Glaser et al., 2019). Specifically, the imputed labor expense is the average labor expense per employee within the same sector and year, times the number of firm employees. The labor share is then the imputed labor expense divided by the sum of the labor expense and Earnings Before Interest, Taxes, Depreciation, and Amortization (EBITDA). Imputation is necessary because the data on labor expenses are only available for some 10 percent of the Compustat universe.20

We now discuss the dependent variables. The first variable is an indicator for firm–years with an ESOP (feature codes 2O or 2P) versus the rest (i.e., PS

19 The distance measures the difference between the current market value of assets and a default point, scaled by the volatility of the asset value. The estimates of the distance-to-default for the Compustat universe, where available, were generously shared with us by Forssbæck and Vilhelmsson (2017).

20 This creates a measurement error in labor share. To check robustness, we replicated all our results in Columns 3 and 4 of Tables 2–4 using predicted labor share (from a regression on imputed share), instead of imputed share, and found that the qualitative results remain unchanged.
Commitment and discretion in contracts

The second one is EBITDA divided by the number of employees as a measure of firm profits. EBITDA represents corporate performance before taking into account interests, taxes, and costs, so it captures the surplus created by the employees. We normalize EBITDA by the employment size, to make it comparable across firms of different sizes. Most of the aforementioned studies on shared capitalism divide firm profits by employees.

The third dependent variable is a measure of revenue efficiency as a proxy for the efficiency of employee work effort. This is in line with the literature on shared capitalism, which often uses the firm revenues divided by the size of employees as a measure of productivity (e.g., Kruse, 1992; Sesil et al., 2007). However, firm revenues can contain factors that are beyond the firm’s control and we also need a benchmark to measure the degree of (in)efficiency. Thus, we use the stochastic frontier model, which is a well-known econometric platform for this type of analysis (Greene, 1993). The idea is that the observed firm revenues are enveloped by a stochastic frontier, which represents the theoretical maximum.

Specifically, the stochastic frontier model is $s_{it} = f(z_{it})\xi_{it} \exp(v_{it})$, where $s_{it}$ denotes sales, $z_{it}$ denotes the number of employees, $\xi_{it} \in (0, 1]$ is a measure of revenue efficiency, and $v_{it}$ is an (i.i.d.) shock. Assuming that $f$ is log-linear, we can estimate this model in a log-log specification for each of 2-digit NAICS sectors, including a set of year dummies. The time-varying scaling factor, $\xi_{it}$, relative to the maximum potential sales deduced from the sales of all firms in the same sector, is our revenue efficiency measure and modeled as $\ln(\xi_{it}) = \exp(-\theta(t - t_{\text{max}})) \ln(\xi_{i})$ for some $\theta \in \mathbb{R}$, where $-\ln(\xi_{i}) \geq 0$ follows a truncated normal distribution. In short, $\xi_{it}$ indicates how close a firm’s sales are to the frontier given employees.

Finally, we include some control variables. The firm size controls are widely used in the finance literature and have also been used in the aforementioned works on shared capitalism. Hence, we include total assets as well as number of employees as firm size proxies. Further, we control for the possible effect of firm’s capital structure by including a debt-to-capital ratio (i.e., total liabilities divided by total assets) because there can be a correlation between the change in a firm’s leverage and the adoption of a (leveraged) ESOP. We also control for the sector dummies represented by either two- or

We classify sample firms having both an ESOP and a PS plan as an ESOP firm for our purpose, because our model predicts that the firms can in fact be indifferent between ESOPs and PS plans if the discount factor is sufficiently high, so some firms might utilize both plans.

Revenue productivity does not, however, necessarily measure production productivity because revenues can depend on firm-specific prices. Thus, we cannot distinguish a firm’s revenue and physical productivities, although the two measures are often highly correlated (e.g., Foster et al., 2008).
Table 1. Summary statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std dev.</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESOP and leveraged ESOP (1 = yes)</td>
<td>0.175</td>
<td>0.380</td>
<td>22,151</td>
</tr>
<tr>
<td>EBITDA per employee (in thousand dollars)</td>
<td>58.92</td>
<td>809.14</td>
<td>20,467</td>
</tr>
<tr>
<td>Revenue efficiency</td>
<td>0.082</td>
<td>0.150</td>
<td>18,987</td>
</tr>
<tr>
<td>Log(distance to default (DD))</td>
<td>0.528</td>
<td>1.323</td>
<td>12,914</td>
</tr>
<tr>
<td>Separation rate</td>
<td>0.039</td>
<td>0.820</td>
<td>22,120</td>
</tr>
<tr>
<td>Competitors (by state and two-digit NAICS)</td>
<td>24.28</td>
<td>36.71</td>
<td>22,151</td>
</tr>
<tr>
<td>Competitors (by state and three-digit NAICS)</td>
<td>13.90</td>
<td>27.24</td>
<td>22,151</td>
</tr>
<tr>
<td>Labor share (imputed at two-digit NAICS)</td>
<td>0.62</td>
<td>13.23</td>
<td>18,619</td>
</tr>
<tr>
<td>Labor share (imputed at three-digit NAICS)</td>
<td>0.61</td>
<td>23.80</td>
<td>14,618</td>
</tr>
<tr>
<td>Log(total assets, in million dollars)</td>
<td>6.773</td>
<td>2.246</td>
<td>21,876</td>
</tr>
<tr>
<td>Log(employees, in thousands)</td>
<td>0.493</td>
<td>2.073</td>
<td>20,934</td>
</tr>
<tr>
<td>Debt-to-capital ratio</td>
<td>0.645</td>
<td>1.584</td>
<td>21,830</td>
</tr>
</tbody>
</table>

Notes: The dataset is an unbalanced panel of the Compustat universe from 2009 to 2017 matched to the Form 5500 filings by EIN, having at least one of the following Pension Plan Characteristics Codes: 2E (Profit sharing), 2I (Stock bonus), 2O (ESOP), and 2P (Leveraged ESOP), where ESOP is 1 for Codes 2O or 2P, and 0 otherwise. See Section 5 for the details of variable construction.

The summary statistics of our panel dataset are described in Table 1. Some variables contain missing data either because relevant data are unavailable from the original sources (e.g., distance-to-default) or because a few sector-level imputation and estimation procedures (e.g., labor share and revenue efficiency) could not be obtained due to insufficient sample sizes and/or non-convergence of maximum likelihood estimation.

6. Evidence

Our first model prediction is that the worker–firm separation probability and labor bargaining power should be negatively correlated with ESOP adoption, whereas the firm bankruptcy probability should have a non-monotonic effect. That is, we expect firms to adopt an ESOP when the bankruptcy probability is below a certain (lower) threshold or above a certain (higher) threshold, and to adopt a PS plan when the bankruptcy probability is in between the two thresholds. To test this non-monotonic effect, we need to divide the distribution of the firms’ bankruptcy probabilities into intervals. As we do not know the empirical value of the two thresholds, we carry out a grid search to find the pair of threshold values that best fit our sample in terms of $R^2$.

Specifically, we pick two percentile values from the set $\{0.05, 0.10, \ldots, 0.95\}$ and define the three intervals based on the corresponding value of the
distance to default. We used all possible combinations of two values in 5 percentage increments, and found that a lower threshold at the 30th percentile and a higher threshold at the 65th percentile gives the best model fit. Thus, instead of using the bankruptcy probability as a linear function, we include two indicators for the lower (30th and below) and the higher (65th and above) ranges, which should be positively correlated with the ESOP adoption, relative to the omitted (middle) range.

The estimation equation is

\[ ESOP_{it} = \alpha + X_{it}' \gamma + Year_{i} + Sector_{i} + State_{i} + \mu_{i} + \varepsilon_{it}, \]  

(4)

where \( ESOP_{it} \) is one if firm \( i \) had an ESOP (or a leveraged ESOP) in year \( t \), and zero otherwise; \( X_{it} \) includes all the proxies for the model counterparts as well as controls, followed by indicators for the year, state, and industry sector of firm \( i \). The firm-specific, time-invariant error term, \( \mu_{i} \), is unobservable to researchers and it is a potential source of bias. For instance, if firm heterogeneity causes a lower separation rate and also induces the firm to adopt an ESOP, then spurious correlation could drive the related regression results.

We cannot rule out this omitted variable bias, as the variation in the firm-sponsored retirement plans is mostly cross-sectional. In our approach, we model the firm-level unobservable as a random effect, which is assumed to be uncorrelated with \( X_{it} \). We prefer a cautious interpretation of our regression results, as highlighting correlations between retirement plan choice and factors such as profits, revenue efficiency, bargaining, and discounting. While we do not argue that these results demonstrate causality, we are interested in whether they point in the same direction as our theoretical predictions.

Table 2 shows the estimation results. The four columns in Table 2 vary by the proxy that we use for the labor bargaining power, because its empirical measurement is not as definitive as the other parameters of the model. Specifically, in Columns 1 and 2, we use the number of competitors (potential employers) in the same state-year with two- and three-digit industry sectors, respectively. In Columns 3 and 4, we use the share of the labor expense, where the average staffing cost was imputed each year at the two- and three-digit sectors, respectively.

We find that both the lower and higher ranges of the firm’s discount factor (distance to default) have a positive coefficient, though only the latter is statistically significant. Given that the middle range is the reference point, this result is consistent with our model because firms prefer an ESOP over a PS plan when the discount factor is sufficiently low, and they are indifferent

\[ 23 \text{While we only present the estimation results using the 30th and 65th percentile thresholds for the ranges of distance to default, the qualitative results are robust to using nearby threshold values.} \]

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Table 2. Determinants of ESOP adoption

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log(DD), 30th or less</td>
<td>0.003</td>
<td>0.003</td>
<td>0.004</td>
<td>0.002</td>
</tr>
<tr>
<td></td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.003)</td>
<td>(0.004)</td>
</tr>
<tr>
<td>Log(DD), 65th or more</td>
<td>0.008</td>
<td>0.008</td>
<td>0.010</td>
<td>0.009</td>
</tr>
<tr>
<td></td>
<td>(0.004**)</td>
<td>(0.004**)</td>
<td>(0.004**)</td>
<td>(0.005*)</td>
</tr>
<tr>
<td>Separation rate</td>
<td>-0.057</td>
<td>-0.055</td>
<td>-0.061</td>
<td>-0.087</td>
</tr>
<tr>
<td></td>
<td>(0.021***)</td>
<td>(0.021***)</td>
<td>(0.024***)</td>
<td>(0.036***)</td>
</tr>
<tr>
<td>Competitors (two-digit)</td>
<td>-0.384</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor share (two-digit)</td>
<td></td>
<td>-0.007</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor share (three-digit)</td>
<td></td>
<td></td>
<td>-0.131</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log(total assets)</td>
<td>0.019</td>
<td>0.018</td>
<td>0.023</td>
<td>0.024</td>
</tr>
<tr>
<td></td>
<td>(0.005***)</td>
<td>(0.005***)</td>
<td>(0.005***)</td>
<td>(0.006***)</td>
</tr>
<tr>
<td>Log(employees)</td>
<td>0.009</td>
<td>0.008</td>
<td>0.004</td>
<td>0.004</td>
</tr>
<tr>
<td></td>
<td>(0.007)</td>
<td>(0.008)</td>
<td>(0.007)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Debt-to-capital</td>
<td>0.042</td>
<td>0.039</td>
<td>0.045</td>
<td>0.045</td>
</tr>
<tr>
<td></td>
<td>(0.014***)</td>
<td>(0.014***)</td>
<td>(0.014***)</td>
<td>(0.016***)</td>
</tr>
<tr>
<td>Sector dummies (two-digit)</td>
<td>Yes</td>
<td>–</td>
<td>Yes</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sector dummies (three-digit)</td>
<td>Yes</td>
<td>Yes</td>
<td>–</td>
<td>Yes</td>
</tr>
<tr>
<td>State dummies</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year dummies</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>12,745</td>
<td>12,724</td>
<td>11,190</td>
<td>8,692</td>
</tr>
</tbody>
</table>

Notes: The dependent variable is the indicator for ESOP (including leveraged ESOP). The coefficients on number of competitors and labor shares are multiplied by 1,000 for exposition. Coefficient estimates in random effects models are presented, and standard errors in parentheses are clustered at the firm level. ***, **, and * denote significance at the 1, 5, and 10 percent levels, respectively.

between them when the discount factor is sufficiently high. Ideally, in relation to the model predictions, the lower range of the distance to default should also be significant, but this is not the case. One potential reason is that it can be costly to adopt a (leveraged) ESOP when the firm is indeed closer to defaulting.

ESOP adoption is significantly correlated with the employee’s separation rate in the predicted (negative) direction in all columns of Table 2. That is, a lower separation rate (hence, a higher discount factor for the employees) is indeed associated with ESOPs rather than PS plans. Next, the coefficient on the labor bargaining power has the predicted (negative) sign across columns, but it is only statistically significant in Column 1. Hence, this is weaker
Commitment and discretion in contracts

Table 3. ESOP and operating profit

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESOP</td>
<td>−24.26</td>
<td>−26.61</td>
<td>−24.15</td>
<td>−40.87</td>
</tr>
<tr>
<td></td>
<td>(9.94**)</td>
<td>(13.22**)</td>
<td>(8.87***)</td>
<td>(14.89***)</td>
</tr>
<tr>
<td>Log(dist. default)</td>
<td>9.19</td>
<td>9.79</td>
<td>9.88</td>
<td>12.10</td>
</tr>
<tr>
<td></td>
<td>(4.64**)</td>
<td>(4.73**)</td>
<td>(5.18**)</td>
<td>(5.98**)</td>
</tr>
<tr>
<td>Separation rate</td>
<td>8.42</td>
<td>8.48</td>
<td>6.58</td>
<td>31.20</td>
</tr>
<tr>
<td></td>
<td>(26.67)</td>
<td>(26.76)</td>
<td>(33.10)</td>
<td>(52.09)</td>
</tr>
<tr>
<td>Competitors (two-digit)</td>
<td>−1.188</td>
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<td>(0.726)</td>
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<td>(0.096)</td>
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<td>Labor share (two-digit)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Labor share (three-digit)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log(total assets)</td>
<td>125.7</td>
<td>132.6</td>
<td>122.5</td>
<td>125.3</td>
</tr>
<tr>
<td></td>
<td>(37.7***)</td>
<td>(41.8***)</td>
<td>(38.5***)</td>
<td>(42.3***)</td>
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<td>Log(employees)</td>
<td>−113.0</td>
<td>−120.8</td>
<td>−109.7</td>
<td>−114.6</td>
</tr>
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<td>(50.1**)</td>
<td>(55.0**)</td>
<td>(50.9**)</td>
<td>(57.7***)</td>
</tr>
<tr>
<td>Debt-to-capital</td>
<td>105.7</td>
<td>116.5</td>
<td>118.3</td>
<td>160.2</td>
</tr>
<tr>
<td></td>
<td>(103.7)</td>
<td>(108.8)</td>
<td>(107.7)</td>
<td>(136.5)</td>
</tr>
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<td>–</td>
<td>Yes</td>
<td>–</td>
</tr>
<tr>
<td>Sector dummies (three-digit)</td>
<td>–</td>
<td>Yes</td>
<td>–</td>
<td>Yes</td>
</tr>
<tr>
<td>State dummies</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year dummies</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>N</td>
<td>12,389</td>
<td>12,368</td>
<td>11,190</td>
<td>8,692</td>
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</table>

Notes: The dependent variable is the EBITDA divided by the number of employees. All coefficients are in the natural units. The rest is the same as the note to Table 2.

evidence consistent with our prediction that, ceteris paribus, the firm is more likely to adopt an ESOP if worker bargaining power is low.

In the remainder of Table 2, we find that the firms with larger total assets are more likely to have an ESOP than those with smaller assets. This suggests that the flexibility or the discretionary nature of PS plans might be more attractive to smaller firms. Additionally, an ESOP firm is more likely to have a higher debt-to-capital ratio, which can be partly explained by the fact that an ESOP can be leveraged (i.e., financed with borrowing). Alternatively, it is also consistent with the claim that distressed firms might have an incentive to use employee stock ownership as a financing tool.

In Tables 3 and 4, we examine whether ESOPs are in fact negatively correlated with firm profits, and positively correlated with revenue efficiency, as our theory predicts. To do so, we move the ESOP variable to the right-hand
### Table 4. ESOP and revenue efficiency

<table>
<thead>
<tr>
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<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
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<tr>
<td>ESOP</td>
<td>2.074</td>
<td>2.128</td>
<td>2.559</td>
<td>2.903</td>
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<tr>
<td></td>
<td>(0.812**)</td>
<td>(0.825***)</td>
<td>(0.950***)</td>
<td>(1.072***)</td>
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<tr>
<td>Log(dist. default)</td>
<td>0.010</td>
<td>0.021</td>
<td>0.037</td>
<td>-0.080</td>
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<td>(0.087)</td>
<td>(0.088)</td>
<td>(0.098)</td>
<td>(0.110)</td>
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<td>Separation rate</td>
<td>1.456</td>
<td>1.621</td>
<td>2.208</td>
<td>5.940</td>
</tr>
<tr>
<td></td>
<td>(1.966)</td>
<td>(1.994)</td>
<td>(2.373)</td>
<td>(3.304*)</td>
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<tr>
<td>Competitors (two-digit)</td>
<td>-0.174</td>
<td>-0.189</td>
<td>-0.000</td>
<td>-0.017</td>
</tr>
<tr>
<td></td>
<td>(0.014***)</td>
<td>(0.033***)</td>
<td>(0.004)</td>
<td>(0.013)</td>
</tr>
<tr>
<td>Competitors (three-digit)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor share (two-digit)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labor share (three-digit)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log(total assets)</td>
<td>0.348</td>
<td>0.269</td>
<td>0.577</td>
<td>0.080</td>
</tr>
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<td></td>
<td>(0.780)</td>
<td>(0.783)</td>
<td>(0.936)</td>
<td>(1.189)</td>
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<tr>
<td>Log(employees)</td>
<td>-0.256</td>
<td>-0.012</td>
<td>-0.260</td>
<td>0.774</td>
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<tr>
<td></td>
<td>(1.036)</td>
<td>(1.036)</td>
<td>(1.236)</td>
<td>(1.539)</td>
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<td>Debt-to-capital</td>
<td>1.068</td>
<td>1.171</td>
<td>1.758</td>
<td>2.682</td>
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<td>(0.921)</td>
<td>(0.933)</td>
<td>(1.026*)</td>
<td>(1.196**)</td>
</tr>
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<td>Sector dummies (two-digit)</td>
<td>Yes</td>
<td>–</td>
<td>Yes</td>
<td>–</td>
</tr>
<tr>
<td>Sector dummies (three-digit)</td>
<td>–</td>
<td>Yes</td>
<td>–</td>
<td>Yes</td>
</tr>
<tr>
<td>State dummies</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year dummies</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>(N)</td>
<td>11,127</td>
<td>11,106</td>
<td>9,575</td>
<td>7,077</td>
</tr>
</tbody>
</table>

**Notes:** The dependent variable is the time-varying revenue efficiency from a stochastic frontier model at the two-digit NAICS level. All coefficients are multiplied by 1,000. The rest is the same as the note to Table 2.

The above estimation equation and use new dependent variables, while everything else remains the same as in Table 2. That is, we still include the original set of covariates in \(X_{it}\), which can affect a firm’s adoption of an ESOP; however, in Tables 3 and 4, we are primarily interested in the direct correlation between the ESOP indicator and the dependent variables of interest.

In Table 3, the dependent variable is the firm’s profit (EBITDA per employee). Profit per employee is a commonly used performance metric in the literature; and here we find that ESOP firms tend to have a lower level of profits than PS firms, which is statistically significant in all columns. This is consistent with our theoretical prediction that, if firms choose retirement plans based on profitability, then observed ESOPs should be associated with lower profits than observed PS plans. Additionally, the...
 coefficient on the distance-to-default is positive, which reflects how firms in distress will tend to have lower profits, for any given choice of retirement plan.

In Table 4, the dependent variable is the firm’s revenue efficiency (i.e., a scaling factor from the revenue frontier). Here, we find that ESOP firms tend to have a higher level of revenue efficiency than PS firms, which is also statistically significant in all columns. This is consistent with our model in that the effort provision is efficient under a formal contract (or ESOP) while it is inefficiently low under a relational contract (or PS plan). The number of competitors, as a control variable, is negatively correlated with the revenue efficiency, which intuitively makes sense because more competition would tend to reduce a firm’s revenues.

In sum, under our empirical construction and econometric assumptions, the data offer some support for the theoretical prediction that firms with a low bankruptcy probability and with a low separation rate of their employees prefer to adopt an ESOP rather than a PS plan, and weaker support that firms prefer PS plans when labor bargaining power is strong. The results are also consistent with the prediction that PS plans might be associated with higher profits but a lower level of revenue efficiency.

Taking our theoretical framework literally, where the separation rate is exogenous, the firm’s choice to adopt a PS plan would itself push up profits and result in lower effort/efficiency. However, other mechanisms might be at play in the real world. For example, it might be that inefficient firms, or firms that extract higher profits from employees, may experience higher turnover, which in turn makes ESOPs unattractive for the workers.

There can also be a variety of other factors, unrelated to commitment and discretion, that affect retirement-plan adoption. For instance, practitioners often highlight the fact that ESOPs can borrow money to buy employer stocks, whereas PS plans cannot. Thus, “[in] limited circumstances, ESOPs have been used to finance the buy-out of a firm or company division that otherwise would have closed” (ESOP Association, 2021). Similarly, firms can set up an ESOP as a takeover deterrent when the management has a smaller stake in the company (e.g., Beatty, 1995; Pagano and Volpin, 2005; Rauh, 2006).

Given the multiple factors that can influence the choice of retirement plan, our empirical results should be interpreted cautiously. Our regression

24“If the leveraging is used to divest a division of the company, the ESOP will buy the shares of a newly created shell company, which in turn will purchase the division and its assets” (ESOP Association, 2021). While this can be observationally consistent with one of our predictions, cases of being bought out of bankruptcy (e.g., Polaroid and United Airlines) seem rare among public firms.
results highlight observable differences between ESOPs and PS plans, and their correlation with various proxies that relate to parameters from our theoretical model. We show that many of these correlations point in the direction predicted by theory, but a more careful examination of causality is left to future research.

7. Conclusion

We have explored how the presence of separation shocks, in a setting with bargaining and relational contracting, can generate a trade-off between efficiency and distribution, and potentially drive up employer profits. Worker exposure to these shocks restricts the set of agreements the parties can implement ex post, which can help increase employer bargaining power ex ante. The implication is that an employer choosing relational contracting, rather than formal contracting, might induce lower worker effort, but nonetheless enjoy higher profits.

Empirically, we relate our theoretical model to employer-sponsored retirement plans, focusing on PS plans and ESOPs. We point out that payments to employees under PS plans are largely discretionary whereas payments under ESOPs are not. Our results show that firms with ESOPs tend to have lower separation rates, lower profits, and higher revenue efficiency, than firms with PS plans. Interpreting ESOPs in terms of formal contracting, and PS plans in terms of relational contracting, these results are broadly consistent with our model’s predictions.

Our main argument is that ESOPs and PS plans can also affect firm performance via incentive provision. We add that the effect of employer-sponsored retirement contributions can be more nuanced depending on the level of discretion or commitment associated with different plans. Tasks that might be considered for future research include a more detailed investigation of causality and when our mechanism affecting retirement-plan choice may be more or less important than others, as well as exploring whether the trade-off between efficiency and distribution that we highlight also arises in other empirical settings.

Supporting information

Additional supporting information can be found online in the supporting information section at the end of the article.

Online appendix
Replication files

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