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Employee Ownership and Participation Effects on Firm Outcomes

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by

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Abstract

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Hundreds of firms in the U.S. are majority-owned by their employees through Employee Stock Ownership Plans (ESOPs). This study measures whether employee ownership makes a difference in firm outcomes, looking also at effects of worker participation in management-type decisions. Theorists have suggested that the rarity of employee ownership is *prima facie* evidence that such firms could not be as efficient as traditional firms. But institutional and financing constraints may be a more realistic explanation for their rarity, and it is important for policy purposes to investigate efficiency objectively.

The author compares sales per employee for a panel of over 300 majority-employee-owned (EO) firms in the United States with a panel of closely matched, traditionally-owned (KO) firms. Responses from a survey of firm work practices are used to estimate worker participation effects.

Sales per employee is substantially and significantly higher for the employee-owned group of firms. This "employee-owned advantage" is significantly greater among smaller firms, and (holding firm size constant) improves as the dollar value of the average employee's ownership stake in firm stock goes up. Holding both firm size and employee stake constant, the employee-owned advantage is substantially (though not significantly) greater in the large group of firms which are 100% owned by their ESOP

Trusts. Holding firm size constant, increased production-worker influence on three facets of firm innovation also improves the advantage.

Resistance to broadening employee ownership may come in part from academic arguments that such a structure must reduce firm (and thus social) efficiency. This study belies those arguments. Broader employee ownership and employee participation in firm management, which have intrinsic social benefits, improve firm outcomes as well.

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First, thanks to Professor Harvey Gram, of Queens College (City University of New York, or CUNY) and the CUNY Graduate Center, who was willing to be my primary adviser on a subject with which he was not familiar. He is, however, expert in the theory of the firm, and provided excellent direction for my self-instruction, as well as provocative ideas, on that topic. Professors Thom Thurston (also of QC and the GC) and David Laibman (Brooklyn College of CUNY, and the GC), the other members of my committee, made many valuable suggestions.

This project would not have been possible without a bit of incredible serendipity. Shortly after starting to review the literature in this field, I noticed that two of the most prominent researchers were on the faculty of Rutgers The State University of New Jersey. By total coincidence, I had taken Labor Economics from one of them during my Masters in Labor Studies program a decade earlier. I approached this professor, Douglas Kruse, about working with me on this project, and not only did he and his colleague, Professor Joseph Blasi, assist me tremendously with suggestions about data sources and methodology, but they also connected me with The ESOP Association (TEA) and helped arrange for the Employee Ownership Foundation (EOF) to pay for some of my research time. Without Kruse's and Blasi's guidance, this project would have been much less viable. Thanks also to Corey Rosen of the National Center for Employee Ownership, one of my initial sources of ideas for research topics.

I thank the CUNY Research Grant Program at the Graduate Center, which provided funding for supplies and postage for the survey which is part of this study (after obtaining this grant and purchasing some of these supplies, The ESOP Association

agreed to print and mail the survey questionnaire, so the bulk of this grant money was returned). Thanks to The ESOP Association, and President Michael Keeling in particular. TEA provided me with their membership list (of employee-owned firms) and associated proprietary data (unavailable elsewhere), and printed and mailed the questionnaire to a substantial part of their membership; I have no doubt that their imprimatur on the survey is the reason for an extraordinarily high response rate. And because TEA wanted this project done, they arranged for the EOF to pay me for some research time, enabling me to leave my full-time job.[1]

Thanks to the Fiscal Policy Institute, my employer for much of the time I worked on this project, and in particular to James Parrott, Deputy Director and Chief Economist, who consistently treated me as a fellow professional and honored my need to complete my doctorate, as well as giving me plenty of opportunity to learn how to work with imperfect data.

[1] The Employee Ownership Foundation is a 501(c)(3) research and education foundation affiliated with and supported by The ESOP Association, a 501(c)(6) business trade group of companies owned by employees through an employee stock ownership plan, or ESOP. The EO companies used as data in this paper are members of The ESOP Association.

Table of Contents

List of tables

List of figures

Employee ownership and participation effects on firm outcomes

> The form of association, however, which if mankind continues to improve, must be expected in the end to predominate, is not that which can exist between a capitalist as chief, and work-people without a voice in the management, but the association of the labourers themselves on terms of equality, collectively owning the capital with which they carry on their operations, and working under managers elected and removable by themselves (John Stuart Mill 1852, cited in Dow 2003).

Introduction: Why Industrial Democracy?

In his analysis of waste in the modern economy, Michael Perelman (2000) notes that frequent observers have made claims similar to those of Benjamin Franklin in 1784:

> if every man and woman were to work for four hours each day on some thing useful, that labour would be sufficient to procure all the necessaries and comforts of life, want and misery would be banished out of the world, and the rest of the twenty-four hours might be leisure and pleasure (cited in Smyth 1905-1907 v.9, p.246).

Leaving aside the details of Franklin's estimation and the ambiguity of what "useful" work might be, this observation reminds us of what classical economics cared about, and what the goal of economics should be even today: not just understanding how production works, but also describing how the organization of production could be improved to allow for less demanding, boring, or dangerous work and more satisfying time—both at leisure and at work that is gratifying, useful, and safe. While not so specific, this has been expressed before:

> If it were not for the hope that a scientific study of men's social actions may lead, not necessarily directly or immediately, but at some time and in some way, to practical results in social improvement, not a few students of these actions would regard the time devoted to their study as time misspent (A.C. Pigou 1932, cited in Bowles et al. 1993).

In the modern era, neoclassical economists who strive to understand the mechanisms of capitalist production seem to have adopted "efficiency" as a disembodied goal, a standard by which to measure both the organization of production and that of the society as a whole—as though the quality and usefulness of product, the distribution of social wealth, the quality of work life, and the hours and quality of leisure were somehow irrelevant to economic analysis—despite the fact that our most precious resource is our own 24 hours a day.

The study of alternative forms of firm ownership and control, then, is an attempt to ask whether other ways to organize production may provide for better selection of products, better distribution of social wealth, better quality of work life, and more leisure—"efficiency" (in the limited neoclassical use) aside. While this is clearly an insurmountable order for one piece of research, it is important to acknowledge these questions in order to make it clear why subsidiary questions are worth asking.

On the other hand, Perelman (2000) points out that even looking just at narrowly defined efficiency (which I take to mean minimal use of limited resources to produce maximal useful product), there is strong evidence that capitalist firms, even given close competition, operate far from a theoretical optimum. Harvey Leibenstein (1966, cited in Perelman 2000) pointed out that competitor plants in near proximity, using similar technology, often had wide differences in productivity, yet survived; he hypothesized an unknown source (an "x-factor") of inefficiency that is built into any organizational structure. On a macroeconomic level, aggregate organizational inefficiency could easily outweigh unemployment and allocational inefficiency in keeping the economy from its potential output (Vanek 1989, p.93, cited in Perelman 2000).

In the United States, David Gordon (1996, cited in Perelman 2000, pp.70-71) has calculated that

> [d]epending on the definition, between 15 and 20 percent of private non-farm employees in the United States work as managers and supervisors. In 1994 we spent $1.3 trillion on the salaries and benefits of nonproduction and supervisory workers, almost one-fifth of total gross domestic product….

According to Gordon, only Canada (at 12.9%) came close to the 13.0% share of all non-farm employees in managerial and administrative positions in the U.S. in 1994; the next closest was Norway, with 6.8% (data were not available for the U.K., France, or Italy); these differences persisted when he controlled for type of industry. Adding in the possibility that "intensive monitoring can be self-defeating, encouraging perfunctory, rather than cooperative behavior" (Perelman 2000, p.71), how much waste is engendered by the monitoring U.S. workers are subject to?

Is it possible that, despite all the theoretical justifications for hierarchical firm management, these hierarchies create intrinsic inefficiencies? In the past century, there has been a tremendous expansion of firm bureaucracies (levels of management above production supervision) that may well be a large part of any "x-factor." This expansion aside, is it possible that large, hierarchical firms create or fertilize a tendency to "shirk,"[2] no matter the intensity of supervision? Adam Smith (1776) noted that division of labor under competitive capitalism can enhance productivity (and thus the social product);

> It is naturally to be expected … that some one or other of those who are employed in each particular branch of labour should soon find out easier

[2] I use quotation marks here to note that this is a value-laden word, but will drop them for readability for the rest of the text. Those of us who have worked at alienated labor might refer to this as strategic withholding of one's maximum effort to conserve one's strength and sanity—and to enhance job security and bargaining leverage for the workforce as a whole.

> and readier methods of performing their own particular work, wherever the nature of it admits of such improvement (Book I, chaper 1).

But if the increased value from improvements in production processes are captured by firm owners (as traditionally understood), is it any wonder that suggestion boxes are empty? That the very people who know the most about the real issues at the point of production quickly learn not to share that knowledge with superiors?

Thus the issue of productive efficiency, even narrowly defined and separated from the questions of social allocation, is worthy of study at this level. For if more democratic structures of production are intrinsically more productive, the greater surpluses from those forms of production can be allocated by worker-owners toward their own greater leisure, as well as toward general improvements in quality of work life.[3] And even if democratic workplaces are no more productive than hierarchical firms, the inherent improvements in quality of work life would have clear social benefits.

Our history has led to a pattern of firm organization in which financial investors hire managers (or entrepreneurs seek investors, who then install managers) who, in turn, hire workers; the residual (net profit) belongs to the investor-owners. But nothing in the theory of the firm favors this prevalence of capital hiring labor; Paul Samuelson (1987) notes that "in the competitive model it makes no difference whether capital hires labor or the other way around." Sherwin Rosen (1993), citing Shavell, notes that "ownership internalizes conflicts of interest over maintenance and reckless use of equipment, which surely is the most important reason why most capital goods are owned outright [rather

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[3] The pure form of industrial democracy is the producer's cooperative, a structure that has been seen as the ideal by both utopian and socialist dreamers for centuries. This is my interest as well, but the limited number and size of such firms in the modern U.S. has made it impossible for them to be the subject of this research.

than leased] by the firms that employ them." Dow (2003, p.166) cites Holmstrom and Milgrom's (1991) suggestion that "If the individuals using an asset do not own it, they may have weak incentives to maintain it properly or avoid its misuse …." He goes on to note that "By a logical extension of their argument, it might appear that large indivisible assets such as oil refineries and steel mills should be owned jointly by the production teams using them, because worker-owners would be in the best position to monitor how physical assets are used." (Dow 2003, p.167) To the expected criticism that free-ridership could undermine the viability of such a commons, Dow argues that "…small to medium-sized production teams might find ways to handle these dilemmas…; small-scale communities can often resolve such collective-action problems through suitable institutions." This inherent conflict of interest over asset maintenance, especially when output volume is the signal for reward, may be minimized, then, if the very people who *use* the equipment own it, rather than the "bosses" with whom they have ongoing tension over shares of the surplus.

According to the most common theory, firms (and "employment") exist because of the need to avoid costly frequent renegotiation of employment contracts, because of the efficiencies gained through development of internal mechanisms of allocation that respond flexibly and on command to the needs of final production, and because of the efficiencies gained through developing and maintaining the culture (my word) of specific production arrangements—knowledge of technique and timing, of personnel allocations, and of finance, factor, and sales markets (Coase, 1937). I would point out that much of

this array of knowledge is held and transmitted by *non*-management workers in today's traditional (financial investor[4]-owned) firms.

There has long been a tension between managers of such traditional firms (hereafter KO firms, for capital-owned) and non-management workers (hereafter "workers," ignoring for convenience that managers may formally be employees as well). Managers, as agents of the owners, try to maximize profit, and hence to extract maximum work effort from workers. Workers, while they may desire their firm to succeed and survive, may desire to minimize work effort, both in intensity and in extent (that is, work effort per hour and number of hours worked); this is the standard assumption in labor economics about their utility function.[5] More intense supervision (assuming observable work effort—increasingly less prevalent in today's forms of production) brings with it the creative resistance that exacerbates this conflict. Perelman (2000, p.69) suggests that "in the course of these epic struggles between labor and capital, a considerable … amount of the resources directly devoted to the production of goods and services waste away." But I agree with him that "the greatest loss … is the failure to take advantage of and to nurture the skills, and even more so the creativity of the unappreciated people who toil to supply us with the goods and services that make up our standard of living" (p.69).

Much human resource management literature and energy is devoted to resolving this conflict in favor of KO firm management, especially in refusing to yield total control of employment conditions to "outside" parties (that is, unions). Thus one dimension on which labor ownership and management may be preferable is in reducing or eliminating

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[4] The reason for qualifying "investor" by "financial" will become apparent below.
[5] I would add satisfaction with work process and product—one might say "quality of work life"—as an argument in workers' utility function; one might also add approval by coworkers, especially in long-term, stable work groups.

this conflict: if workers collectively retain the residual, they may be able to decide what level of work effort (and hours) maximizes their joint utility of profit and "leisure" (inclusive of "reduced effort"), as well as how to make the work itself more satisfying. While this decision-making process does not guarantee *compliance* (that is, neither shirking nor absenteeism is automatically avoided, especially in firms where large size makes the decision-making process less participatory), it at least eliminates the inherent conflicts of interest that underlie management-worker conflict in KO firms.

Secondly, if we assume that productivity improvements are of social benefit (holding aside the question of allocation of that benefit to financial investors or to workers—or neither), we need to note that workers in KO firms, while they are naturally creative about such improvements, are commonly aware that (1) they will probably not benefit directly from suggested innovations, except perhaps by token recognition; and that (2) such innovations, if successful in reducing worker-hours needed, may in fact jeopardize their own jobs or those of their coworkers. In a worker-owned firm, however, in which (as noted above) ease of work and quality of work are recognized as *firm* goals, and employment stability is an established norm,[6] workers' and the firms' motivations for improved productivity would be aligned; while there may still be only token recognition for the suggestion, there will no longer be the threat of a severe cost.

Third, I would argue that most workers have a strong desire to control their work process. The world-wide prevalence of small proprietorships in the face of tremendous

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[6] Worker-owned and -managed firms have been shown to adjust *hours* rather than *employment* in response to business cycles or other market changes. See, for example, Craig and Pencavel (1992): "…when reductions in labor costs are called for, the cooperatives are inclined to protect employment and tolerate more moderate wage increases, if not cuts in earnings, than conventional firms…", p.1089.

odds against their (even short-term) success is strong evidence of this, as is the demand for land tenure (rather than farming for hire) in much of the still-agricultural world. While industrial democracy does not give *individual* control to each worker, I would argue that, at least in smaller firms in which there can still be a sense of collectivity (that is, workers can feel the firm is "us"), this desire for work-process control can be met under employee ownership, reducing further the tension between the worker's and the firm's objectives, and providing structures that allow and encourage workers to share and implement their wealth of energy and ideas.

Fourth—and here let me reduce the universe to the United States—I would argue that there cannot be *civic* democracy without substantial *industrial* democracy.[7] True democracy requires the active participation—not just voting—by broad segments of the polity. Workers whose work lives are spent in alienated work, directed entirely by others and constrained against any creative inputs, are essentially trained not to have such inputs into their communities, nor do they often have the energy or time to participate in these ways; especially in a society in which household is most commonly just nuclear family, childcare and household tasks overwhelm any "leisure" hours. Both by involving workers in participatory decision-making in the work process, and by accepting reduced work effort and work hours as part of the firm's maximand, industrial democracy can encourage and build political democracy outside of the workplace (see, for example, Smith 1985).

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[7] I have had some of these ideas so long that I cannot source them. But Bowles and Gintis (1996) express very similar ideas, especially pp.75 ff. Dow (2003) provides a review of the literature on the connections between workplace and civic democracy in section 2.3, pp.27-32. An extensive argument is found in Dahl (1985).

Neo-classical economics treats workers as interchangeable parts; "labor" is just another factor in production. But Marxian theory aside, workers are not lumber or machines. Workers have a natural human tendency to develop social networks at work, to value continuity of employment (even if the work itself is alienating or ill-paid), to identify with employers. Our work effort is not just another input; it is a piece of ourselves, an irreplaceable number of calories and hours and brain power that—while it may be motivated by the need to earn a paycheck and retain continued employment—is in another view a form of investment in the firm's success and survival, even if only because that makes our continued employment more secure. Further, this investment (let's call it "labor investment") is of far more importance to its donor than money invested is to financial investors. Unlike equity, it is not fungible or impersonal—it is, conceptually if not always actually, blood and sweat—and a wage that (supposedly) reflects instant marginal productivity rather than the long-term value of the worker's efforts cannot be an adequate return. In a real sense, workers, not financial investors, are the firm; is there then any logic to imputing "ownership" solely to financial investors, or to insisting through law that firms' primary duties must be enhancing those investors' values?

Much literature focuses on aligning incentives. But looking only at the firm's incentives is too narrow a focus. Corporations were created because governments (at first, monarchs) saw advantages to allowing private finance to make investments that might wind up enriching public (or royal) wealth. Their existence today—that is, the existence of institutions of production that have most of the legal protections of individuals (and often favored tax treatment)—can be justified only insofar as they contribute to social

well-being. Publicly held firms have *perverse* incentives on several dimensions of social well-being, which I would argue might be reduced or eliminated under worker ownership: (1) they have incentives to produce and promote products that will soon need to be replaced (in the case of computers, for example, new software turns out to require new hardware); (2) they focus on small differentials such as branding rather than on true innovation (think automobiles); (3) environmental damage, both in production and excessive packaging, is externalized; and (4) maltreatment of workers in productivity pressures, safety failures, and alienation (that is, making the work as unsatisfying as possible through Taylorization, etc.), can be rewarded by higher profits (or higher stock values), even though such rigidity limits creativity and potential for firm innovation that may have longer-term positive social (and firm!) value. While there are no guarantees that worker ownership would eliminate these social damages (even better working conditions are not guaranteed), I would argue that there is far more alignment of incentives between firms and society at large when firms are owned by people who are a direct, everyday presence, a part of the local community, and who must directly bear the consequences of the firms' production decisions. Even in a competitive economy, employee-owners are not likely to outsource their jobs to Malaysia, nor to create hazardous waste sites in their communities.

Because of all the standard assumptions about the efficiency rationales for financial investors owning firms, it is necessary to ask whether ownership by employees might be just as (if not more) viable a way to organize production under modern capitalism. This project is a piece of trying to answer that question.

Chapter 1: The firm, ownership, and incentive alignment

The firm

Ronald Coase (1937) said that a firm "consists of the system of relationships which come into existence when the direction of resources is dependent on an entrepreneur" (Coase, in Williamson and Winter, p.22). But the discussion that leads up to that summary does not in fact require an entrepreneur as we understand the term—only that there be some person or group who does manage the enterprise; that could as well be the collective will of the participants in the enterprise. So I will recast Coase's core observation in a preliminary definition:

A firm (enterprise, company) is a collection of individuals who engage in shared production. Some individual or group of individuals has the authority to manage production and external (market) transactions. Internal transactions (the allocation of resources within) are incompletely contracted, and occur in a non-market environment under the management's direction, with a range of possible levels of shared control and renegotiation of these contracts among the participants.

Coase argued that firms emerge in situations in which there would be substantial costs of repeatedly going to the market for new factors, making contracts for those factors, and in particular determining prices for those factors. It is clear[8] that it is labor that has the indeterminate price, since material factors are likely to be market-priced and readily contracted for in a clear and insurable way (that is, providers take responsibility for quality). But the quality and quantity of labor are far less clearly evaluated in the

[8] "[Lack of specificity in the contracting of factors] is obviously of more importance in the case of services—labor—than it is in the buying of commodities" (Coase, in Williamson and Winter, pp.21-22).

market, and come with no guarantees. So rather than repeatedly going to a hiring hall, bargaining with "human factors" over a wage (with no guarantees of output quantity or quality), and renting a day's worth of labor power[9] *ad hoc*, the management of the firm enters into a longer-term (perhaps indefinite) hiring contract "whereby the factor, for a certain remuneration (which may be fixed or fluctuating), agrees to obey the directions of an entrepreneur *within certain limits* [emphasis in original; the existence of limits is made explicit to exclude slavery]" (Coase, in Williamson and Winter, p.21). Thus the firm amasses enough labor power, working together under the direction of management, to turn its other factors into products.

H.B. Malmgren (1961, p.403) adds stability as a motivation for the existence of firms:

> [w]here fluctuations in demand, or in the time required for supply, or both are important the firm can consolidate production and carry the necessary average level of idle capacity to achieve long-term stability in production and price, … [in turn reducing] the cost of finding and making transactions.

According to these observers, then, firms exist because having a management that brings workers under a single "roof" to produce together, with open contracts that allow reallocation of labor power as needed, and enabling the enterprise to have a longer planning horizon, minimizes transaction costs and adds to productive efficiency and stability. In turn, the price stability and quantity flexibility provided by these organizations grease the wheels of the whole economy.

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[9] I make the Marxian distinctions: one cannot rent *labor*, but only people's *labor power*. And one can only rent it, since *purchasing* it suggests it is separable from the worker. These distinctions are not critical to the discussion here, and I will not expand on them.

Brian Loasby adds a further dimension to the rationale for the existence of firms. He argues that many circumstances affecting factor prices and production methods are unknowable (even in principle) *a priori*, and that "the organisation of this adaptive process … provides the function for management." (Loasby 1976, p.65) Firms are almost organic [my analogy] institutions which, "instead of attempting to establish contingent claims markets in situations where the necessary complete listing of possibilities cannot be achieved, … organise subassemblies [of people and resources] within the economy to encourage the ongoing search for knowledge, and the effective transfer of new technology"(p. 70). This is not just avoidance of uncertainty, but avoidance of "the logically infinite costs of creating a system of contingent claims markets when there is no way of knowing when the search for a complete listing [of possible future states] has reached its goal" (pp. 70-71). He agrees with Coase that the firm "offers a possible substitute for the market system when the information required for the working of that system is costly to acquire and use," but notes that this "argument becomes even stronger when we recognise that some of that information cannot exist" (p. 78).

For Loasby (1976, chapter 4), the incomplete contracts specified by firms are but one piece of a general state of ignorance about the future; not only is the distribution of future states unknown, but it *cannot* be known. The firm is an adaptive mechanism that gathers experience, enabling it to decide *ad hoc* how to proceed as situations (supply availabilities and prices, labor markets, personnel, consumer demand, technologies, regulations) change. Accepting this critique, I would modify my working definition:

> A firm (enterprise) is a collection of individuals who engage in shared production, and which is structured to adapt as needed to external and internal changes. Some individual or group has the authority to manage production and external (market) transactions. Internal transactions (the

> allocation of resources and tasks within) are incompletely contracted, and occur in a non-market environment under the management's direction, with a range of possible levels of shared control and renegotiation of these contracts among the participants. Knowledge is accumulated and used to evaluate alternative reactions to changes such as in supply availabilities and prices, labor markets, personnel, consumer demand, technologies, and regulations.

But I would note that this abstraction still ignores the fact that the experience thus gained is embodied in the people who work at the firm, and that effective evaluation and implementation of such changes requires the enthusiastic participation of those workers. I would posit that firm ownership and control by workers is one way to elicit that enthusiasm. Further, I would argue that the supposed dangers of free-ridership in such collective endeavors are far smaller than the dangers (to productivity and creative problem-solving, as well as to human bodies and psyches) of alienation of work in hierarchical KO firms.

Firm ownership

Gregory Dow (2003) modifies Coase's definition; Dow's firm is

> a set of agents supplying inputs to a common production process, where the productive activities of the agents are coordinated through an authority structure and the resulting outputs are sold on a market. Inputs may include labor, physical assets, financial wealth, raw materials, land, or any other resource that can be owned by an individual or group (p.92).[10]

Authority and compliance issues within a firm are focused on compliance by labor; defective or otherwise unsatisfactory purchased material inputs can be sent back to a supplier, subject to common law and the discipline of the market. It is the power of some

[10] Dow includes "sold on a market" in order to exclude household production for household consumption.

agent(s) to describe and delimit labor's tasks, subject ultimately to the threat of firing for non-compliance, that makes a collection of workers into a firm.

But one must then ask where that authority is vested. While various intermediary models may exist, Dow contrasts pure control by financial investors (the capital-managed firm) with pure control by productive[11] workers (the labor-managed firm), and concludes that there is nothing in the theory of the firm to explain why most corporations today are controlled by financial investors. In fact, "[a]ny allocation of resources that can be supported by firms having an outside asset owner or 'principal' can also be supported by firms where worker teams own assets jointly and no principal exists" (p.134, citing Dow, 2000).

Dow thoroughly explores the question of why capital controls most firms, and argues that there is no basis for concluding that the answer is one of greater efficiency. Rather, "differences in *alienability* affect control rights in firms [emphasis added]" (Dow, 2003, p.236). The fact that labor cannot be separated from the person who performs it, while capital can be exchanged (alienated), matters in several ways.[12] First, worker-owners are perceived (by potential lenders) to have shorter time horizons than investor-owners, and may over-depreciate their equipment or pursue risky projects in pursuit of short-term gain; thus potential lenders and investors have little confidence in repayment, and EO firms have less opportunity for investment and credit. Second, if control is vested in a substantial number of worker-owners, the controlling group is thereby much larger than an investor-selected board of directors (or individual CEO); thus there may be

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[11] "Productive" is used here to clarify that Dow does not mean to include such structures as limited partnerships with large subordinate staffs.

[12] The following arguments are from Dow, 2003, pp.236-240.

additional transaction costs (delays, reversals of policy) traceable to the larger number of participants. Third, even though there may be markets for membership in a worker-owned firm, the essential identity between *membership* and *employment* suggests that such markets would likely function less efficiently than markets for shares of capital ownership. Employee-owned firms might fail to expand employment as needed (because of unwillingness to dilute the value of incumbents' shares of fixed assets) or succumb to outside buyers' bids to buy them out; the transition from employee ownership to investor ownership would be much less challenging than the reverse, with its accompanying financing problems. And if membership markets fail to fully value membership rights, that failure would encourage the supposed short-sightedness that limits financing options.[13]

Pagano and Rowthorn (1996a) add an extremely valuable insight on path-dependence to Dow's suggestions. Essentially, they say that the predominance of capital-owned firms creates a superstructure that reinforces that predominance:

> First, the self-reinforcing nature of a given organizational equilibrium inhibits gradual evolution through piecemeal mutations in property rights or technology…. Secondly, the efficiency of each organizational equilibrium is itself dependent on the frequency of other types of organizational equilibrium. The joint consequence of these objections is that, instead of a simple efficiency story based on market 'selection,' there will be a process of cumulative causation between property rights and technology which is such that alternative, and potentially more efficien[t] combinations, may never have the chance to develop (p.117).

These challenges to the usual assumption that the infrequency of employee ownership proves that EO firms must be less efficient than KO firms demonstrate the need for empirical tests of that hypothesis.

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[13] This last point is my own addition to these hypotheses.

Incentive alignment and monitoring

A sole producer-proprietor has a clear interest in the productivity of her enterprise: the more she can produce (assuming a stable price above costs), the more she earns from her work. But the establishment of shared production in a firm creates a new set of problems: if production is truly shared (as opposed, for example, to piecework establishments), and output is thus not linked to a particular worker, what is any worker's incentive to carry his share, both in quantity of work done and quality of the produced output? Sherwin Rosen points out (1993, p.82) that as firms grow in complexity, costs of directly monitoring work grow prohibitively. Absent direct monitoring, and assuming that workers are (at least occasionally) loath to exert effort, how can management avoid shirking? Gross malfeasance, if discovered, can always be penalized by separation; in a labor market with substantial unemployment (and incomplete unemployment insurance) this can be a significant threat, especially if reputation affects future employability. But how does management minimize less dramatic deviations from the firm's expectations?

As far back as the early 20th century, "social harmonizers" thought that the tension between labor (trying to minimize work effort) and capital (trying to maximize profit) could be ameliorated by giving workers a share of firm profits.

> There can be no doubt that the soundest possible solution of the labour question will eventually be found in such a modification of the terms of partnership as shall bind the interests of the employer and worker more closely together. Under such a system the weekly wages would be regarded merely as subsistence money or advances …. The balance … would be paid (as) a share of all surplus profits [ellipses in citation] (Jevons, 1910).

This classic solution to aligning incentives (when piece-work is not viable because output is not ascribable to individuals) has had a long and varied history. In the

early 20th century, while there were a number of large firms with profit-sharing plans, these did not cover most workers, and were "seen primarily as a form of executive compensation" (Mitchell et al. 1990, p.35). As of 1986, 22% of the full-time workforce in medium and large firms had some form of profit-sharing (U.S. Bureau of Labor Statistics, 1987, p.81). But given its irregular history, and the fact that there is seldom immediacy or transparency to rewards, there has been little consensus that profit-sharing is an effective incentive.

Another answer to the question of motivating work effort, and one which further modifies the definition of the firm, is by Alchian and Demsetz (1972). While they do not disagree with Coase's formulation regarding *a priori* wage indeterminacy, they focus on the issue of work incentives. Team production, in which joint effort creates output greater than would be produced by the sum of separate individual efforts, is assumed; why else have labor work together? But this makes it impossible to measure *individual* work effort simply by observing *team* output; such measurement—if attempted at all—becomes very costly: "measuring marginal productivity and making payments in accord therewith is more expensive by an order of magnitude than for separable production functions" (Alchian and Demsetz, p.779). Assuming that workers enjoy leisure (exerting less work effort, as well as less work time), and given that the cost to each worker (in reduced compensation for the team's reduced output) of shirking is only 1/N of the *team's* lost marginal product value, "each input owner will have more incentive to shirk when he works as part of a team, than if his performance could be monitored easily or if he did not work as [part of] a team" (p.780). And the 1/N effect limits incentives for coworker monitoring as well;

> so long as there are costs for other people [in the team] to detect this shift toward relaxation, it will not pay (them) to force him to readjust completely by making him realize the true cost…; [the result will be] a lower rate of productive effort and more shirking than in a costless monitoring, or measuring, world (p.780).

Alchian and Demsetz suggest that having a specialized monitor may begin to solve the problem of evaluating (and enforcing) worker performance. But to create a correct incentive for proper monitoring, "give [the monitor] title to the net earnings of the team, net of payments to other inputs" (p.782)—that is, the residual. "The monitor earns his residual through the reduction in shirking that he brings about … by observing and directing the actions or uses of these inputs [i.e., workers]" (p.782). The monitor must be able to alter or cancel the employees' contracts based on his observations, since otherwise there is no enforcement effect. They then use this arrangement as part of their definition of the "classical capitalist firm:"

> … the contractual organization of inputs … with (a) joint input production, (b) several input owners [workers], (c) one party who is common to all the contracts of the joint inputs, (d) who has the rights to renegotiate any input's contract independently of contracts with other input owners, (e) who holds the residual claim, and (f) who has the right to sell his central contractual residual status (p.783).

Edward Lazear (1979) suggested that private pensions were an effort to create an incentive for proper work effort: the worker received only part of her marginal product in the wage, and the rest would be returned later in her career, dependent on not being fired in the interim for poor work. A similar logic can explain tenure-related wage increases in many work contracts: a worker is paid less than marginal product value early on, in the expectation that she will recoup the loss later if her work remains satisfactory.

Even if such a bond (that is, an implicit promise by the worker backed by anticipation of pay gain) were to be very high, however, it would still only be effective if

there is some type of monitoring which can either measure effort, or observe some behavior that is presumed to be correlated with effort. Further, Alchian and Demsetz's formulation seems to me only to beg the question: if work effort is no longer measurable because of team production, how does assigning a monitor lead to the ability to motivate workers to do any more than satisfy that monitor's immediate expectations? The more intrusive and punitive that monitoring, creating immediate incentives to comply, the more incentive there is for workers to do no more than required to keep their jobs;[14] true investment by workers—such as creative modifications and knowledge-sharing—is never attained.

Holmstrom and Milgrom (1991) develop a model in which multi-tasking by agents is the key to incentive issues. Either the principal "has several different tasks for the agent or agents to perform, or the agent's single task has several dimensions to it" (p.25). In the context of the employment relationship under costly monitoring, then, even a single task for a worker in which quantity of output might compete with quality of output fits such a model. Under these circumstances, "a system of piece rates for output may lead agents [workers] to increase the volume of output at the expense of quality" (p.25). In general, in setting incentives, the principal must take into account the fact that "incentive pay … serves to direct the allocation of the agents' attention *among* their various duties" (p.25), and must therefore be careful in providing incentives for readily measurable activities when the competing activities—e.g., quality of output or good maintenance of capital assets—are of value to the principal. This model leads directly to

[14] Thus the "working stupid" and work-to-rule campaigns suggested by worker advocates responding to intensive work pressures during the 1970s and 1980s; for current examples, see Slaughter (2005), esp. pages 67 and 132-133.

a reflection on asset *ownership*: if good maintenance of the productive asset is important and not readily measured, *either* "only muted" incentives should be provided for quantity of output (assuming the asset is owned by the principal), to protect the asset from abuse, *or* ownership should be vested in the agent [worker]—who will then have incentives to maintain it—but strong incentives for quantity should be implemented to prevent too-cautious use (p.26). These authors show (seemingly successfully) that the general predictions of this model as to when explicit incentives should be offered are validated in common business practice.

Efficiency wages

Many observers have noted that, in highly capital-intensive industries, workers are paid more than workers with comparable traits in more labor-intensive industries; these apparent discrepancies are collectively called "efficiency wages." In their incisive paper describing these phenomena, Krueger and Summers (1988) effectively demolish explanations for these inter-industry wage differentials such as unmeasured labor quality, union effects, and compensating differentials, and argue that these differentials amount to a rent to induce workers to better performance. "[H]igh wages are efficacious in reducing turnover" (p.260), thus reducing search and training costs to employers. Efficiency wages may raise work effort by increasing the expected cost to workers of job loss, given workers' limited information about external employment possibilities (but note that as with Lazear's suggested role for pensions, this rationale still requires that there be some level of monitoring that can ascertain the acceptability of each individual's work efforts). Krueger and Summers add another possible explanation for the above-market wages: that "firms which pay higher wages will find that they attract a higher quality pool of

applicants"—a selection effect rather than one of adjusting incentives. In any case, the difficulties of monitoring play a central role in making such above-market wages cost-effective;

> …when there are differences in their ability to … supervise and monitor their workers, or to measure labor quality … because of differences in the technology of production, then the optimal wage to pay will vary (p.261).

Shapiro and Stiglitz (1984) and others explain observed higher wages in more capital-intensive industries as "efficiency wages," designed to elicit effort by increasing the expected cost of dismissal, especially as work effort is not readily measurable. As explained by Pohjola (1993, p.151),

> … the modern production system requires effort which is hard to quantify. What is required from the workers is their ability to deal with changes occurring on the shop floor as well as to treat problems and prevent errors in the production process. Not all of this is routine work which can be standardized and measured. At least some tacit knowledge of the production process is required. Effort can … be interpreted as the intensity with which the worker uses his … knowledge of the system of production.

The profound problem facing firm management, then, is how to guarantee maximum, consistent work effort while not stifling workers' creative energies. I am suggesting here that this dilemma may not be solvable under capital-ownership.

Employee ownership and incentive alignment

As production becomes more complex, and individual output less measurable, industrial theory needs to address whether a new paradigm is in order. Intensive monitoring with potential punishment may not work to motivate work effort and creativity. Aligning incentives in firms where effective production demands employees' creative—even enthusiastic—input may require more than some tweaking of HR policies. Applebaum and Berg (2000) observe that modern production technology has

enabled manufacturing firms to be highly attuned to quality control, flexible (rapidly adjusting product design to meet customers' changing demands), and better able to provide "just-in-time" production for customers, reducing inventory-related costs. They argue that all these changes require better-trained production workers, and that some of the decision-making previously vested in supervisors must be devolved to horizontal interactions among shop-floor workers. "… [C]oordination and communication among workers to solve problems and regulate production assume a key role. Firms tend to foster communication and coordination by adopting human resources and industrial relations practices that encourage and reward these coordination and problem-solving activities by front-line workers…" (p.107). Any time taken from direct production work for horizontal consultation is compensated for by reducing inventory, improving quality, prompt satisfaction of customer needs, and solving production snags as they arise. While in some cases the horizontal-coordination effect on *productivity* may be small or zero, "[t]he real payoff to companies … comes on the revenue side of the equation as companies that consistently deliver perfect quality products in a timely fashion develop long-term relationships with their customers..." (p.114). Front-line workers use the hands-on information they have to yield these values; "[i]n all of these situations, the information rents are positive," and Applebaum and Berg go on to raise the question of whether workers in these situations should have guarantees of capturing some of the returns on their human capital investments. They speculate that workers' extensive investment in firm-specific human capital may need to be compensated by "[e]nforceable rights to employee participation in corporate governance [that would]… safeguard the continuity of the employment relationship" (p.118).

And Brian Loasby (1976) underlines the need to give employees more latitude if their knowledge is to be useful to the firm:

> …subordinates have a good deal of control over the information which their superiors use, including the information by which they are judged…. Neither the target nor the performance recorded in a control system necessarily represents reality; on the contrary, all formal control systems may be expected to generate misinformation (pp.138-139).

While participation in firm *governance* (though highly unlikely in an industrial regime that resists even shareholder initiative) might lead to protections for workers' human-capital investments, might not worker *ownership* provide a more intuitive framework? The usual response to this question is to raise the issue of work discipline: even if most workers understand their ownership and care about outcomes, what about free-riders?

Weitzman and Kruse (1990) respond to the free-rider objections to profit-sharing as a viable incentive broached in Alchian and Demsetz (and by many other theorists). They argue that in repeated games with full information (as would be the case with long-term employment in a relatively consistent work environment), there is a cooperative equilibrium in which all gain (though modestly) from each employee's increasing work effort, though there is no guarantee that this equilibrium would be achieved;[15] this result would apply as well to employee ownership. Alchian and Demsetz, in their discussion of firm structures other than the classical capitalist one, note that while pure profit-sharing

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[15] But note that stable employment groups within firms develop cultures; it is not hard to posit cultures in which the expectation of some satisfactory level of effort is transmitted from senior employees (or natural leaders) to others, with social sanctions as enforcement, thus making achievement of the cooperative equilibrium much more likely. See, for example, Winther and Marens (1997), pp.400-401: "…members of a collective may anticipate mutual monitoring based on social norms for work behaviour in peer groups and that[,] combined with significant degrees of ownership[,] could have a preponderous influence on performance."

suffers from the same potential misalignment of incentives as does the unmonitored team, teams with *small* numbers of members may effectively self-monitor; for smaller teams, "monitoring need not be entirely specialized" (p.786). And they acknowledge the possibility that "team spirit" (which I would argue is essentially the cultural standard suggested in the note below) might discourage shirking and make team production more efficient (p.790). Appelbaum and Berg (2000, p.135) observed that with even a small share of workers' compensation linked to firm performance, workers seemed to "contribut[e] discretionary effort to improv[e] efficiency and quality." They speculated that "[i]t is the recognition of workers as stakeholders in the firm, and not the size of the incentive, that is significant and that provides incentives for workers to expend appropriate levels of discretionary effort" (p. 135). And, in reporting on results of a recent survey of workers at over 300 work locations, Freeman, Kruse, and Blasi (2007) find that ownership cultures can reduce shirking;

> "shared capitalist" arrangements—defined broadly as those in which firms share rewards and decision-making with workers—and positive labor relations encourage workers to act against shirking behavior and thus strengthen the potential for group incentive systems and team production to overcome the free rider problem….[16]

Given relatively stable attachment between worker and work group, then, employee ownership includes the possibility of non-hierarchically-enforced norms of production (read "effort") that can not only allow but even encourage the creativity and enthusiasm for work needed in modern production contexts; "efficiency" need not suffer. Employee ownership, at least theoretically, provides the opportunity to ameliorate many of the contradictions suggested in the introduction between workers' lives at work and

[16] This study reported that anti-shirking behavior is, as expected, strongest in smaller firms.

their status in the community at large. What remains is to ask some empirical questions about its viability: where employee ownership exists, do firm outcomes differ?

Chapter 2: Employee Ownership Stock Plans (ESOPs)

In order to study the effects of employee ownership in the U.S., I have turned to the largest group of firms for which employee ownership is a credible description, those in which a substantial portion of corporate value is held by an Employee Stock Ownership Trust under the provisions of an Employee Stock Ownership Plan, or ESOP. As of the latest available estimates, there are about 9,800 ESOPs, stock bonus plans, and profit-sharing plans primarily invested in employer stock, with over 11 million employee participants, and holding assets of over $900 billion (National Center for Employee Ownership [NCEO] 2008). While the NCEO asserts that these other incentive plans are similar to ESOPs, I find that assertion somewhat weak, since I am concerned with forms of ownership in which workers have a strong enough share of firm value to credibly have a sense of ownership, and in which there is at least the possibility of substantial worker input into firm management.

Looking at profit-sharing, gain-sharing, and stock options, a 2006 survey found that 46.7% of private-sector employees participated in at least one of these forms of capital ownership.[17] An earlier analysis of federal benefit plan reports (Form 5500) by Kruse (2002, reporting on 1998 data) showed that there were over 2,000 large (over 100 participants) "non-401(k)" ESOP plans, with total participation by over 3 million employees, and total plan assets of nearly $70 billion, of which $54 billion was in employer stock, for an average of $17,000 in employer stock per participant. Because such plans hold much higher shares of their assets (77.1% on average, compared to

[17] Data from the 2006 General Social Survey, administered by the National Opinion Research Center, University of Chicago, and provided to me by Prof. Joseph Blasi of Rutgers University, New Brunswick, NJ.

401(k) ESOP plans, with 39.0% on average) (Kruse 2002, Table 1) as employer stock than any other type of employee ownership plan, it is these I will focus on.

> Employee stock ownership plans [ESOPs] are defined in sections 401(A) and 4975(E)(7) of the Internal Revenue Code and in section 407(D)(6) of the Employee Retirement and Income Security Act (ERISA). These and all other federal laws mentioning ESOPs treat them as employee benefit plans. However, the original promoters of ESOPs did not intend them to serve primarily as such. The 1976 annual report of the Joint Economic Committee described the intended purposes of ESOP incentives as follows: "to provide a realistic opportunity for more U.S. citizens to become owners of capital, and to provide an expanded source of equity financing for corporations." (U.S. Congress 1976a, p.100).
>
> A subsequent congressional report acknowledged that "ESOPs share certain characteristics with other employee benefit plans—profit sharing, thrift and savings, and stock purchase or bonus plans." [U.S. Congress 1976b, p.4] But the differences between ESOPs and other employee benefit plans were again stressed, particularly the potential use of ESOPs as a technique of corporate finance. The report also stated that ESOPs "may … [elllipsis in citation] enhance employee motivation which in turn increases productivity" (Both paragraphs from Conte and Svejnar 1990, pp.143-144).

Louis Kelso, a banker and corporate attorney, "believed in the annual issuing of stock to mainly low income families…. As economies become more capital intensive, reformed institutions are necessary in order to provide households with other sources of income than labour" (Winther and Marens, p.403). He was the major actor to push Senator Russell Long to include Employee Stock Option Plans (ESOPs) in the Employee Retirement Income Security Act (ERISA) of 1974.

> The ESOP is a trust, a 'legal fiction' designed to hold stock on behalf of employees until they retire from the firm… Virtually all full-time employees must be included in any ESOP, with the major exceptions being unionized workers (who may negotiate to join the plan) and non-citizens. Stock is usually allocated to each employee on the basis of that person's share of total payrolls, though it can be allocated on the basis of seniority … or, in rare instances, on the principle of equal shares to all participants. In addition, other rules are in place to ensure that most of the

benefits do not go to the better paid employees (Winther and Marens, pp.403-404).

Substantial tax benefits are offered to financial institutions to loan money to ESOP trusts to purchase shares, and dividends paid to the trust are deductible for tax purposes if they are used to pay off these loans. Besides the tax and financing advantages, what distinguishes ESOPs is that unlike any other employee benefit trust, in which diversification is required by ERISA to protect employees, ESOPs by definition hold most (often all) of their assets in employer stocks.[18]

Does ESOP participation substitute for other compensation?

Advocates of employee ownership must respond to the argument that total compensation must be responsive to the labor market, and thus that granting employees what amounts to a future benefit must come at the cost of other income. But Blasi, Conte, and Kruse (1996) found that, among public companies in which broad-based employee ownership plans held at least 5% of company stock as of 1990, there was an 8% higher average compensation level than at other, comparable public companies.

Kardas, Scharf, and Keogh (1998), using 1995 employment and wage data for 102 ESOP firms and 499 matching firms from the Washington State Employment Security Department, and benefit data from 1995 IRS forms 5500, concluded that "employees are significantly better compensated in ESOP companies than are employees in comparable non-ESOP companies." And another study comparing pay and benefits

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[18] For a thorough explanation of the legislative history and tax advantages of ESOPs, see Employee Benefit Research Institute (1988), "Employee stock ownership plans can enhance corporate performance, but most ESOPs have not been structured to realize their full potential in this area," Issue Brief number 74, January, 1988, on line at http://www.ebri.org/publications/ib/index.cfm?fa=ibDisp&content_id=3715.

between ESOP and non-ESOP firms in Massachusetts found that pay and other benefits were similar between these two types of firms (Scharf and Mackin, 2000). I have seen no studies that dispute these conclusions.

Chapter 3: The empirical literature: effects of employee participation and ownership

Corey Rosen, the Executive Director of the National Center for Employee Ownership (and whom I consulted when starting this project), noted, in his Guide to Doing Academic Research on Employee Ownership, (Rosen, 2007) that major studies have found "that when employee ownership is combined with a 'high involvement' management style, companies perform a great deal better than they would have been expected to perform otherwise." This seems to be the consensus in the field, and a fairly accurate reflection of the research reviewed below. This article also responds to the issue of whether ownership is given as a substitute for wages or other benefits:

> Overall, the data show that ESOPs significantly add wealth to employees, albeit with substantial variations from one company to another. They also show that ESOP participants are more likely to have other retirement plans than comparable non-ESOP participants.

There have been several very thorough reviews of this literature, and this chapter does not attempt to replicate those. In reporting on the articles in the literature, I omit those that explicitly and solely deal with cooperatives, firms which are wholly and directly owned and controlled by all their workers, since these bear little resemblance to ESOPs, even those which are wholly owned.[19]

Ownership effects

One of the earliest studies (and most comprehensive, since it used privileged IRS data) of ESOPs was done by the Government Accounting Office (now the Government Accountability Office) and released in 1987. Looking at firms that adopted ESOPs from

[19] Aside from the fact that even in 100% ESOPs workers may have little or no control over their work, their realization of any share of the residual is long in the future, while cooperative worker-members make ongoing decisions about how to allocate any residual.

1974 through 1979, and comparing firm measures for 2 years before and for 3 years after adoption, the GAO "found that its profitability and productivity measures for firms that adopted ESOPs did not show consistent, statistically significant patterns of improvement after the ESOP was established" (GAO p.3). But while such before-and-after analysis may be the most valid, we must note that the characteristics and size of the U.S. ESOP sector have changed substantially in the 30 years since the data used here.

Thorardson (1987) compared Swedish worker-owned firms (at least 50% owned by at least 50% of the workforce) with closely matched traditionally-owned firms from 1976 to 1983 (15 pairs). Return on total capital showed no difference, but both value added and labor productivity (value added per worker) were significantly higher for the worker-owned group. Both the EO and KO firms were mostly in small-scale industry, with relatively high human-capital input and relatively low material capital input, but within this sector the EO firms had a significantly higher capital-labor ratio. The author notes that this tendency is consistent with a model of labor-managed firms (LMFs) in which worker-owners prefer capital investments to expanding the numbers of worker-owners, although there is no indication in the article as to whether any of the EO firms were in fact labor-managed.

Another "classic" in this literature was Conte and Svejnar's 1988 study of total factor productivity in 40 US firms, comparing profit-sharing companies, Employee Stock Ownership Plans (ESOPs), producer cooperatives (in the plywood industry), and companies with programs for employee participation but with no profit-sharing or employee ownership. They found that "profit sharing has a positive effect, although the coefficient is statistically significant only in [one] specification" (p.146). They argue,

however, that because "under profit-sharing the extent to which workers have a say over their own incomes is rather limited[, o]ur results suggest that in companies which have profit-sharing programs there exist other programs as well under which workers can influence their own incomes, and it is these programs which lead to productivity gains" (p.146).

In 1995, Chris Doucouliagos performed what may have been the first meta-analysis of studies on this topic. He looked at 43 published studies of both worker-managed firms and "participatory capitalist firms." "Profit-sharing, worker ownership, and worker participation in decision-making are all postively associated with productivity" (p.58), with the associations being stronger among the worker-managed firms.

A 1996 article by Blasi, Conte and Kruse compared 562 publicly held U.S. companies that had more than 5% employee-held stock during 1980-1990 with the balance of publicly held companies on various output and growth measures. While they found no significant differences between EO and non-EO firms in 1990 levels of return on assets, return on equity, price/earnings ratio, or profit margin, employee ownership had significant positive impacts on changes in all of these measures (except P/E) between 1980 and 1990, controlling for employment level and for capital intensity. Further, the relationship between employee ownership and higher profit growth was strongest among smaller companies.

More directly relevant to this paper, Winther and Marens (1997) sampled ESOP and matching non-ESOP firms in New York and Washington states over the period 1987–1991. Their independent variables were: ratio of ESOP participants to total

employment, percentage of total firm stock owned by the ESOP, and a dummy for whether ESOP participants held voting rights. Employee participation was quantified differently for the two sub-samples; in New York, management was asked to rate employee influence in investment, purchase of tools and equipment, budgets and cost control, work organization, health and safety, and decisions pertaining to the general work environment. The responses could be (1) employees had no influence at all; (2) management's decisions were communicated to the employees; (3)employees were encouraged to make suggestions or express opinions; (4) employees' suggestions were regarded as equal to management's and implemented on an equal footing; and (5) employees were in full control of those decisions (these response options strongly influenced my questionnaire format). In Washington, participation was measured by how many means of communication and participation managers used: new employee orientations, suggestion systems, quality circles, employee task forces, autonomous work groups, profit-sharing plans, participative management training, labour-management training, employee representation on board of directors, and others; firms that used four or fewer of these were called "less participatory" and those using five or more "more participatory."

They found that average annual growth in sales was significantly higher in New York for ESOPs than for controls, and ESOP employment growth in Washington out-performed that for controls, though not significantly. In Washington, the margins (ESOPs over controls) for both sales and employment growth were significantly (and substantially) higher for the more participatory firms. For New York, growth in sales per employee was highly correlated with the degree of employee participation, holding share

of ownership, ESOP participation rate, and voting rights constant. Over all, they concluded that they found no consistent effects for ownership alone, only "a complementary effect of ownership and workplace democracy" (p.417), a result that jibes with the consensus noted by Rosen (of the NCEO) and other analysts and with Conte and Svejnar's observations, and which motivates my hypotheses below.

Kruse and Blasi (1997) wrote a thorough and exacting review of studies of employee ownership on attitudes and performance. Focusing on ESOPs only, these authors performed a meta-analysis of eleven studies of performance (some cross-sectional, some at adoption of ESOPs, and some post-ESOP adoption) and concluded that "most of the tests strongly reject, for each of the three types of comparisons, the null hypothesis of a zero relationship …" (p.137). "The average estimated productivity difference between ESOP and non-ESOP firms is 6.2 percent, while the average estimated pre/post-adoption difference is 4.4 percent" (p.144), though most individual studies do not reject their null hypotheses. But almost no studies show worse performance for ESOPs, which "flies in the face of theoretical predictions that employee ownership will lead to deteriorating workplace relations, decisions, and performance"[20] (p.145).

In testimony before Congress in 2002, Kruse expanded further on his and Blasi's meta-analysis noted above. Adding several studies to the ones covered in 1997, he reported to a Senate committee that "productivity improves by an extra 4-5% on average in the year an ESOP is adopted, and the higher productivity level is maintained in

[20] They note that some authors predict inadequate supervision, underinvestment, and/or inefficient decision-making. On the other hand, many of these predictions assume worker-management as well as worker ownership, and most ESOPs in the U.S. are far from worker-managed.

subsequent years." Further, "employee ownership was linked to faster employment growth in three of four studies," and "employee ownership is linked to higher rates of firm survival;" U.S. public companies existing in 1983 were 20% more likely to survive through 1995 if they were substantially employee-owned.

Participation effects

Conte and Svejnar (1990) published a lengthy review of the literature on worker ownership and participation, in which they summarized two earlier studies of their own, along with several others. Reporting on their whole review, they note that "Perhaps the clearest evidence concerns the effect of participation in employee-owned companies. The evidence shows that participation groups improve company performance in an employee ownership setting..." (167).

Freeman and Rogers (1999) reported on a large mid-1990's study of employee involvement (EI) programs in US firms. EI programs included such practices as "quality circles and discussion groups, total quality management, self-directed work teams, safety committees,[and] production committees…" (p.101). They found that EI programs were widespread (52% of respondents said their firms had at least one type), and that "Workers believe that EI improves company performance … and studies of worker participation in company decision-making suggest that, at a minimum, such programs do not harm productivity on average and, more likely than not, raise it" (p.116).

A 1997 study by Ichniowski, Shaw, and Prennushi focused on "innovative employment practices" in the steel industry in the U.S. They found that "Lines using a set of innovative work practices, which include incentive pay, teams, flexible job assignments, employment security, and training, achieve substantially higher levels of

productivity than do lines with the more traditional approach, which includes narrow job definitions, strict work rules, and hourly pay with close supervision" (p.291).

A 1999 study by Buchele and Christiansen—which, incidentally, shares much theoretical grounding about work processes with this paper—looks not at worker ownership nor worker participation (as an independent variable), but rather at workers' rights on the job, starting with the hypothesis that "workers' willingness to give up the protection provided by rigid work rules, disclose their proprietary knowledge [to management], and initiate changes in the production process that raise labor productivity depends on their ability to trust management to honor commitments to long-term employment and productivity gain sharing" (p.94). They develop two orthogonal indices of workers' rights in 15 advanced capitalist countries (factor-analyzing such measures as collective bargaining coverage, unemployment insurance replacement rate, and statutory requirements for notice prior to dismissal), and discover that both measures have significant and substantial positive effects on average annual productivity (output per hour) growth among these countries. These observations jibe with my observations in the introduction that workers will be reluctant to invest in ("own") their work unless they really *own* their work—that is, unless they see a direct connection between improved output and improved quality of worklife, leisure, or income, and have assurance that their investments in process improvement will not threaten their tenure.

A study by Freeman, Kleiner, and Ostroff (2000) looked at sales and productivity effects of "employee involvement" (including profit-sharing and various HR practices, as reported in a survey of HR managers). Their "analysis cannot detect an EI effect on

productivity," although they did "find some evidence that incentive pay affects productivity, albeit one that varies with estimating technique and specification" (p.12).

Kruse, Freeman and five others (2003) did another study in an effort to determine what more is needed (besides employee ownership) to resolve the free-rider problem, to generate "a corporate culture that emphasizes company spirit, promotes group cooperation, encourages social enforcement mechanisms, and so forth" (citing Weitzman & Kruse 1990, p. 100). These authors suggest (p.6) that

> Firms, or workers, must do something more [than just ownership and involvement] to prevent free riding behavior from destroying employee morale and the potential of an ownership incentive system. They must set in motion forces that lead employees to view themselves as critical contributors to output even though each individual's contribution is modest, much as democracies must motivate voters to go to the polls even though it is rare that any single vote determines any election.

They gathered Human Resources policies from 11 ESOP firms, and compared surveys of employee attitudes among those firms. A derived "involvement index" of HR policies was positively correlated to positive employee reports of co-worker performance, perceptions of fairness, and perceptions of worker input and influence. "Within-firm comparisons in three ESOP firms … show that employee-owners who participate in employee involvement committees are more likely to exert peer pressure on shirking co-workers" (from the abstract). They argue that their results suggest that positive performance effects from employee ownership would require (1) viable and visible incentives, (2) participative mechanisms allowing workers to affect policies and procedures, and (3) developing a corporate culture that "battles against tendencies to free ride" (from the abstract).

Lastly, Sesil (2006) looked at a sample of British manufacturers over a ten-year period, looking at both workers' degree of control—meaning that (for example) they have the authority to shut down the production process if they perceive a quality problem ("shopfloor or worker quality task control")—and return, some form of group incentive (either profit-sharing or company-wide bonuses). He controlled for quality of workforce and skill level by using a dummy variable for "whether the blue-collar workforce is given multi-skill training." Neither control nor return alone had significant effects on return on assets or return on sales, but when they were both present, positive performance effects were highly significant—and substantial—in most models.

Hypotheses

Based on the theories discussed earlier, and on the thrust of the empirical literature, I have generated the following hypotheses to test:

• Firms which are substantially owned by employees will be more productive than similar firms owned in a traditional manner. Here, "substantially" means that the ESOP owns at least 50% of firm value; "similar" means in the same or very similar industry, and having close to the same number of employees; and "productive" refers to sales per employee per year. This is the principal hypothesis, and will be tested with a one-tailed measure (the null will be that KO firms are equally or more productive).

• Each of the following should improve EO firms' margin of productivity (if any) over matched KO firms:

- ESOP ownership of a higher portion of firm value (more collective "investment" by employees, perhaps implying more control by workers and more centrality of employee ownership to firm culture);

- Higher ESOP firm value held per participant (higher individual "investment" by employees, perhaps providing more incentive);
- Higher degree of worker control over various aspects of their jobs (since the opportunity to affect production and other decisions is necessary for ownership to matter, and control should enhance workers' sense of ownership);[21] and
- Smallness of the firm (reflecting the discussions above about firm culture and the 1/N effect).

David Laibman (personal communication) has suggested that ownership effects may be stronger in labor-intensive industries than capital-intensive ones, since if worker effort improves productivity, that will matter more when labor is a larger factor in production. Thus I will test the following hypothesis:

• EO firms' margin of productivity over KO firms (if any) will be greater for retail, wholesale, information, business services, health and education, leisure, and service industries (NAICS 4 through 8) than for extraction, construction and utilities, and manufacturing (NAICS 2 and 3). While this is a grossly simplified dichotomy, it is a fair first approximation.

Lastly, because construction firms hire large numbers of workers on a project basis—workers who have no firm ownership—I will also perform some of the above tests excluding construction firms.

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[21] For this test, I will look both at a worker-control score derived from detailed survey questions, and at the management-to-worker ratio as reported in the survey. There is so little choice by workers of firm directors, and so little variation in union presence, that this information from the surveys is not usable.

Chapter 4: Data Sources and Methodology

The employee-ownership panel

My original plan for obtaining data for this study was to obtain a list of major employee-owned firms from the National Center for Employee Ownership (which I did, for a fee), and then to gain productivity and other relevant information from the 2002 Census of Manufactures at the Census Data Center (at Baruch College). While I was in preliminary discussion with CDC Director Rosemary Hyson with regard to access, Douglas Kruse and Joseph Blasi informed me of The ESOP Association's (TEA) interest in my study. The ESOP Association is a business trade group of companies owned by employees through an employee stock ownership plan; its member firms are, in the main, fully owned by their ESOP Trusts. After some discussion with them and TEA President Michael Keeling, it became clear that the TEA was prepared to provide me with their membership list of employee-owned firms and associated proprietary data, as well as to endorse, print, and mail out my survey questionnaire about worker influence in firm management. Blasi also suggested that I could get relevant data on these firms (and find matching firms) from the D&B (Dun and Bradstreet) Million-dollar Database. Given the discouraging responses I had gotten from Hyson, I decided to proceed with the TEA's data, and to use the D&B database to obtain sales, employment, and industry classifications. Luckily, as a former adjunct at Baruch, I was able to search and download D&B data on-line through Baruch College Library's subscription.

First, let me note that this database is not designed for this type of comprehensive data retrieval, and all data gathering, including finding matches, was extremely tedious. Most annoying, the data was often internally contradictory, in the following way: each

firm location (that is, branch or self-standing firm) lists “sales (this site)”, “sales (all sites)”, “employment (this site)”, and “employment (all sites)”. But quite often—I would estimate in at least 20% of company records—there are different employment numbers for the two entries, but identical sales figures. Despite many calls to D&B’s data people, I got no satisfactory explanation of how to interpret this inconsistency. In several cases of multi-site or multi-subsidiary firms, however, I looked at D&B’s “corporate linkage” information, and noted that the sum of all subsidiary employment tallied closely with the “employment all,” and the sum of subsidiary sales figures tallied closely with “sales all,” so where I had to use these records, I used the “employment all” and “sales all” figures.

I narrowed the TEA’s membership list to those 292 firms in which the ESOP trust owns 50% or more of firm value, and which have 100 or more employees, both according to the TEA’s data; the minimum firm size was chosen simply to make the task tractable. At a later date, after receiving and compiling survey questionnaire returns, I added the 81 firms which had returned surveys (but which had not been included in the first panel because the TEA’s information indicated they have fewer than 100 employees) in order to fully investigate the effects of worker influence. I queried the D&B database for each of my employee-owned firms, and downloaded and recorded sales (all sites), employment (all sites), and detailed (6-digit) industry (NAICS, the North American Industrial Classification System). I use all-site data on the grounds that ownership is of a corporate complex, not of a particular site. Of the firms I started with (members of the ESOP Association with more than 50% employee ownership and 100 or more employees, according to the Association’s data), I could not find 30 in the database, even after searching Google and their websites for possible alternate names, and these cases had to

be dropped.[22] In addition, 2 of the original firms that I found in the database had no estimates of employment, so these also had to be dropped, leaving 260 firms. These searches, and those for matching non-employee-owned firms, were done between August, 2007, and February, 2008. D&B occasionally updates its data; I noticed only one or two very minor changes when I had to revisit files for various reasons, so I believe this is a short enough time span that comparisons are valid.

I further checked each ESOP firm in the panel against a recent (2004) database provided by the IRS (and publicly available—thanks to Douglas Kruse for the simplified format) to be sure that it was indeed an Employee Stock Ownership Plan firm. Those that I did not confirm I cross-checked with www.freeerisa.com, a free database that covers the same material. There were several firms that I still did not confirm as having ESOPs until I checked their websites and saw them proclaim their employee ownership. Altogether, I dropped 7 of the original EO firms because they had been bought out, had only profit-sharing plans, or were otherwise confirmed as not having ESOPs, leaving 253 firms. I could find no viable matching KO firms for three of these, leaving 250 of the original 292, plus 81 from the survey-return group. The resulting employee-owned firms panel has 331 firms; statistics for the panels appear in chapter 5.

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[22] Because all these firms are privately held, these data were often reported as estimated. I am concerned that D&B's algorithm for estimation may be simple enough that close matches by industry and size may yield the same estimated sales per employee, biasing any comparisons toward zero (I confirmed this in some cases: multiple matches with estimated sales and employment often had identical S/E). For this reason I noted whether each record showed "actual" or "estimated/modeled," and did so also with the matching firm records. I will perform tests both using and excluding estimated data. The small sample size argues against exclusion, so if the "actual" results are similar I will use the full panels.

The non-employee-owned, "matching" firms panel

For each EO firm, I queried the database seeking firms with an identical 6-digit NAICS, and with employment within about 10% of the firm's employment. Because majority-EO firms are by definition not subsidiaries, I limited the search to non-subsidiary firms, and asked the database to provide full-corporation numbers (not, for example, employment and sales at a branch location).

• If this yielded a reasonable number of matches (about 1 to 10), I accepted these. If not, I widened the employment range a bit, up to about ±20%.

• If this yielded matches, I accepted these. If not, I widened the industry range, successively dropping specificity from the NAICS, though I would not go below a 3-digit match, and used my judgment in accepting less-specific industry matches (for example, in attempting to match a large tire-repair firm, I accepted other types of auto repair firms, but not car washes, even though they share the same 4-digit designation). If there were no matches within about 20% of the employment target at this point—this occurred in only 3 cases—I marked the case as "no matches" and deleted it from the sample.

• In many cases (business services such as printing or engineering consultancies, in particular), I obtained an unreasonably high number of matching firms, even narrowing employment to an exact number. In such cases, I selected matches just from the state of the EO firm and immediately surrounding states. In several cases among smaller companies with many more potential matches, I narrowed the matches to just the same state in order to get a tractable number—and even then wound up with twenty or more matches for several EO firms.

• Obviously non-profit (university-related, for example) and government enterprises were excluded, since their cost and operations structures may be very different from for-profit firms.

• Once the full list of 2,254 potential matches was complete, I then checked these firms for employee ownership in the same way as the ESOPs. 42 potential matches (three of them multiple appearances of the same firm) were dropped because I confirmed that those firms did have ESOPs. One EO firm lost its single match in this way; by broadening my parameters I found five satisfactory new matches, leaving 2,217 matches in the KO panel.

Firms with fewer than 100 employees are required to file 5500 forms only every 3 years, so the 2004 file of IRS 5500 data did not include smaller firms that have ESOPs. I checked all 841 matching firms on FreeErisa (a tedious job that could only be done one at a time), and deleted five firms which have ESOP plans (including one plan which had been liquidated in 2004, in case any effects linger);[23] the final KO panel has 2,212 firms.

Dealing with multiple matches

For those EO firms with multiple matches, I created a matching "meta-firm," using a weighted average of sales per employee among the firms in that firm's match group (total sales divided by total employment)[24]. This enables the matching-firm panel to have the same size and industry distribution as the ESOP panel, and avoids potential

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[23] Many of these firms (as with the larger matching firms) have 401K plans, "profit-sharing" plans, and/or pension plans. I assume that these do not represent a meaningful share of firm ownership by employees, and thus that most employees are not part of a culture of "we own it."

[24] While a non-weighted average S/E might be equally justifiable, there will be almost no difference, since matching firms in each group have identical or very similar employment.

distortion of comparisons due to different numbers of firms in different industries. It was suggested that this potential distortion could be controlled for by using regressors for industry, and I will test whether including all matching KO firms affects results.

Employer value per employee

The TEA membership list contains estimates of the share of firm value held by its ESOP; these are generally unavailable elsewhere, though I did ask for this information in my survey, and used the survey value when these differed (note that I also asked for total employment in the survey, but, to be consistent with data from the matching firms, did not substitute these for D&B's employment numbers). However, it is reasonable to hypothesize that the size of each employee's "investment" in their ESOP may also affect their sense of firm ownership (or correlate with some aspect of firm culture such as promotion of "ownership" among the staff). I therefore used the IRS data file to obtain the total value of firm securities held by each ESOP and the total number of ESOP participants, giving me an average firm value held per participant (as of 2004). When I was unable to find the firms in the IRS file, I obtained the relevant data from FreeErisa.com, although in some cases these data were available from 2005 rather than 2004; I consider this a minor issue, because such minor discrepancies should wash out over the broad range of firms.[25]

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[25] In the IRS database, the firm name is in the column "Sponsor name," and the data in columns labeled "Total active, retired, and separated beneficiary count" and "Employer securities end-of-year amount." On the 5500 forms posted by FreeErisa.com, the participant count is in line 7f, and the value of employer securities held is in Schedule I, line 3(d) (for "small plans") or Schedule H, Part 1, line D(1) (for "large plans"); I used end-of-year figures here also. I also verified that these two sources were consistent for 2004.

Sales per employee

My understanding of "productivity" leads me to prefer value added per production worker (omitting administrative workers who cannot affect output pace or quality) as the most valid measure. But for privately held firms, these data are essentially inaccessible without access to the Census of Manufactures. As discussed above, this access, while pursued, was not possible. Rosen (2007) notes that

> Data on the economic performance of public companies are available from a variety of sources, but data on private companies, other than sales and employment (available from Dun and Bradstreet), are not. Few private companies will provide financial data, making studies that rely on productivity, profits, stock prices, return on assets, or other measures, essentially impossible.

Firms' concerns with security of their information are such that in order to maximize survey questionnaire returns, I did not dare to ask for any financial information on these questionnaires. Given these limitations, there was little issue in this study about using sales per employee. Note that Winther and Marens (1997) used both annual growth in sales and growth in sales per employee as outcome measures. And while sales per employee is clearly affected by type of industry, the fact that I am using matched panels should wash out any distortion from such effects.

Developing a survey questionnaire for employee participation

In order better to understand the effects of employee ownership and participation in firm governance on firm outcomes, it is necessary first to have some measure(s) of participation. I assume that, in employee-owned as in traditional firms, managers "participate" in management, so the measures of interest here would be whether and how much production workers (broadly defined) control decisions within the firm. While there have been many articles purporting to describe the effects of employee participation in

firm governance (often in conjunction with other determinants), researchers' measures of participation have ranged from rudimentary to thorough.

Cable and Fitzroy (1980) looked at "productive efficiency" among West German firms. They asked managers to rate worker involvement in each of eight decision-making areas, from determining piece rates to price and investment policy (their article did not list the other six); in each of the eight areas they were asked to indicate whether workers had no participation, were observers, were advisers, or were active participants. For their summary variable, each of the eight responses was given equal weight; they say that their regression results were consistent across various alternative weighting schemes.

Jones and Svejnar (1985a), in their study of Italian producer cooperatives, just used the fraction of the workforce (of each producer cooperative) that were member-owners as an indicator for the level of employee participation. Conte and Svejnar (1988), studying total factor productivity among U.S. manufacturers, used dummy variables for (any) employee participation plan, for workers' participation in decisions about wages, and for workers' participation in production decisions, as well as a continuous measure of the unionized share of the workforce.

Smith (1985), in his evaluation of a hypothesis that participation at the workplace would influence civic participation, asked workers how often they discussed (with the relevant personnel) issues about work practices; company financial policies; hiring, firing, and layoff of production workers; and selection and activities of supervisors and management—and then took a simple average of these responses as an indicator of participation.

Doucouliagos's (1995) meta-analysis of "participatory capitalist firms" used only a dummy variable for participation ("joint decision making or influence sharing between employees and managers").

Grunberg, Moore & Greenberg (1996) compared cooperatives, ESOP firms, union-represented firms, and non-union firms in the wood products industry. Their participation measures were based on survey responses from workers regarding their degree of decision-making power on issues "like company spending, hiring priorities, and pay scale;" on how much say they have in selecting the Board of Directors; and on their degree of influence over safety practices and working conditions in general.

Winther and Marens (1997) tried a comprehensive set of indicators in their study of growth among employee-owned firms in New York State. They asked firm managers to

> rate their perception of employee influence in making operational decisions in six areas: investment, purchase of tools and equipment, budgets and cost control, work organization, health and safety and decisions pertaining to the general work environment. Respondents chose one of the following for each kind of decision: (1) employees had no influence at all, (2) management's decisions were communicated to the employees, (3) employees were encouraged to make suggestions or express opinions, (4) employees' suggestions were regarded as equal to management's and their suggestions were implemented on an equal footing with management's, and, finally, (5) employees were in full control of these decisions.

In the same publication, these authors analyzed a parallel study on Washington State firms, using a very different approach to measuring participation. Here they asked managers whether their firms used new employee orientations, suggestion systems, quality circles, employee task forces, autonomous work groups, profit-sharing plans, participative management training, labor-management training, employee representation

on board of directors, or any other means of employee participation. However, their participation indicator was a binary indicator for using four or fewer of these techniques vs. using five or more—given the disparate nature of these techniques, I would argue a very weak indicator.

Ichniowski, Shaw, and Prennushi (1997), looking at steel production plants, constructed an elaborate set of HR variables from interviews with both managers and union representatives, including whether there was profit-sharing, formal work teams, sharing of company financial information, and regular meetings of line managers with production workers. Because of extensive collinearity among these indicators, they grouped firms into four levels of participation: (1) traditional, hierarchical firms with essentially no worker participation; (2) firms that have instituted some team-production practices and some information-sharing; (3) firms that have high levels of team production and information sharing, with extensive skills training; and (4) firms that also explicitly screen new hires for fitting into a cooperative work environment, provide group incentive pay, offer employment security, offer job rotations, and meet regularly with line workers.

While Chinese law provides for substantial participation of employees in firm governance, Li (2004) argued that this provision was far from broadly honored, and developed a measure of participation based on surveys of union leaders as to (1) frequency of meetings of the firm's Congress of Employee Representatives, (2) whether decisions on business budgeting, major investments, and ownership changes are made by employees or by management (5-point scale), (3) who makes decisions about distributions of wages and bonuses and about internal rules and policies (5-point scale),

and (4) who makes decisions about uses of the employee benefits fund, employee housing, and other major employee welfare issues (5-point scale).

Sesil (2006), in a study of performance of British manufacturing firms, used a dummy indicator called "control" for whether shopfloor workers "have a high degree of control over job tasks (e.g. the authority to shut down the production process if they perceive there is a quality problem)."

Finally, and most directly relevant to the measure I am seeking, Ben-Ner et al. (2000) used a survey of firms (primarily responded to by HR managers) in Minnesota in their study of prevalence of employee ownership and profit-sharing plans. The survey was intended to measure the extent of "employee involvement" in firm decision-making, as a parallel dependent variable to the presence of ESOP and profit-sharing plans. Respondents were asked to indicate (on a 5-point Likert scale, from "Workers have no influence at all" to "Workers have the power to make decisions on their own") the extent of non-managerial employee participation in fifteen types of decisions, as follows:

primary group:	secondary group:
working conditions	training and development
pay and other compensation	social events
selection of personnel	work rules
equipment maintenance	job redesign
selection of new equipment	safety and health
investment policies	selection of materials
profit allocation	production planning
	corporate finance

The authors created two dependent variables: a broad indicator of involvement, an average of all 15 Likert scores; and an average of only the items in the primary group, "decisions with considerable operational significance to the firm." (pp.205-6). No

explanation was given, however, for how "job redesign" and "production planning" might be less significant that "selection of new equipment," for example.

My survey instrument

Unlike several of these cited studies, I make a clear distinction between company practices that are called participation, and those which actually empower production workers. Starting in the 1980s, in their relentless race to increase productivity, U.S. manufacturers expanded Japanese-modeled team production (e.g., Saturn auto plants), in which (among other dynamics) line workers were asked to volunteer information that could improve efficiency—essentially to "buy into" their otherwise repetitive jobs. But, as pointed out repeatedly by worker advocates (see, for example, Parker and Slaughter, 1988), the invitations to participate came with no material rewards, and in many cases workers understood that productivity improvements might well lead to reduced employment (layoffs, or reduced overtime when overtime pay was seen as necessary to maintain a standard of living).

Thus ownership, with its implication (or explicit promise) of job security, is an essential ingredient in allowing production workers' knowledge of their jobs (and their inherent creativity) to lead to work method improvements. Employee-owners can be invited to participate in kaizan, but if suggestions are handled as suggestions most often are in traditionally owned firms (that is, ignored), or if higher-level decisions such as about products, marketing, and management personnel are out of bounds, there will be little incentive to participate. Thus my questionnaire does not ask about team production, wider ranges of job training, or other aspects of work organization that may lead to greater job satisfaction without giving true control over one's work.

The grid section of the questionnaire I developed is based largely on the Ben-Ner model, but with strong influence from Winther and Marens' study. I felt that the Ben-Ner et al. response categories (1) and (2) were not clearly different, and modified (2) accordingly. Finally, I adjusted (3) through (5) to make what I thought were clearer and more realistic distinctions. Similarly, I added to their list of areas of control several elements suggested by the other literature here, as well as some of my own. The overall questionnaire is also based on issues of worker control that come from over thirty years of my own experience as a blue-collar worker and worker-advocate. Drafts of the questionnaire were sent to several firm managers suggested by Michael Keeling for their review, and several items were clarified in response to discussions with these managers. The final survey questionnaire as sent to TEA member firms is reproduced in the appendix.[26]

Dealing with survey responses

I received 154 usable survey responses (a very few had ambiguous responses that I was unable to clarify upon contacting the respondents), a remarkable 22% return rate. I entered all the responses in a database; the responses to the grid questions were coded 1 (least worker influence) to 5 (most), and where respondents checked multiple boxes I used mean values. In one case where a firm had different responses for different sites, I used scores that were averages of site scores, weighted by employment at each site. The responses to the question about union representation were nearly all zero, so I did not use these. I then used SPSS to run a factor analysis, a standard social-science survey

[26] Layout of the survey questionnaire has been adjusted to fit print guidelines for this dissertation, but the content is identical to the original.

procedure to attempt to extract commonality from among survey elements,[27] including responses to management-to-worker ratio (0 - 1) and share of Board of Directors chosen by workers (0 - 100%), both of which seem to me to be potential indicators of "worker control." Only one factor with any meaning resulted; the residual factors represented 8% or less of the total variance of the data, so I treat these as simply part of the residual variance—that is, noise. The weighting on the management-to-worker ratio was ridiculously small (-0.03), suggesting that this variable had no meaningful correlation with the other variables. When I performed the analysis again without this variable, the portion of total variance (of fewer variables) represented by the first factor changed from 41.5% to 44.3%. However, the weighting on the next variable, share of Board of Directors chosen by workers, was still only 0.19, while weights on the grid variables ranged from 0.52 to 0.77. It seemed to me that removing that variable (and including it separately in the regression) would again improve the fit of the factor, and, indeed, the new factor represents 47.0% of the total variation among the grid answers. I used these factor weights to obtain worker-influence scores for each of the responding firms.[28] Table 1 shows the imputed weights for the new "worker control" variable, and its correlations with each of the variables it incorporates.

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[27] "Factor analysis is used to discover patterns among the variations in values of several variables, essentially through the generation of artificial dimensions (factors) that correlate highly with several of the real variables" (Babbie 1990, p.313).

[28] There were 17 questions on the grid, and 154 responses, so the raw scores are a 154 x 17 matrix, RS. The factor is reported as a 17 x 1 vector, F, so the worker-influence scores are RS X F. Where there were missing raw scores, rather than drop the entire response set for that firm, I assigned the mean score for that question to that firm; this preserves the means for each question and retains appropriate rank-ordering among the firms. Factor analysis essentially provides the "appropriate" weighting for creating such composite scores from varied responses.

Table 1: Factor derived from answers to survey questions about worker influence

Worker influence on …	Weight in factor	Correlation with consolidating variable
Innovation in work processes	0.722	.720
Safety procedures	0.526	.526
Physical layout of environment	0.663	.664
Quality control	0.664	.655
Investment policies	0.685	.663
Hiring and promotions	0.749	.741
Equipment maintenance	0.653	.661
Company Philanthropy	0.658	.634
Wage levels	0.668	.651
Overtime allocation	0.672	.651
Work schedules	0.711	.711
New products	0.769	.734
Marketing	0.712	.695
Evaluating supervisors	0.646	.615
Equipment purchases	0.730	.719
Benefit offerings	0.688	.667
Profit allocation	0.665	.623

Chapter 5: Data descriptions and issues of validity

There were several efforts to verify the quality of the data used in these analyses. I compared D&B employment numbers with the employer-reported firm sizes from returned survey questionnaires; the mean absolute difference between the D&B figures and these presumably accurate numbers was 18.2% of the survey-reported figures, and the correlation a very satisfactory 0.978. To be consistent with the matching-firm data, however, I used D&B employment numbers even when the survey-reported numbers were different.

The only reliable source for the shares of firm value owned by the ESOP Trusts is the survey returns, but The ESOP Association provided their estimates, based on reports (which may be several years old) by their member firms. The correlation between these numbers was only 0.434, but the mean absolute discrepancy between the shares as reported was only 15.2% of the survey-return values. Because I assume the self-reports in the survey are more accurate than the TEA's values, I replaced the TEA values with the survey values where available.

The next issue I wish to address here is whether there is any inherent bias in the survey-response rate—that is, is there an observable difference between firms which returned the survey questionnaire and those which did not, potentially making any derived measures unrepresentative?

Are survey returns representative?

Questionnaires were mailed by the ESOP Association to 692 member firms in August, 2007. Over the next few months, I received 154 questionnaires (a 22% response, or 19% when weighted by firm size) which had usable information in the Likert-scale

section. A few markings were non-standard, such as percentages instead of check marks. I consulted with these respondents by phone and email, and received explanations that allowed me to translate those markings to usable responses. I compared the responding firms with the surveyed firms, and was satisfied that the former were reasonably representative of all the firms in the ESOP sample. The data for that evaluation follow in tables 2 and 3, and are graphically presented in figures 1 and 2.

Table 2: Distribution of firm size (total employment as reported to the ESOP Association) among surveys sent and surveys returned

	Surveyed	Returned
Total employment	count = 692	count = 154
100 or smaller	56.6%	59.7%
101-250	25.4%	26.6%
251-500	9.3%	5.8%
501-750	3.2%	4.5%
751-1000	1.9%	2.6%
1001-2500	2.5%	0.0%
Over 2500	1.2%	0.6%

Figure 1: Distribution of firm size (total employment as reported to the ESOP Association) among surveys sent and surveys returned

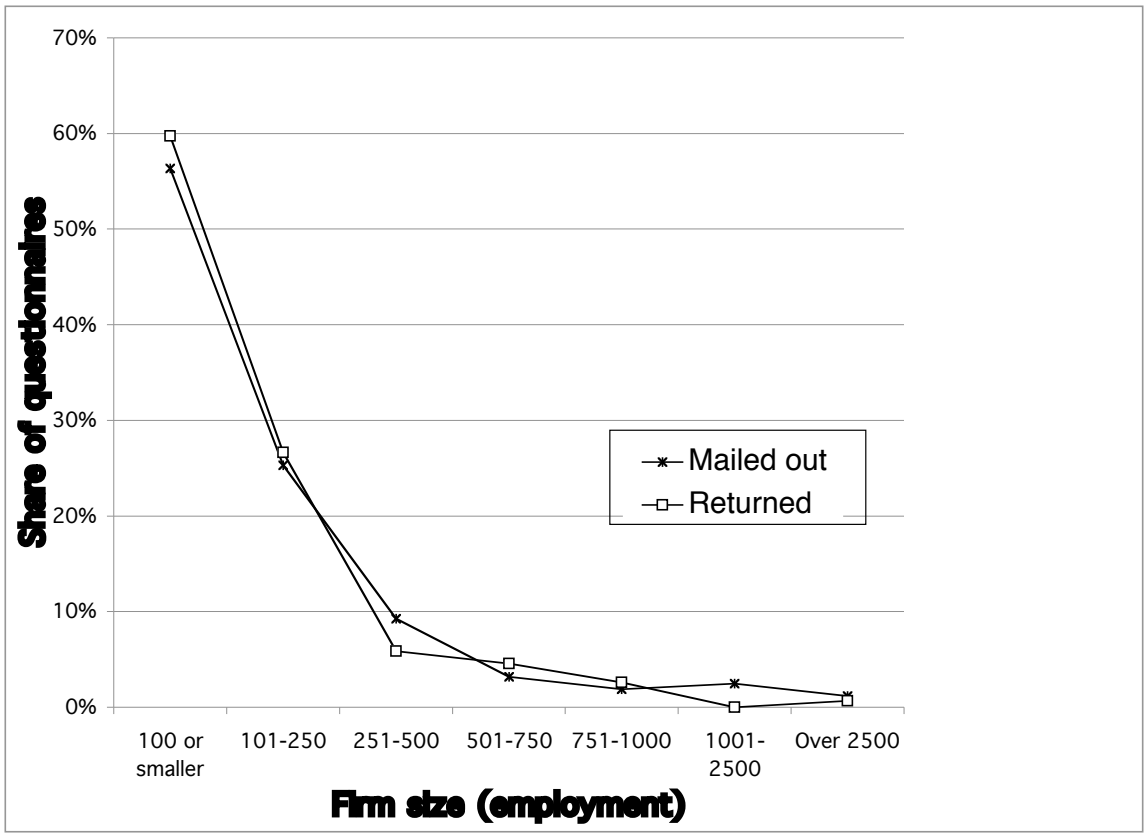
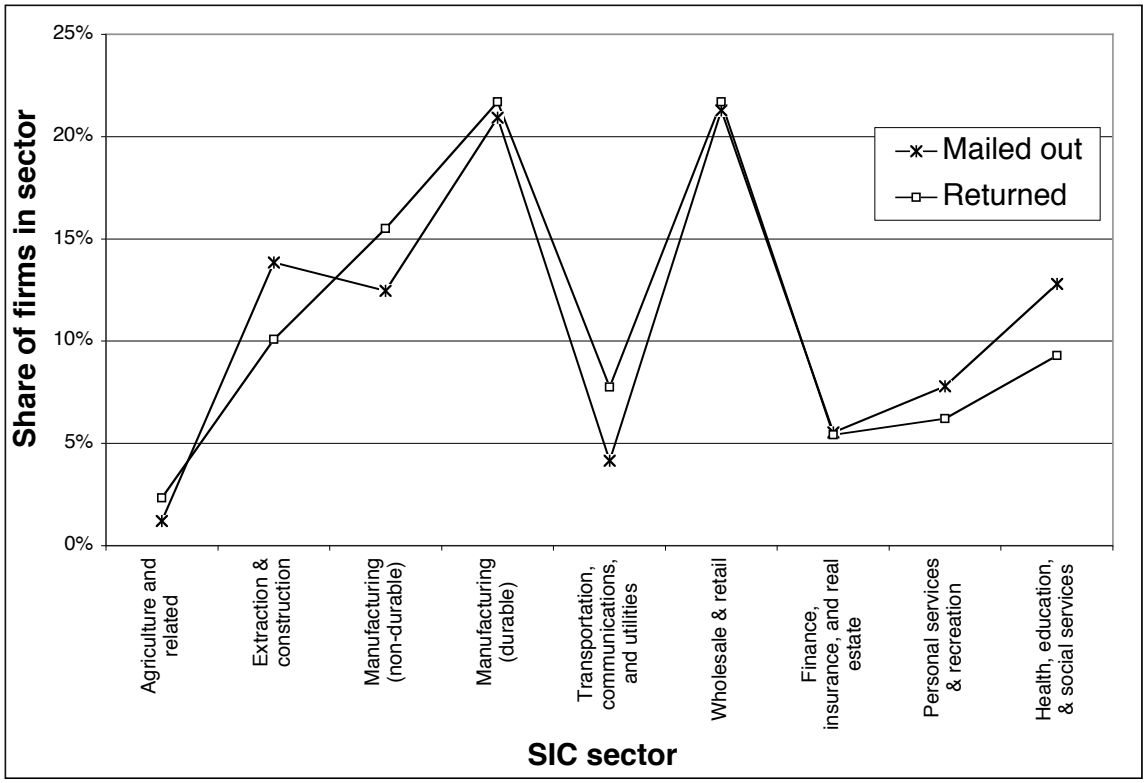


Table 3: Distribution of industrial sector (one-digit SIC)* among surveys sent and surveys returned

	Surveyed	Returned
Agriculture and related	1.2%	2.3%
Extraction & construction	13.8%	10.1%
Manufacturing (non-durable)	12.5%	15.5%
Manufacturing (durable)	20.9%	21.7%
Transportation, communications, and utilities	4.2%	7.8%
Wholesale & retail	21.3%	21.7%
Finance, insurance, and real estate	5.5%	5.4%
Personal services & recreation	7.8%	6.2%
Health, education, & social & business services	12.8%	9.3%

*Note that, while in the main analysis and matching, I use 6-digit NAICS to identify firms by industry, The ESOP Association had pre-coded the recipient firms by SIC, so it made more sense to break out by SIC in this step.

Figure 2: Distribution of industrial sector (one-digit SIC) among surveys sent and surveys returned



Is the TEA list of employee-owned firms representative?

The next question to be addressed is whether the firms in the EO panel representative of all majority-employee-owned firms in the US (note that in many surveys, or studies of supposedly random panels from a given universe, we simply assume their representativeness). There are no official lists of employee-owned firms; only the National Center for Employee Ownership gathers, maintains, and makes a list available—and their list does not guarantee comprehensiveness. Since I had already purchased the NCEO list prior to getting the ESOP Association's list, I was able to compare the two lists. Tables 4 through 6 and figures 3 and 4 show the results of

comparing two of those distributions. The sector distributions seem very adequately matched. Among the firms for which the NCEO provided share data, the NCEO list seems to have a higher proportion 100%-owned by their ESOP Trusts than the TEA list. However, I note that the NCEO did not provide these data for 65% of their listed firms, and so I do not consider this to be a valid comparison. My primary concern is that the NCEO list has a higher share of larger firms (employment ≥ 400) than does the TEA list (25% compared to 12%).[29] I would hope that resources are found to replicate some of these comparisons using the larger NCEO list of majority-EO firms, recognizing that ESOP share of ownership would not be available for that study, nor would any of the survey-derived values.

Table 4: NCEO and TEA lists of majority-employee-owned firms by industrial sector (1-digit SIC)

Sector (1-digit SIC)	NCEO	TEA
Extraction & construction	11.6%	14.0%
Manufacturing (non-durable)	13.4%	12.8%
Manufacturing (durable)	22.3%	20.8%
Transportation, communications, and utilities	2.7%	3.9%
Wholesale & retail	24.1%	21.7%
Finance, insurance, and real estate	7.0%	6.0%
Personal services & recreation	7.4%	8.2%
Health, education, & social & business services	11.6%	12.6%

[29] The NCEO also has a higher absolute number of larger firms. NCEO gathers its list from news reports (of ESOP conversions, for example) and networking, and larger firms are more likely to show up in these ways. It is also possible that larger EO firms perceive less need to join an organization such as TEA.

Table 5: NCEO and TEA lists of majority-employee-owned firms by firm size (total employment)

Employment*	NCEO	TEA
1-74	27.5%	42.7%
75-149	23.1%	26.3%
150-399	24.8%	18.8%
400 & over	24.6%	12.2%

* employment ranges were chosen to approximate quartiles for the NCEO distribution

Table 6: NCEO and TEA lists of majority-employee-owned firms by share of firm value held by ESOP Trust

Share of firm owned by ESOP	NCEO	TEA
50-74.99% owned	24.8%	31.6%
75-99.99% owned	16.6%	22.7%
100% owned	58.6%	45.7%

Figure 3: NCEO and TEA lists of majority-employee-owned firms by industrial sector (1-digit SIC)

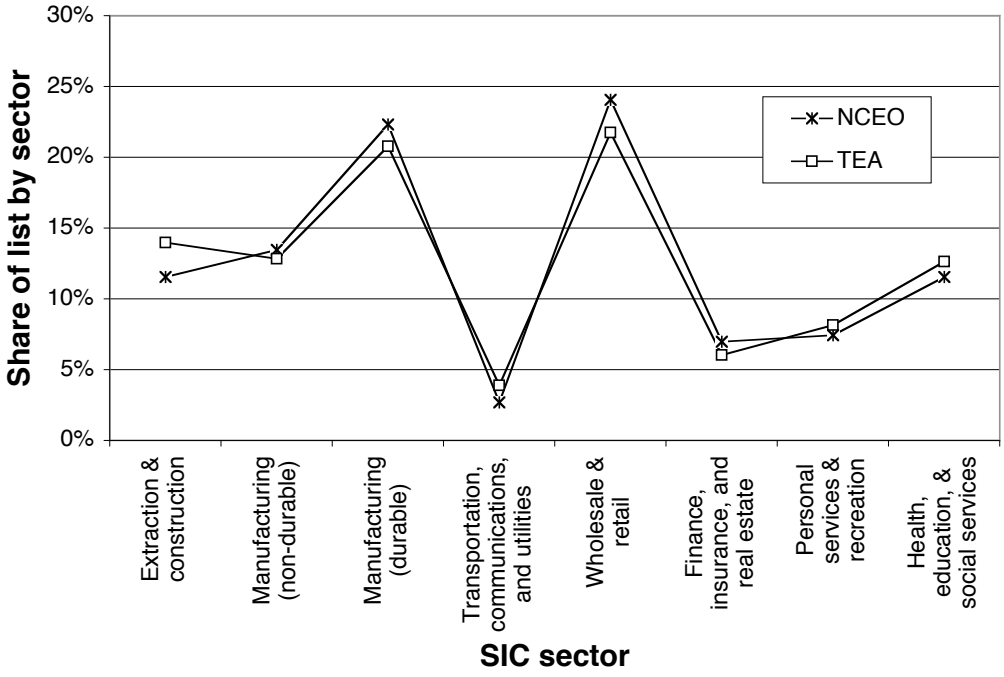
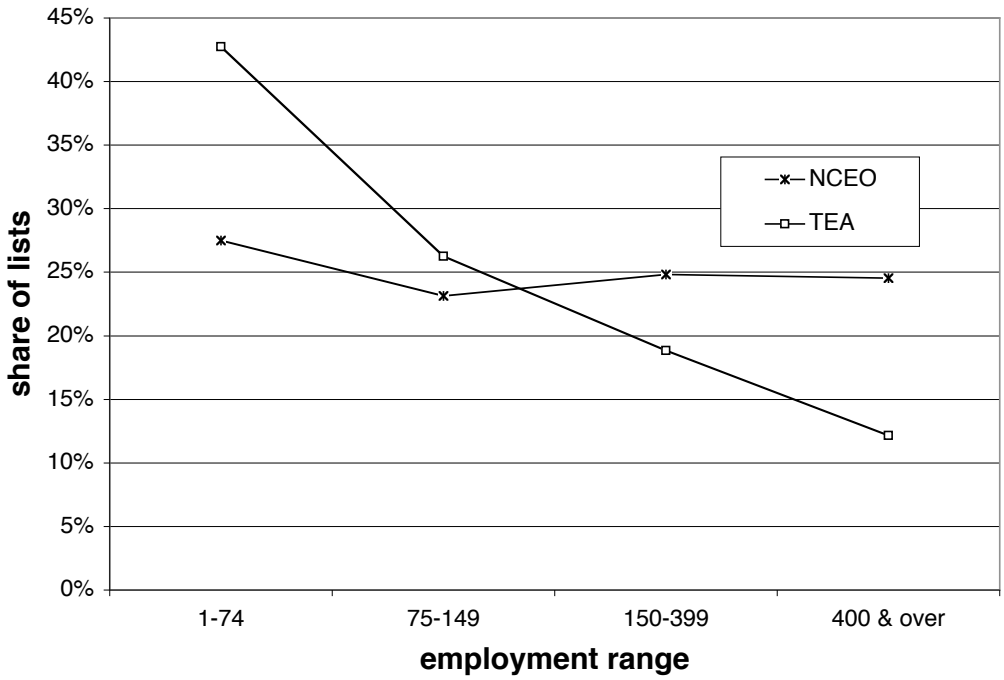


Figure 4: NCEO and TEA lists of majority-employee-owned firms by firm size (total employment)



Are smaller firms representative?

The first part of the EO panel contains all the firms in the TEA's list with 50% or more ESOP share of firm value, and 100 or more employees (TEA data), except for a few firms that were not confirmed as employee-owned or for which I could not obtain sales information; thus this part of the EO panel is not a sample, but essentially the universe, since there is no official list of EO firms. However, I added to the first part of the EO panel 87 firms which have fewer than 100 employees, but which returned the survey questionnaire, so I must confirm that those firms are representative of the TEA's "universe" of 382 EO firms with 50% or more share, but with 99 or fewer employees. The results of the comparisons I undertook are in tables 7 through 9, and the data for table 9 are also presented in figure 5. The comparisons by firm size and value share seem

very reasonable. But while the differences by industry may seem small, the over-representation of non-durable manufacturing and transportation in the sample, and the under-representation of construction and FIRE, seem to me to demand that at least some comparison runs be done both with and without these added firms (and their matches). These validation tests are in the appendix, tables A-1 and A-2, and confirm that adding these firms does not substantially change results

Table 7: Firm size distributions, smaller firms, questionnaires sent and returned

Employees (per TEA)	All TEA firms in range	Surveys returned
1-30	26.7%	28.7%
31-65	44.5%	42.5%
66-99	28.8%	28.7%

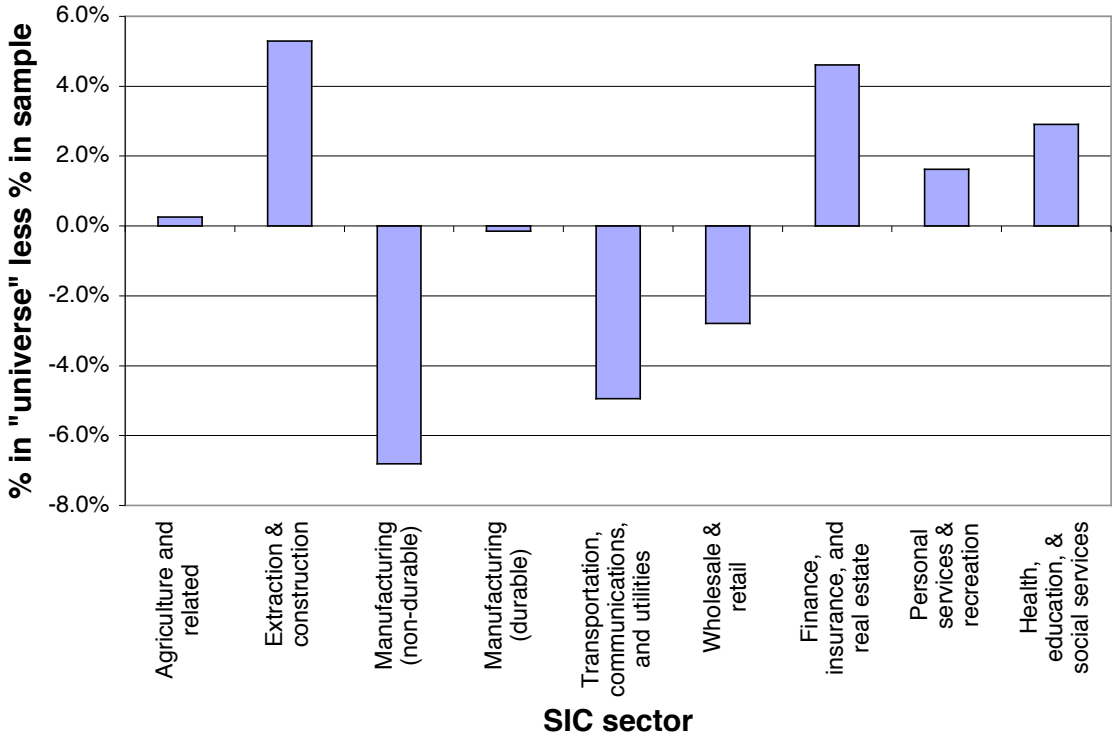
Table 8: Firm value share distributions, smaller firms, questionnaires sent and returned

Share of firm value (TEA)	All TEA firms in range	Surveys returned
50-65%	25.4%	27.6%
66-80%	13.1%	16.1%
81-99%	16.5%	16.1%
100%	45.0%	40.2%

Table 9: Industrial sector distributions, smaller firms, questionnaires sent and returned

One-digit SIC (per TEA)	All TEA firms in range	Surveys returned
Agriculture and related	1.7%	1.4%
Extraction & construction	14.0%	8.7%
Manufacturing (non-durable)	10.6%	17.4%
Manufacturing (durable)	20.1%	20.3%
Transportation, communications, and utilities	3.8%	8.7%
Wholesale & retail	21.8%	24.6%
Finance, insurance, and real estate	7.5%	2.9%
Personal services & recreation	8.9%	7.2%
Health, education, & social & business services	11.6%	8.7%

Figure 5: Percentage point differences in sector distributions, small EO panel sample and all small EO firms in the TEA database



The Data Sets

The final EO panel as gathered has 331 firms. As discussed in the next chapter, when sales per employee difference (between the EO and matching KO firms) becomes the dependent variable, data are closer to a normal distribution without three outliers; once these are removed, the remaining panel is 328 firms. Tables 10 and 11 show distributions by industrial sector (1-digit NAICS), employment, sales, firm value per ESOP participant, share of total firm value owned by the ESOP, worker-control score, management to non-management-worker ratio, and sales per employee. Further, to illustrate the range of employment, figure 6 shows a histogram of log(employment) (base

ten). As you can see, the range is from the teens through nearly 10,000 employees, with a mode around 200.

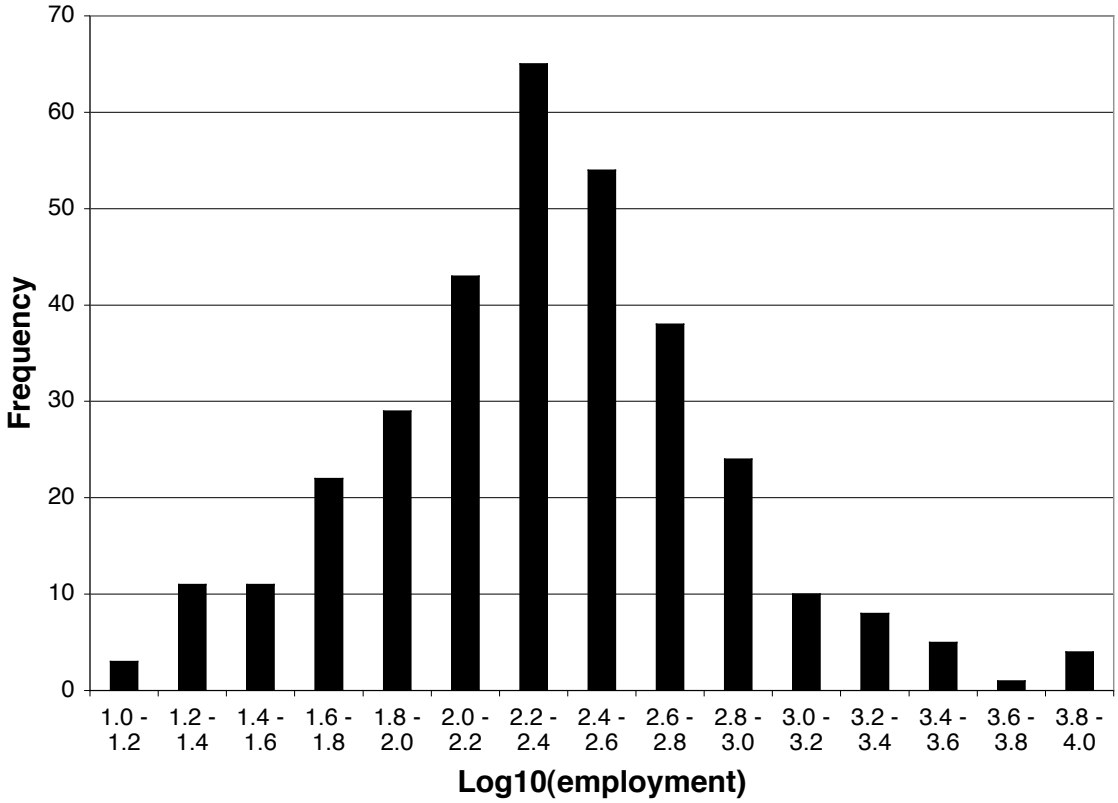
Table 10: Industrial sector distribution (1-digit NAICS), EO firms panel (N = 328)

Employee-owned firms panel	Share in industrial sector
Agriculture, Forestry, Fishing	0.3%
Extraction, Construction, Utilities	15.9%
Manufacturing	28.7%
Wholesale & retail & transportation	25.9%
Information & business services	25.6%
Education, health, & social services	2.1%
Arts & leisure	0.9%
Other services	0.6%
Total	100.0%

Table 11: EO firms panel distributions of employment, sales, ESOP total value per employee-owner (*valperee*), share of firm value owned by ESOP trust (*ESOPshr*), worker influence index (*WorkCtrl*), management-to-worker ratio (*mgtratio*), and sales per employee (without 3 outliers)

		Employment	Sales	Valperee	ESOPshr	WorkCtrl	mgtratio	Salesperee
N	Valid	328	328	303	328	127	127	328
	Missing			25		201	201	
Mean		496	94551560	67800	0.878	28.0	0.186	209042
Median		210	29800000	43630	1.000	26.6	0.150	142489
Std. Deviation		1061	237641823	79877	0.166	7.5	0.146	228540
Minimum		12	1000000	1272	0.500	12.4	0.040	7598
Maximum		9600	2512497000	753955	1.000	47.4	1.000	1708333
Percentiles	25	108	13725000	23737	0.750	22.2	0.100	84735
	75	448	71359725	84513	1.000	33.6	0.200	232605

Figure 6: Distribution of firm size, EO panel (N = 328)



Similar statistics are given for the entire KO panel in tables 12 and 13, although of course I have only industrial sector, sales, and employment for these.

Table 12: Industrial sector distribution (1-digit NAICS), KO firms panel (before aggregation) (N = 2,212)

Capital-owned firms panel (all firms before aggregation)	Share in industrial sector
Agriculture, Forestry, Fishing	0.0%
Extraction, Construction, Utilities	24.1%
Manufacturing	24.5%
Wholesale & retail & transportation	24.0%
Information & business services	23.7%
Education, health, & social services	1.9%
Arts & leisure	1.3%
Other services	0.5%
Total	100.0%

Table 13: Full KO firms panel distributions of employment, sales, and sales per employee

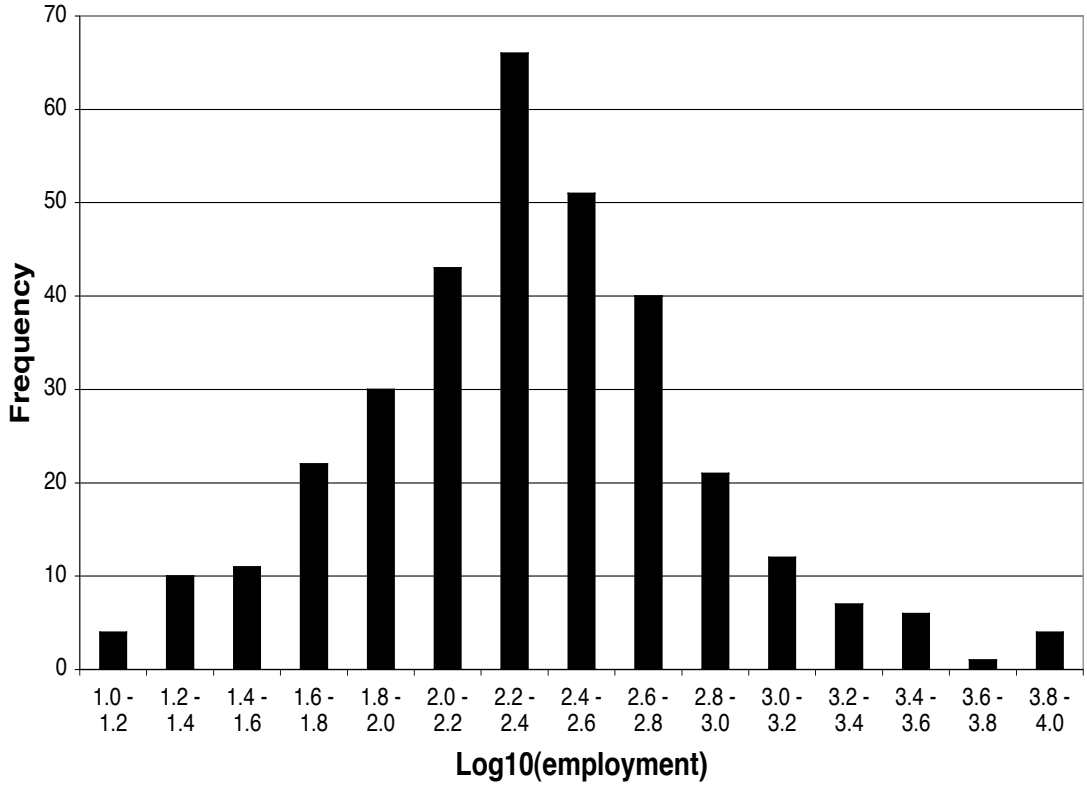
		Employment	Sales	salesperee
N		2212	2212	2212
Mean		308.66	58,857,479	170,283
Median		150.00	16,400,000	110,109
Std. Deviation		755.396	343,398,975	428,714
Minimum		10	60,000	960
Maximum		10325	9,840,304,000	17,830,000
Percentiles	25	60.00	5,800,000	72,222
	75	300.00	39,000,000	182,955

Calculating the average sales per employee for each match group yields 328 "meta-firms" in an aggregated-firm KO panel (without the outliers). By virtue of the matching procedure, the distribution by industry is identical to that of the EO panel, represented in table 10 above. Employment and sales per employee (of each meta-firm) are shown in table 14, and I show the log(employment) histogram for the aggregated KO panel in figure 7 as well. Very close matches in the statistics between the EO and aggregate KO panels on employment reassure me of the quality of the matching process.

Table 14: Aggregated KO panel, distribution of mean employment per "meta-firm" and average sales per employee

		Employment	Salesperee
N		328	328
Mean		489	164518
Median		207	130067
Std. Deviation		1057	120319
Minimum		12	17955
Maximum		9558	794412
Percentiles	25	109	92981
	75	438	199224

Figure 7: Distribution of firm size, aggregated KO panel (N = 328)



Chapter 6: Test results

The first series of tests was simply to see if there are meaningful differences in sales per employee (S/E) between the two panels. A preliminary paired-samples differences test yielded a highly significant EO firm advantage in S/E over KO firms ($p<.004$ two-tailed, but since my hypothesis is directional, a one-tailed test is appropriate, so I reject this null at $p<.002$). For each test below, I also show and discuss differences in the logarithm of sales per employee between EO and matching KO firms; these give us the ability to estimate *percent* differences between the two. In some cases results are weak and/or ambiguous; these hypotheses are not confirmed, and these variables are not studied further. In some cases, however, the tests show strong and consistent results, and it is a matter of preference whether we report the EO sales per employee advantage as a difference or as a ratio (or percent difference).

Table 15: paired-sample differences test, full panel

SEEO is S/E for each EO firm, and SEKO is S/E for that firm's aggregated matches.

	Paired Samples Statistics			
	Mean	N	Std. Deviation	Std. Error Mean
SEEO	233904	331	413862	22748
SEKO	167601	331	130852	7192

	Paired Samples Test							
	Paired Differences							
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
SEEO - SEKO	66303	415609	22844	21365	111241	2.9024	330	0.0040

The paired-sample difference test used here requires that the difference being tested be distributed (approximately) normally (Keller and Warrack 2003, 472); the

suggested "test" for validity is just to observe a histogram, which appears in figure 8. I noted that there appear to be 3 major outliers; deleting these three (in which sales per employee for the EO firm less average sales per employee for the matching KO firms was, respectively, $2.3 million, $5.9 million, and negative $820,000) improves the distribution enough towards normality (see figure 9) that all further tests are done on the panel without these outliers.

Figure 8: distribution of sales per employee differences, EO firm less matched aggregate KO firm (original panel)

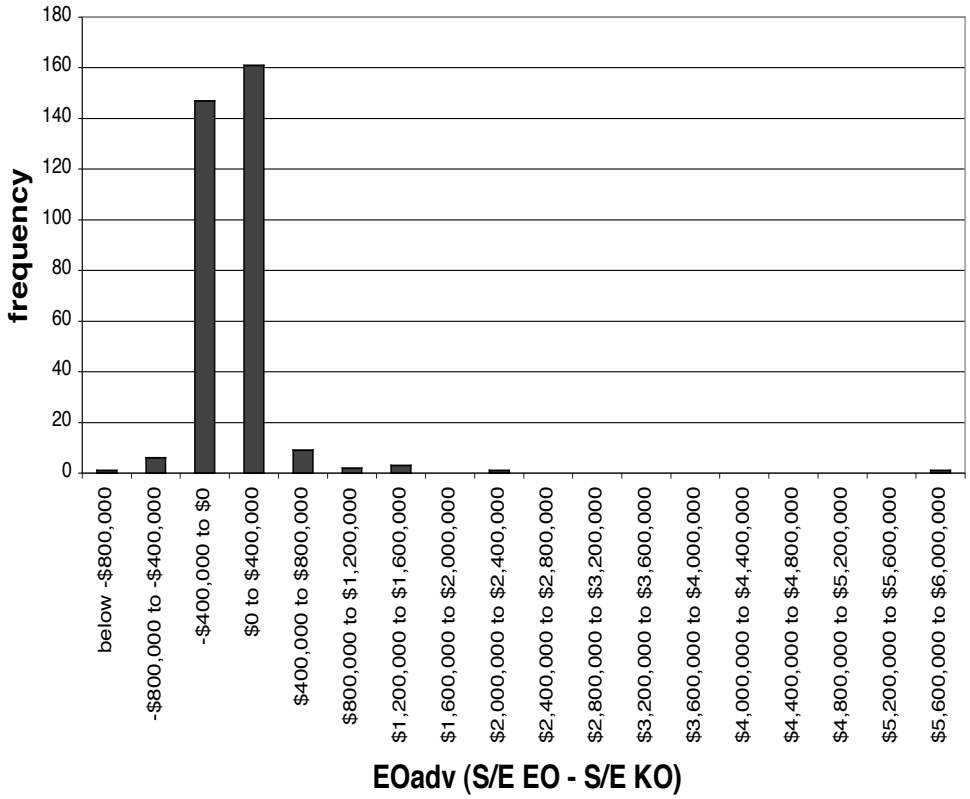
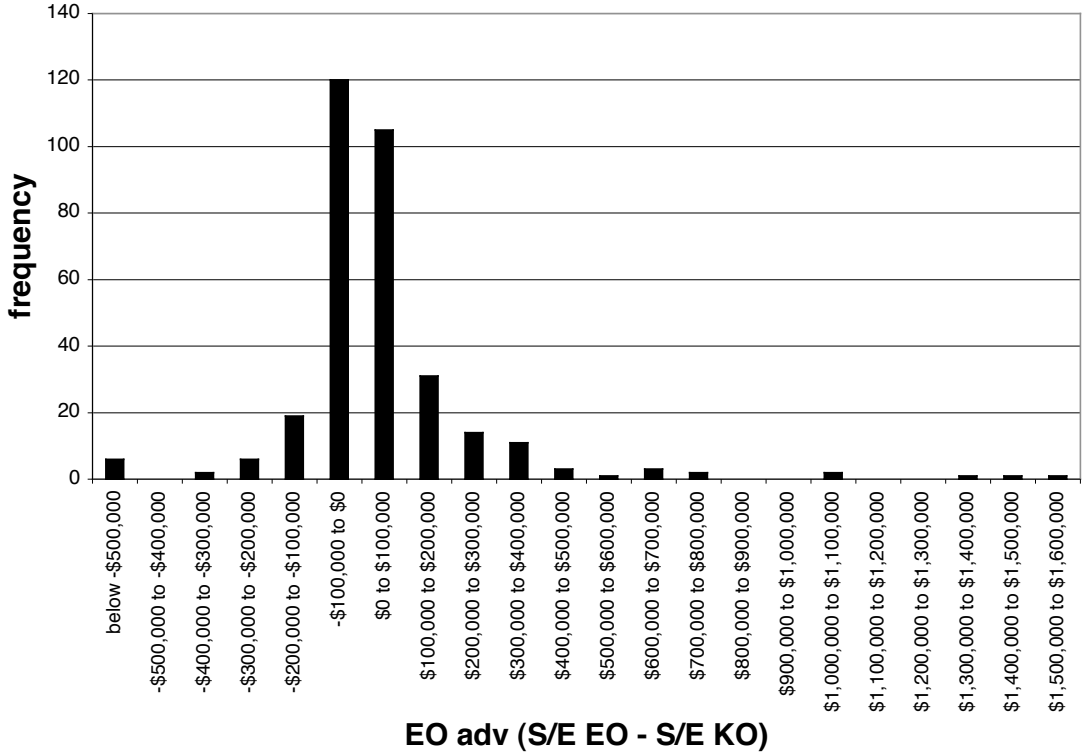


Figure 9: distribution of sales per employee differences, EO firm less matched aggregate KO firm (deleting 3 outliers)



Redoing the above test without the outliers yields the following table:

Table 16a: paired-sample differences test, full panel (without 3 outliers)
SEEO is S/E for each EO firm, and SEKO is S/E for that firm's aggregated matches.

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
SEEO	209042	328	228540	12619
SEKO	164518	328	120319	6643

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
SEEO - SEKO	44524	229240	12658	19624	69425	3.518	327	.0005

On average, then, these employee-owned firms have $44,500 higher S/E than their matching (aggregate) KO firms. A one-tailed significance of p<.0003 strongly

suggests that this result can be generalized to the universe: it is less than .03% likely that we would see these data if, on average, KO firms had sales per employee equal to or larger than similar EO firms.[30]

Table 16b: paired-sample differences test in logs, full panel (without 3 outliers)
lnseeo is the natural logarithm of sales per employee for the EO firm, and *lnseko* is the natural logarithm of sales per employee for the corresponding aggregate KO firm

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
lnseeo	11.8941	328	.81688	.04510
lnseko	11.8093	328	.63184	.03489

Paired Samples Test

	Paired Differences							
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
lnseeo - lnseko	.08474	.79040	.04364	-.00111	.17060	1.942	327	.053

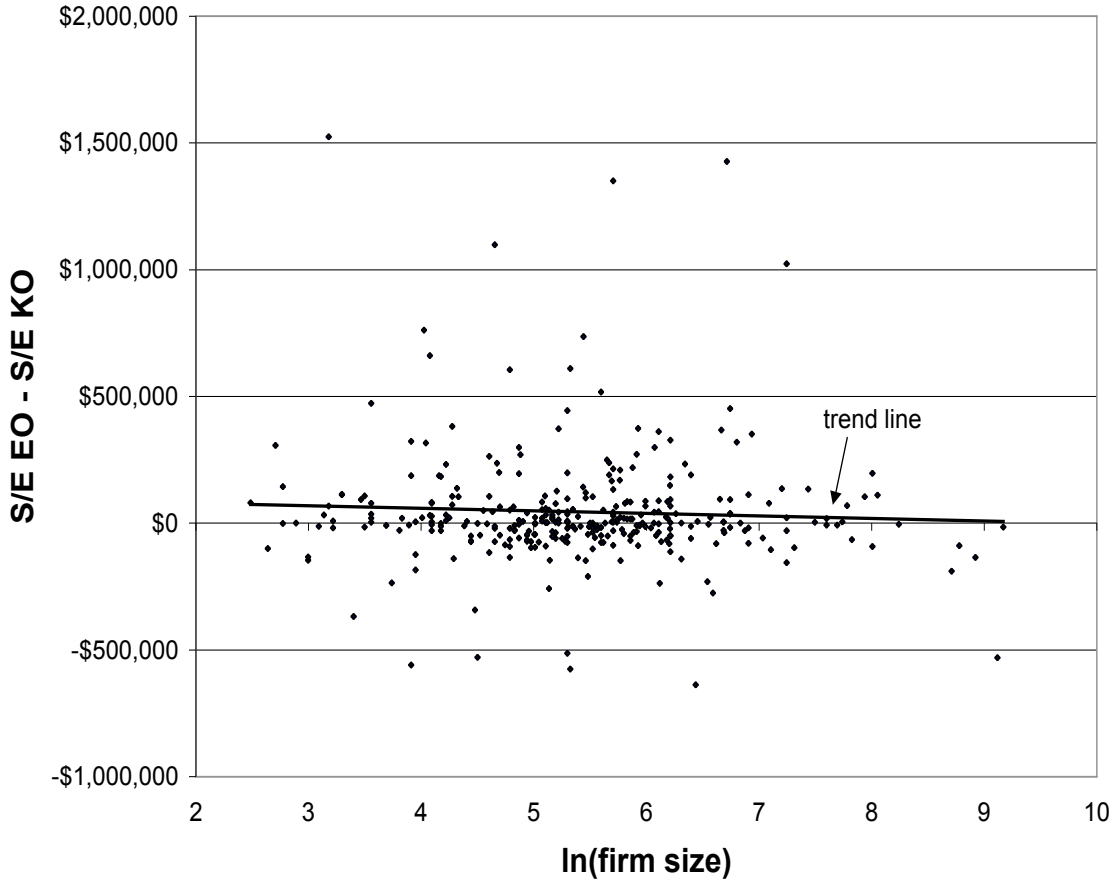
On average, across these panels, the $(S/E)_{EO}$:$(S/E)_{KO}$ ratio is exp(.08474) = 1.088, which says that EO firms have an 8.8% average advantage in sales per employee over their KO matches. This difference is highly significant (one-tailed p<.027). These results confirm the major hypothesis of this study.

The next hypothesis to be tested is that employee ownership can make more of a positive difference in sales per employee in smaller firms. Figure 10 shows a scatter-plot

[30] This conclusion depends on the assumption that the EO panel is a reasonably random selection from the universe of EO firms.

of the difference SEEO – SEKO against log of employment;[31] the implied trendline has a clearly negative slope.

Figure 10: EO firm sales per employee less matching KO "meta-firm" sales per employee vs. (logarithm of) firm size



To estimate this effect, I regressed *EOadv* on employment; the results are presented in table 17a. The coefficient on employment is indeed negative, with a one-tailed p<.029. On average, among these firms, an EO firm with 100 fewer employees than another has a $2,263 greater advantage in S/E over its matching KO aggregate "firm," and it is less

[31] Log of employment is used because firm sizes are clustered in the low hundreds; this makes it easier to see the data points.

than 2.9% likely that, among all EO and KO firms, larger EO firms have higher advantages than or the same advantages as smaller ones. Table 17b, the comparison using logs, says that, on average, EO firms improve their sales-per-employee advantage by 0.8% for each 100 fewer employees they have, and this pattern is also highly significant. The nearly identical R-squared statistics say that neither of these ways of looking at the relationship has an advantage over the other. Note, however, that only 5 firms in these panels have over 4,000 employees, so no implications can be drawn for very large firms from these tests.

Table 17a: regressing the EO "advantage" over KO match in S/E (*EOadv*) on firm size

Coefficients			Dependent Variable: EOadv			R Square	.011
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	3.618	.058
(Constant)	55748.241	13919.775		4.005	.000		
Employment	-22.630	11.897	-.105	-1.902	.058		

Table 17b: regressing the EO "advantage" in logs over KO match in S/E (*logdif*) on firm size

logdif is the natural logarithm of sales per employee for the EO firm minus the natural logarithm of sales per employee for the corresponding aggregate KO firm

Coefficients	Dependent Variable: logdif					R Square	0.011724
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	3.867	.050
(Constant)	0.124736	0.047976		2.600	.010		
Employment	-0.000081	0.000041	-.108	-1.967	.050		

Tables A-1 through A-8 in the appendix give the results of the same tests as in tables 16a and 17a, but with restricted panels. The first replication uses just the original panel of firms thought to have 100 or more employees, then I exclude construction-

industry firms, then I use just those EO firms and matching KO firms for which the D&B data was marked "actual" (rather than "estimated/modeled"), and finally I use just those firms which did not respond to the survey questionnaire; the rationale for performing these validity checks is reviewed in the appendix. All of these give sufficiently similar results (to the tables here) that I am satisfied that using this panel, with aggregated KO values and deleting the three outliers, gives a valid indication of relationships among all EO and KO firms.

Given the clear and strong effect of firm size, I continued to include employment as a regressor, while testing each of my other independent variables in turn, to get an idea which of my other hypotheses look promising. The results are shown in the next tables.

Table 18a: regressing *EOadv* on firm size and a dummy for "hard industries" (construction and manufacturing)

Coefficients Dependent Variable: EOadv						R Square	.011
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	1.805	.166
(Constant)	56267.769	17888.894		3.145	.002		
Employment	-22.620	11.917	-.105	-1.898	.059		
hardind	-1177.682	25410.516	-.003	-.046	.963		

Table 18b: regressing EOadv in logs (*logdif*) on firm size and a dummy for "hard industries" (construction and manufacturing)

Coefficients Dependent Variable: logdif						R Square	0.018278
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	3.026	.050
(Constant)	0.068014	0.061451		1.107	.269		
Employment	-0.000082	0.000041	-.110	-1.995	.047		
hardind	0.128581	0.087289	.081	1.473	.142		

Testing the hypothesis that the employee-owned advantage will be weaker in capital-intensive ("hard") industries, the size (employment) effect is still strong, and significant with a one-tailed test ($p<.030$ in the first specification, $p<.024$ in the log specification). In the test using linear differences in S/E, the coefficient on the indicator for hard industry has the predicted sign, but is not close to significance. However, the log specification shows a strong response in the opposite direction: holding firm size constant, "hard"-industry EO firms in the panel have an average 14% *higher* advantage in sales per employee over their KO matches than do "soft" ones. Had this been the predicted relationship, the result would be significant at a one-tailed $p<.071$. Because of the ambiguity of these results, however, no further tests will be done using this indicator. I look at industrial sector effects in more detail below.

Next, I looked at the average value of the ESOP trust's holding of firm stocks per employee-owner, *valperee*; the hypothesis is that (assuming employees have some idea of their "investment" in the firm) higher holdings will enhance a sense of ownership, and thus encourage productive effort. The null is that the effect is zero or negative; the result is presented in tables 19a and 19b. Holding firm size constant, this yields a very highly significant relationship, and one which has predictive power (the F is significant at $p<.001$ in the first test, and at $p<.027$ in the second). Firm size keeps its strong effect, and we see that employees' stake has a strong effect as well. For the average-size firm in this study (mean employment = 496, excluding the outliers), a $1,000 increase in firm value per employee-owner from the mean ($67,799) would bring the EO firm's S/E advantage from 17,390.3 + (-23.509*496) + (.518*67,799) = $40,823 up to $41,341—or total sales advantage from $20.2 million to $20.5 million. The log(S/E) comparison says that,

holding firm size constant, each increase of $1,000 in average employee stake increases the sales-per-employee advantage of an EO firm over its matching KO by 0.1%. There is only a 0.07% chance (1.7% for the log comparison) that we would get these results if, among all EO and KO firms, the EO advantage were zero or lower for firms with higher ESOP value per employee-owner.

Table 19a: EO advantage regressed on firm size and average firm value held by ESOPs per employee-owner (*valperee*)

Coefficients Dependent Variable: EOadv						R Square	.044
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	6.853	.001
(Constant)	17390.229	17627.430		.987	0.3247		
Employment	-23.509	11.730	-.113	-2.004	0.0459		
Valperee	.518	.161	.182	3.224	0.0014		

Table 19b: EO advantage in logs regressed on firm size and average firm value held by ESOPs per employee-owner (*valperee*)

Coefficients Dependent Variable: logdif						R Square	0.023862
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	3.667	.027
(Constant)	0.028589	0.062566		.457	.648		
Employment	-0.000075	0.000042	-.103	-1.800	.073		
Valperee	0.000001	0.000001	.121	2.125	.034		

Next, I look at the portion of firm value held by the ESOP trust as a whole (ranging from 50% to 100%). Here, the effects are far from significant, and again point in opposite directions. Note, however, that among the firms in this panel, more than half are 100%-owned by their ESOP trusts, so there is very little variation in the independent

variable. Given the ambiguous effect and my intent to look at just whether the firm is fully or partly owned by the ESOP trust, I will not use this variable further.

Table 20a: regressing the EO advantage on firm size and share of firm value held by the ESOP trust

Coefficients Dependent Variable: EOadv						R Square	.012
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	1.908	.150
(Constant)	25433.586	68077.702		.374	.709		
Employment	-22.899	11.926	-.106	-1.920	.056		
ESOPshr	34677.174	76225.315	.025	.455	.649		

Table 20b: regressing the EO advantage in logs on firm size and share of firm value held by the ESOP trust

Coefficients Dependent Variable: logdif						R Square	0.011987
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	1.972	.141
(Constant)	0.192320	0.234680		.819	.413		
Employment	-0.000080	0.000041	-.107	-1.947	.052		
ESOPshr	-0.077309	0.262767	-.016	-.294	.769		

Next, I look at the value for worker control derived from the factor analysis of the survey returns, *workctrl*; the hypothesis is that a higher degree of worker control would increase firms' EO advantage. Here, the results are again weak and ambiguous. It may well be that asking managers to report on workers' influence and control provides less than reliable responses; individual responses from workers, if available, could be much more useful. However, there are interesting and potentially meaningful effects of the responses to some individual questions in the survey, reported in tables 27 and following, below.

Table 21a: regressing the EO advantage on firm size and my measure of worker influence (*workctrl*)

Coefficients Dependent Variable: EOadv						R Square	.056
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	3.660	.029
(Constant)	38945.730	83332.949		.467	.641		
Employment	-63.214	24.726	-.229	-2.557	.012		
WorkCtrl	757.324	2817.275	.024	.269	.789		

Table 21b: regressing the EO advantage in logs on firm size and my measure of worker influence (*workctrl*)

Coefficients Dependent Variable: logdif						R Square	0.075629
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	5.073	.008
(Constant)	0.139734	0.252042		.554	.580		
Employment	-0.000233	0.000075	-.276	-3.113	.002		
WorkCtrl	-0.000548	0.008521	-.006	-.064	.949		

The next test is to use the survey-response measure of management intensity (managers were asked to provide the ratio of managers to non-management workers in their firms). This is part of the same hypothesis as the worker-control variable: that a high *mgtratio* would correspond to low worker control, and thus decrease any EOadvantage. While an increased management-to-worker ratio increases the EO advantage in the linear test, though not with significance, it decreases it in the estimation of the logarithmic advantage (that is, the ratio SEEO:SEKO rises as management intensity decreases), again without significance. The weakness and ambiguity of this effect suggests that the management ratio should not be included in further tests.

Table 22a: regressing the EO advantage on firm size and management-to-worker ratio

Coefficients Dependent Variable: EOadv

	Unstandardized Coefficients		Standardized Coefficients			R Square	.058
	B	Std. Error	Beta	t	Sig.	F	Sig.
(Constant)	44670.706	34212.336		1.306	.194	3.812	.025
Employment	-64.514	24.028	-.234	-2.685	.008		
mgtratio	84982.061	141700.110	.052	.600	.550		

Table 22b: regressing the EO advantage in logs on firm size and management-to-worker ratio

Coefficients Dependent Variable: logdif R Square 0.081669

	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	5.514	.005
(Constant)	0.196549	0.103257		1.903	.059		
Employment	-0.000233	0.000073	-.276	-3.210	.002		
mgtratio	-0.387184	0.427667	-.078	-.905	.367		

The next test was to divide the EO panel into firms which are fully owned by their ESOP trust and those which are less than fully owned (note that all EO firms in the panel are at least 50% owned by their ESOPs). The coefficient on the binary variable *ownall* is in the predicted direction in both tests, and very close to significance ($p<.106$) in a one-tailed test in the prediction of the linear EO advantage. In this panel, holding employment constant, EO firms which are fully owned by their ESOP trusts have, on average, a $31,766 higher S/E advantage over their KO matches than do those not fully ESOP-owned, and the likelihood is less than 11% that, among all EO firms, fully-ESOP-owned firms would not have more of an advantage over their KO matches than partly-owned ones. The second table says that, holding employment constant, fully-employee-owned

EO firms have a 5% higher sales-per-employee advantage over their KO counterparts than do partially-owned firms, although this pattern is far from significant and cannot be generalized. Because this is a strong and consistent effect, I will keep this variable in further tests.

Table 23a: regressing EO advantage on firm size and whether or not the ESOP trust owns all the firm stock

Coefficients Dependent Variable: EOadv						R Square	.016
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	2.599	.076
(Constant)	38908.227	19328.977		2.013	.045		
Employment	-23.434	11.903	-.108	-1.969	.050		
ownall	31766.377	25321.544	.069	1.255	.211		

Table 23b: regressing EO advantage in logs on firm size and whether or not the ESOP trust owns all the firm stock

Coefficients Dependent Variable: logdif						R Square	0.012720
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	2.094	.125
(Constant)	0.098192	0.066747		1.471	.142		
Employment	-0.000082	0.000041	-.110	-1.993	.047		
ownall	0.050072	0.087440	.032	.573	.567		

Putting together the three variables which seem to have strong predictive value, we have a very impressive result (see table 24). All effects are in the hypothesized direction, and size and value per employee are significant at p<.02 (one-tailed), and the effect of full ownership is close to significance at p<.18 (one-tailed). Among the firms in the panel, on average, each decrease in employment size of 100 workers increases the S/E advantage by $2,433. Holding employment constant, an increase of $1,000 in the amount

of firm value held by the ESOP trust per employee would, on average, increase the EO advantage in sales per employee by $517. Holding employment and average employee stake constant, fully employee-owned firms have, on average, a $23,896 higher EO advantage in S/E than firms not fully owned by their ESOPs. The high F value says that these three measures predict the EO advantage in the panel better than random guesses, and the high significances say that it is very unlikely that any of these effects are absent or go in the opposite direction among all EO and matching KO firms.

Table 24: regressing the EO advantage on firm size, average firm value per employee-owner, and whether the firm is fully owned by the ESOP trust

Coefficients Dependent Variable: EOadv						R Square	.046
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	4.855	.003
(Constant)	5428.158	21816.061		.249	.804		
Employment	-24.332	11.766	-.117	-2.068	.039		
Valperee	.517	.161	.182	3.216	.001		
ownall	23895.587	25665.728	.053	.931	.353		

Sector effects

I have already failed to sustain the hypothesis that employee ownership is more effective in improving sales per employee in more labor-intensive industries than in more capital-intensive ones, at least using the crude dichotomy of calling industries in NAICS sectors 2 and 3 (construction and utilities; and manufacturing) “capital-intensive” (hardind = 1) and those in sectors 4 and 5 (retail, wholesale, and transportation; and information and business services) “labor-intensive” (hardind = 0) (because there were very few firms in NAICS sectors 1, 6, 7, and 8, I omitted these in the sector comparisons). But I must ask what (if any) difference industrial sector may make in any

employee-ownership effect. Thus I introduce binary indicators ("dummies") for these sectors and look at the regression of EO advantage on the three predictive variables above, plus these dummies. Holding firm size, ESOP value per employee, and whether the firm is fully employee-owned constant, sector 4 firms (retail, wholesale, and transportation) have, on average, a greater advantage in S/E over their KO matches than do firms in other sectors. Construction and utilities firms come next (though there are very few utilities in this panel), then manufacturing firms, and firms in sector 5 (information and business services, which includes financial firms) have the lowest EO advantage. None of these differences are significant, but this rank-ordering is robust to other specifications. Dropping ownall, for example, because of its weak effect in this specification, leaves the ordering among the 4 sectors undisturbed; see table 26. In the specification in table 26, EO information and business service firms at the mean value per employee have *lower* sales per employee predicted than their matching KO firms if they have more than 150 employees; for manufacturing the "break-even" is at 1,480 employees, for construction 2,970, and for retail-wholesale, 4,940 employees.

Table 25: regressing EO advantage on 3 predictive values, and on dummies for industrial sector

Omitted sector: construction and utilities

Coefficients Dependent Variable: EOadv

R Square .078

	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	3.981	.001
(Constant)	25836.472	37777.602		.684	.495		
Employment	-23.481	12.220	-.111	-1.922	.056		
Valperee	.519	.164	.182	3.172	.002		
ownall	12837.851	26809.783	.028	.479	.632		
Manufacturing	-33846.459	40662.077	-.067	-.832	.406		
Retail, wholesale, & transportation	44861.408	41332.384	.086	1.085	.279		
Information & business services	-62259.430	41298.626	-.121	-1.508	.133		

Table 26: regressing EO advantage on 2 predictive values, and on dummies for industrial sector

Omitted sector: construction and utilities

Coefficients Dependent Variable: EOadv

	Unstandardized Coefficients		Standardized Coefficients			R Square	.077
						F	Sig.
	B	Std. Error	Beta	t	Sig.	4.744	.000
(Constant)	32980.777	34659.652		.952	.342		
Employment	-22.935	12.150	-.108	-1.888	.060		
Valperee	.519	.163	.182	3.174	.002		
Manufacturing	-34119.430	40603.069	-.067	-.840	.401		
Retail, wholesale, & transportation	45117.869	41272.995	.087	1.093	.275		
Information & business services	-64677.344	40933.318	-.125	-1.580	.115		

While it has been suggested that the higher EO advantage in retail-wholesale may be because these are industries in which employee-owners have direct contact with customers, I hesitate to try to explain this rank-ordering among industrial sectors. I just report it as a curious result of this study, and leave possible explanations for future research.

Further investigation of worker influence effects

After discovering that the *workctrl* factor derived from the 17 questions in the survey had an effect that was not significantly different from zero, it occurred to me that there might be valuable information in the answers to individual questions in the survey grid. I regressed *EOadv* on firm size (employment in the EO firm) and each score in the grid separately; the results are presented in table 27. Employment retained its large and significant effect throughout. Note, however, that there are three questions which have large effects (and thus high significances): innovation in work processes, new products, and marketing, all of which can be interpreted as having a relationship to innovation in

the workplace. The standard deviations of these three scores are all close to unity (0.90, 1.07, and 1.22, respectively). The mean response for innovation is 3.2, slightly higher than "workers are asked their opinions and these are taken seriously;" a change to 4.2 (just above "workers have formal mechanisms for input, and receive feedback") would, on average, increase *EOadv* by $32,362. Similarly, the means for new products and marketing are 2.5 and 2.4 respectively, halfway between "workers may make suggestions" and "workers are asked their opinions and these are taken seriously." A one-point increase here (to between "workers are asked their opinions and these are taken seriously" and "workers have formal mechanisms for input, and receive feedback") would, on average, increase *EOadv* by $47,649 (for new products) or $37,620 (for marketing). I have no explanation for the weaker (and sometimes negative) effects of the other 14 scores.

Table 27: Regressing *EOadv* on employment and on each of the response scores to survey questions (separately)

Worker influence on…	Coefficient	Significance (2-tailed)
Innovation in work processes	32362.30	0.161
Safety procedures	-17667.64	0.402
Physical layout of environment	-6026.50	0.792
Quality control	6311.15	0.742
Investment policies	-1022.84	0.965
Hiring and promotions	-11679.63	0.589
Equipment maintenance	5492.51	0.783
Company philanthropy	-1499.71	0.937
Wage levels	-20550.27	0.386
Overtime allocation	-14429.31	0.401
Work schedules	-11823.81	0.551
New products	47648.53	0.021
Marketing	37619.76	0.050
Evaluating supervisors	-10427.26	0.586
Equipment purchases	6976.08	0.758
Benefit offerings	-9176.35	0.681
Profit allocation	23787.81	0.365

The next question is whether these three responses can be built into a new worker-influence score. I did a new factor analysis, with just these three scores. The resulting factor explains 74.35% of the total variance in the three scores, and the weightings are presented in table 28.[32] This new score ("*innov*"), used as a regressor in combination with employment, has a large and significant effect in the linear specification, and firm size retains its strong effect. Adjusting for the weights of the underlying responses, and holding firm size constant, a one-point increase in worker influence on innovation in work processes would, on average, increase the EOadv by $14,563; for influence on new products, $16,592; and, for influence on marketing, the increase would be $16,182. In

[32] As with the previous factor analysis, when deriving index scores using the factor weights, I assigned the mean for each question to missing data points.

the log specification, holding employment constant, a one-point increase in "innov" increases the EO advantage ratio by 2.7%. In both specifications the constant is negative, presumably because of the need to account for high variation in *innov*. At the mean employment of 496 and mean *innov* score of 6.5, the linear regression predicts an EO advantage of $30,220, and the log regression predicts a 1.2% EO advantage.

Table 28: Factor derived from three survey items

Worker influence on …	Weight in factor	Correlation with consolidating variable
Innovation in work processes	.795	0.746
New products	.905	0.914
Marketing	.883	0.893

Table 29a: Regressing *EOadv* on firm size and the new factor (*innov*, for influence on innovation) for worker influence

Coefficients	Dependent Variable: EOadv					R Square	.089
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	6.020	.003
(Constant)	-61295.000	61066.338		-1.004	.317		
Employment	-56.706	23.932	-.206	-2.369	.019		
innov	18328.014	8609.295	.185	2.129	.035		

Table 29b: Regressing *logdif* on firm size and the new factor (*innov*, for influence on innovation) for worker influence

Coefficients	Dependent Variable: logdif					R Square	.083
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	5.625	.005
(Constant)	-0.053602	0.187218		-.286	.775		
Employment	-0.000220	0.000073	-.261	-2.998	.003		
innov	0.026719	0.026394	.088	1.012	.313		

Further investigation, building the earlier influential variables (valperee and ownall) back into the regression, show a weaker (but still significant) effect for *innov*, although these other two variables lose their strength. Table 30 shows the results of the estimate. Holding size, full-ownership, and employee stake constant, a one-point increase in production-worker influence on any of these three types of innovation would, on average, increase the EOadv on the order of $19,000. It is less than 1.8% likely that we would see this result if, among all EO firms and KO matches, increased worker influence decreases or has no effect on EO advantage. But when compared to table 26, neither the size effect nor the influence-on-innovation effect has changed much, and the F score has decreased, although it is still significantly different from unity (indicating that the regression estimator predicts the dependent variable better than random guesses). This suggests that, once we account for size effects, what makes the most difference in EO advantage (among factors that we can generalize to all firms) is production workers' ability to influence innovation in work processes, products, and marketing. A 3-point increase in employee influence on innovation in work processes, new products, or marketing (say, from "workers have no influence at all" to "workers have formal mechanisms for input, and receive feedback") would improve EO advantage about as much as a decrease in firm size of 1,000 employees.

Table 30: Regressing *EOadv* on firm size, average firm value per employee-owner, whether the firm is 100% employee-owned, and the degree of production-worker influence on innovation in the firm

Coefficients Dependent Variable: EOadv						R Square .107	
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	3.121	.018
(Constant)	-115219.524	80763.691		-1.427	.157		
Employment	-57.465	24.159	-.225	-2.379	.019		
Valperee	.132	.276	.045	.480	.632		
ownall	39209.558	47411.327	.078	.827	.410		
innov	19833.958	9327.786	.203	2.126	.036		

Chapter 7: Conclusion

There is a long history of studies of employee ownership around the world, but there is a shorter history of such studies for U.S. firms, corresponding to the novelty and near-invisibility of this sector. This study attempts to use a fairly large group of employee-owned firms, matched with similar capital-owned firms, to evaluate several hypotheses about such firms' productivity, relative to traditional (capital-owned) firms.

Many theorists have suggested that the rarity of employee ownership (at least at a level at which ownership becomes more than token, 50% ownership in this study) is *prima facie* evidence that such firms could not be as efficient as traditional firms, because otherwise they would be more common. But institutional and financing constraints may be a more realistic explanation for their rarity, and it is important for policy purposes to investigate efficiency objectively.

The most straightforward comparison between the employee-owned groups and their capital-owned matching firms gave the strongest result: on average, EO firms in the test panel have much higher sales per employee ($44,500) than their KO matches (in cases with multiple matches, the KO values are averages of all matching firms); statistical tests suggest that it is very unlikely that the opposite could be true among all EO and KO firms. A similar test using logs of sales per employee, to look at ratios rather than differences, shows that the average employee-owned firm has an 8.8% advantage over its matched KO firms, and this pattern can be generalized as well. This confirms the major hypothesis of the paper.

Some arguments about the effectiveness of employee ownership suggest that employee ownership would make more of a difference in smaller firms, where firm

operations and structure may be more transparent, and a culture of "this is ours" might be more credible to workers.[33] The test of the firm-size effect confirmed this hypothesis for this panel, with each 100 additional workers leading, on average, to a decrease of $2,263 in the sales-per-employee advantage employee-owned firms have over capital-owned ones, or a 0.8% decrease using a ratio measure. This result, too, has strong statistical significance, and it is very unlikely that the pattern could be the reverse among all firms.

Two hypotheses were not confirmed. Testing whether more capital-intensive firms would have weaker sales-per-employee advantages (employee-owned over matching capital-owned), and whether firms in which the employees (through their ESOP Trust) owned a larger percentage of the firm's stocks would have stronger sales-per-employee advantages, led to weak and ambiguous results. Were larger panels (or better data) available, these questions might be worth pursuing.

More effective, though, was the magnitude of employees' ownership value, as measured by the average value of each ESOP Trust's firm stock ownership per employee-owner. The hypothesis is that (assuming employees are aware of the value of their holdings, even though they are not liquid) higher per-person values increase workers' sense of ownership, and/or the prominence of ownership in the culture of the firm. Holding firm size constant, an increase of $1,000 in the average employee's ownership of firm value leads to an average increase of $518 in sales-per-employee

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[33] A recent study by Freeman, Blasi, Kruse, and Mackin (2007) observes that "shared capitalism [such as ESOPs] has beneficial effects on all outcomes save for absenteeism and that it has its strongest effects when combined with … high-performance work policies (employee involvement, training, and job security)…. The interaction of the effects of shared capitalism with other corporate policies suggests that the various shared capitalist and other policies may operate through a latent variable, 'corporate culture'" (from the abstract).

advantage in this panel, or, using ratio measures, a 0.1% increase. These results are also statistically significant, meaning that it is very unlikely that the reverse relationship would hold among all firms.

Another hypothesis emerged as the study progressed: that full ownership of the firm by the ESOP Trust might make a positive difference (in the sales-per-employee advantage) over part-ownership. This was verified by the tests in this series; holding firm size and firm value owned per employee constant, fully employee-owned firms in the panel have, on average, $23,900 higher sales per employee advantage over KO counterparts than partly employee-owned firms (the smallest share here being 50%), or a 5% higher advantage as a ratio. While this result cannot be confidently generalized to all firms, it is still strongly indicative of the effect of full ownership on firm culture.

The most innovative and interesting part of this study (to the researcher) was an attempt to develop a measure of non-management employee control over or influence in their employment situation, using a survey questionnaire. While this was done partly because previous studies have strongly suggested that ownership and influence have synergistic effects on productivity, and my own hypotheses built on these, it was also done because I believe not enough attention is paid to workplace democracy in general, and I think it would be very useful to have a validated metric for this dimension. One measure that came from the survey, which I had interpreted as a measure of worker control, had an ambiguous influence on sales-per-employee advantage of employee-owned firms, and I cannot argue that it is a valid measure of worker control or influence.

A measure that incorporated fewer of the survey results, however, did have substantial and significant effect on the sales-per-employee advantage, holding firm size

constant. The three scores included were those on production worker influence on innovation in work processes, new products, and marketing, all of which seem to have some relation to innovations in general; to some extent the observed effect validates this "innovation" measure. It remains for further investigation to determine why other scores had weaker (or negative) effects, and to develop and validate better measures of worker influence and job control.

The other measure from the survey, the ratio of managers to non-management workers at surveyed firms, had an ambiguous effect as well. I had expected that firms with higher management intensity would leave little room for employee initiative, weakening or negating any potential productivity advantage from employee ownership. However, the results of this test were weak, and in opposite directions in the two specifications.

Another provocative (and unexplained) result of the analysis here is that, holding several of these relevant factors constant, firms in the retail, wholesale, and transportation sector tend to have greater sales-per-employee advantages than those in construction and utilities, which in turn have greater advantages than those in manufacturing, and these in turn have greater advantages than those in information and business services (other sectors, such as arts and leisure or general services, had too few cases to include in these comparisons). While these results were statistically weak, they were consistent in various specifications, and there are no obvious (to me) explanations for this ordering of effects; a closer look at the raw data—or further research—may lead to some speculation, but that is not on the agenda for now.

I started this work believing that workplace democracy (for which employee ownership may be a necessary, but not sufficient, predicate) is a good in itself, in its effects on workers' lives both inside and outside the workplace. Efforts to bring shared ownership to employees (beyond top management) have come from some of these beliefs, as well as a sense that broader ownership of businesses would lead to a more equitable distribution of wealth, and a healthier polity. But there is a lot of inertia to overcome to broaden employee ownership among U.S. businesses, and academic arguments that such a program might reduce productivity have been part of that resistance. I hope that this experiment may be part of proving those assumptions wrong.

Appendix

In chapters 4 and 5, several concerns were raised about the validity of the panel as constructed. The small discrepancy in distribution of industry sectors among the smaller (added later) firms, compared to all smaller EO firms, led to a concern about including these at all. Tables A-1 and A-2 show the results of omitting these firms from the analyses represented in tables 16a and 17a above; the results are similar enough to suggest that these firms can indeed be included; lower significance here may just be a result of the smaller panel size.

Table A-1: paired-sample differences test, original panel without smaller firms added (compare table 16a)

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
SEEO	232645.6315	258	447831.27579	27880.75741
SEKO	162881.0099	258	123397.55706	7682.39634

Paired Samples Test

	Paired Differences							
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
SEEO - SEKO	69764	449145	27962	14699	124829	2.495	257	.013

Table A-2: regressing the EO "advantage" over KO match in S/E (EOadv) on firm size, without smaller firms (compare table 17a)

Coefficients	Dependent Variable: EOadv					R Square	.008
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	2.061	.152
(Constant)	89009.556	32614.623		2.729	.007		
Employment	-34.175	23.807	-.091	-1.436	.152		

During a discussion I had with a construction firm manager (I had had a question about the meaning of one of her survey responses), she pointed out that many of their projects involved contracting work to non-employees. Since non-employees would not be subject to employee ownership effects, I realized that I should replicate some of these tests without construction firms in the data. Tables A-3 and A-4 perform the same tests as presented in tables 16a and 17a, but without the construction firms. The results are similar enough to suggest that these firms can indeed be included—in fact the weaker results here suggest that ownership effects may be *stronger* in construction firms.

Table A-3: paired-sample differences test, panel without construction firms (compare table 16a)

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
SEEO	200073.8634	276	226527.86495	13635.37514
SEKO	160560.4382	276	118778.39755	7149.61936

Paired Samples Test

	Paired Differences							
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper	t	df	Sig. (2-tailed)
SEEO - SEKO	39513	221175	13313	13305	65722	2.968	275	.003

Table A-4: regressing the EO "advantage" over KO match in S/E (EOadv) on firm size, without construction firms (compare table 17a)

Coefficients Dependent Variable: EOadv

	Unstandardized Coefficients		Standardized Coefficients			R Square	.003
	B	Std. Error	Beta	t	Sig.	F	Sig.
(Constant)	45275.065	14871.083		3.045	.003	.759	.384[a]
Employment	-12.290	14.110	-.053	-.871	.384		

I noted in the methodology discussion that I was concerned that the D&B data marked "estimated/modeled" might be based on algorithms using only (or primarily) employment and industry as arguments, thus leading to similar or identical sales per employee for EO firms and KO matches that both have estimated data. While I did not expect D&B to reveal their algorithms, I thought I might at least find out what arguments were used, but queries to their data people led noplace. Thus I performed these same two tests using just EO data marked "actual," and KO matches to those firms marked

"actual;" the results are in tables A-5 and A-6. These results show no reason to doubt the full-panel results in tables 16a and 17a. In particular, while the EO advantage is lower in the full panel ($44,500 rather than $78,250), it has much more significance (p<.0003, compared to p<.0015 here), and employment effects are more significant as well, at least partly because the doubled panel size there increases test power. My concern that including estimated data would weaken any effect has been assuaged. My advisers assure me that D&B data is generally thought to be reliable; thus it makes sense to use the larger (full) panels to maximize sample size.

Table A-5: paired-sample differences test, using only data marked "actual" (compare table 16a)

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
SEEO	293233.9598	163	326621.95184	25583.00570
SEKO	214982.2319	163	150217.22262	11765.92094

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
SEEO - SEKO	78252	334080	26167	26579	129924	2.990	162	.003

Table A-6: regressing the EO "advantage" over KO match in S/E (EOadv) on firm size, using only data marked "actual" (compare table 17a)

Coefficients Dependent Variable: eoadv

R Square .003

	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	.448	.504
(Constant)	86262.221	28812.064		2.994	.003		
Employment	-17.020	25.415	-.053	-.670	.504		

Another question raised in discussions with advisers was whether there might be systematic self-selection among firms which returned surveys. To examine this, I performed these same tests, but excluding those firms which returned survey questionnaires. The results in table A-7 are nearly identical to those in table 16a, though with lower significance (reflecting the 39% drop in panel size). Table A-8 shows almost no effect of firm size on the EO advantage, unlike table 17a, but I would argue that this is because eliminating firms which returned the survey eliminates almost the entire group of firms with employment below 100, weakening this test *a priori.* To show the basis for this argument, figure A-1 compares the size distributions of the panels with and without survey respondents.

Table A-7: paired-sample differences test, using only firms which did not respond to the survey questionnaire (compare table 16a)

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
SEEO	208479	201	228381	16109
SEKO	162771	201	123651	8722

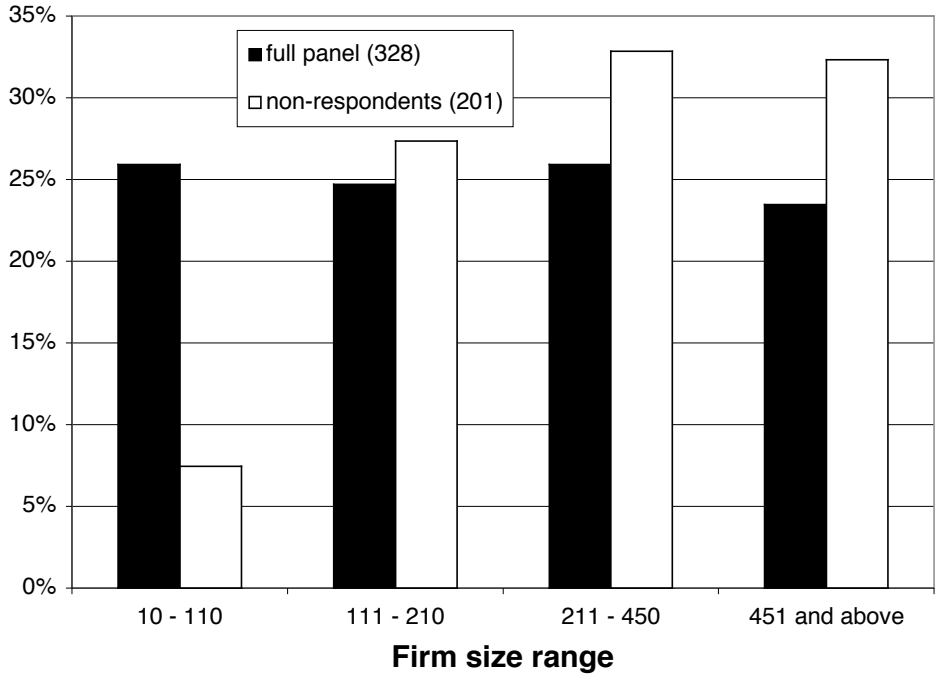
Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
				95% Confidence Interval of the Difference				
	Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
SEEO - SEKO	45708	224928	15865	14424	76993	2.881	200	.004

Table A-8: regressing the EO "advantage" over KO match in S/E (EOadv) on firm size, using only firms which did not respond to the survey questionnaire (compare table 17a)

Coefficients	Dependent Variable: EOadv					R Square	0.002
	Unstandardized Coefficients		Standardized Coefficients			F	Sig.
	B	Std. Error	Beta	t	Sig.	.427	.514
(Constant)	51443	18148.587		2.835	.005		
Employment	-9	13.826	-.046	-.654	.514		

Figure A-1: firm size distributions, panels with and without survey respondents



Validity check: use all matching firms

Prof. Thurston has raised a question as to whether the paired-sample differences test, with each group of matching firms aggregated, deletes some useful information. I consulted Prof. Ted Joyce, a health economist who teaches microeconometrics. He

agreed that this was the proper way to analyze the data, given the structure of my data.[34] With some brainstorming, however, he developed a structure for a test that would allow all matching firms to be included. This involves regressing sales per employee on an indicator (dummy) for employee ownership, controlling for the variability of the other characteristics and sizes of matching groups by including (as regressors) indicators for each employee-owned + matches group, and clustering errors within each employee-owned + matches group. One analogy is to treatment of one person in each family; to tease out the treatment effect, other characteristics of the family must be held constant by including family dummies. Another analogy would be to establishing a new educational program in one school in each school district; to tease out effects, when comparing results to schools in the same district, other characteristics of the school district must be held constant. Including the group dummies means that we are looking only at within-group (excluding between-group) differences. The results of these tests are in tables A-9 through A-13, and agree fairly consistently with the tests using aggregated KO firms.

[34] The analogous situation in health economics would be with matched panels of subjects, with one panel being treated and one not (here the "treatment" is employee ownership), and comparing some measure (e.g., blood pressure) after the treatment.

Table A-9: using all KO matches, regress sales per employee on an indicator for employee ownership (*iseo*) and on indicators for each group of employee-owned firms with their matches (compare table 16a)
(omitted dummy: d2)

```
Linear regression                                       Number of obs =    2522
F( 33,   327) =       .
Prob > F      =       .
R-squared     =  0.0981
Root MSE      =  4.1e+05
(Std. Err. adjusted for 328 clusters in match)
------------------------------------------------------------------------------
             Robust
salesperee       Coef.   Std. Err.      t    P>t     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        iseo    45421.14    13573.8     3.35   0.001     18718.15    72124.12
          d3   -215502.7    1131.15  -190.52   0.000      -217728   -213277.5
          d4   -250645.5   2262.299  -110.79   0.000      -255096     -246195
          d6     -172669   2585.485   -66.78   0.000    -177755.3   -167582.7
          d7     -330960   2262.299  -146.29   0.000    -335410.5   -326509.5
          d8   -194842.5    1131.15  -172.25   0.000    -197067.7   -192617.2
          d9     -170657   2.67e-06        .   0.000      -170657     -170657
 (results for 322 additional case dummies deleted)
       _cons      442014   4524.598    97.69   0.000       433113    450914.9
```

This analysis says that, holding aside characteristics that differ among the matching groups, there is, on average, a $45,400 advantage in sales per employee for employee-owned firms over their KO matches, with a one-tailed confidence of 99.95%. This is nearly identical to a $44,524 EO advantage (p<.0003, or 99.97% confidence) from the paired-sample differences analysis, using aggregated matches, presented in table 16a above. Next, I tried a regression using the EO indicator and employment times the indicator, keeping the case dummies because, again, I want to look only at differences within match groups.[35] These results are presented in table A-10.

[35] A regression without the case dummies gives the expected sign on the employment variable, but with no significance (p<.301). That result just reflects whether, across a broad range of EO firms of different types, S/E responds to firm size.

Table A-10: using all KO matches, regress sales per employee on an indicator for employee ownership (*iseo*), on firm size times the indicator, and on indicators for each group of employee-owned firms with their matches (compare table 17a)
(omitted dummy: d2)

```
Linear regression                                      Number of obs =    2522
                                                       F(  1,   327) =       .
                                                       Prob > F      =       .
                                                       R-squared     =  0.0984
                                                       Root MSE      =  4.1e+05
                                  (Std. Err. adjusted for 328 clusters in match)
------------------------------------------------------------------------------
             |               Robust
  salesperee |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        iseo |   55246.89   15116.14     3.65   0.000     25509.74    84984.05
      eoempl |  -21.73792   11.51291    -1.89   0.060    -44.38664    .9107928
          d3 |  -264355.1   25749.57   -10.27   0.000    -315010.8   -213699.4
 (results for 326 additional case dummies omitted)
       _cons |   504713.3   32919.73    15.33   0.000     439952.1    569474.5
```

This says that the average difference in sales per employee between EO firms and their matching KO firms is $55,247 - $21.74 times employment, or $44,465 at the mean employment of 496; table 17a (using just aggregate KO S/E) gave this as $55,748 - $22.63 times employment, again a nearly identical result. The one-tailed significance here is p<.0005 for the EO effect and p<.030 for the employment effect; in table 17a they were p<.0005 and p<.027, respectively.

Attempts to do these regressions with the EO indicator and any of the variables which exist only for EO firms fail, because there are no values for the KO firm matches, and the regression cannot distinguish (identify) whether variation is assigned to the EO indicator or to the EO-specific measure. Table A-11 is typical.

Table A-11: using all KO matches, regress sales per employee on an indicator for employee ownership (*iseo*), on the indicator times employment, and on average employee's share of the value of the ESOP trust (*valperee*)

```
. regress salesperee iseo eoempl valperee
      Source |       SS       df       MS              Number of obs =     303
-------------+------------------------------           F(  2,   300) =    9.61
       Model |  9.1924e+11     2  4.5962e+11           Prob > F      =  0.0001
    Residual |  1.4344e+13   300  4.7815e+10           R-squared     =  0.0602
-------------+------------------------------           Adj R-squared =  0.0540
       Total |  1.5264e+13   302  5.0542e+10           Root MSE      =  2.2e+05
------------------------------------------------------------------------------
  salesperee |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        iseo |  (dropped)
      eoempl |  -9.528044   11.52868    -0.83   0.409    -32.21537    13.15928
    valperee |   .6859067    .157795     4.35   0.000     .3753815    .9964319
       _cons |   165177.4   17325.32     9.53   0.000     131082.8    199271.9
------------------------------------------------------------------------------
```

As far as I can tell, the only other way to use all KO data is with regressions by industrial sector, a variable present for all firms. I constructed dummies for each of four sectors, conditioned on whether firms are EO or not; tables A-12 and A-13 present results with and without case dummies.[36] Note that without case dummies, the sector effects wash out any size effect, but that the size effect is still strong (as are all sector effects) with the case dummies present, and coefficients on EO and EO times employment are very similar to those in table A-10 above. The results in table A-12 say that, holding size constant, the EO sales-per-employee advantage is highest among construction firms, then among retail and wholesale firms, then among information and business service firms, and lowest among manufacturing firms. The sector results without case dummies (A-13), however, are much closer to those in tables 25 and 26. I offer no explanation for the difference in the sequence (I have none for the sequence in the earlier tables either).

[36] As in tables 25 and 26, the other NAICS sectors, with many fewer cases than these 4, are omitted.

Table A-12: using all KO matches, regress sales per employee on an indicator for employee ownership (*iseo*), on the indicator times employment, on indicators for employee ownership in each of 4 sectors, and on case dummies (compare tables 25 and 26)

(omitted sector: construction; omitted case: d2)

```
Linear regression                                       Number of obs =    2427
                                                        F(  1,   314) =       .
                                                        Prob > F      =       .
                                                        R-squared     =  0.0953
                                                        Root MSE      =  4.2e+05
                                (Std. Err. adjusted for 315 clusters in match)
------------------------------------------------------------------------------
             |               Robust
  salesperee |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        iseo |   56456.15   15525.52     3.64   0.000     25908.95    87003.36
      eoempl |  -21.77696   12.17998    -1.79   0.075    -45.74166    2.187733
       eomfg |  -434906.9   37145.44   -11.71   0.000    -507992.3   -361821.5
   eoretwhol |  -229263.6   32995.21    -6.95   0.000    -294183.2   -164343.9
      eoinfo |  -332799.2   2587.587  -128.61   0.000    -337890.4     -327708
          d3 |   170563.4   10407.48    16.39   0.000     150086.2    191040.6
       (313 other case dummies not shown)
       _cons |   504428.7   35031.89    14.40   0.000     435501.8    573355.6
------------------------------------------------------------------------------
```

Table A-13: using all KO matches, regress sales per employee on an indicator for employee ownership (*iseo*), on the indicator times employment, and on indicators for employee ownership in each of 4 sectors (compare tables 25 and 26)

(omitted sector: construction)

```
Source |       SS       df       MS              Number of obs =    2427
-------------+------------------------------           F(  5,  2421) =    9.44
       Model |  7.9658e+12     5  1.5932e+12           Prob > F      =  0.0000
    Residual |  4.0876e+14  2421  1.6884e+11           R-squared     =  0.0191
-------------+------------------------------           Adj R-squared =  0.0171
       Total |  4.1672e+14  2426  1.7177e+11           Root MSE      =  4.1e+05
------------------------------------------------------------------------------
  salesperee |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        iseo |   46199.72   27005.25     1.71   0.087    -6756.077    99155.52
      eoempl |  -3.941311   21.91591    -0.18   0.857     -46.9172    39.03458
       eomfg |  -59113.98   23751.43    -2.49   0.013    -105689.2   -12538.75
   eoretwhol |   71395.29   23923.53     2.98   0.003     24482.58      118308
      eoinfo |  -65331.11   23955.24    -2.73   0.006      -112306   -18356.22
       _cons |   186452.3   17331.64    10.76   0.000     152465.9    220438.6
```

Validity check: test by employment quartile

Prof. Kruse has pointed out that, given the structure of these regressions, errors in employment numbers might create a consistent bias in the regression coefficients on firm size. A suggested way to check for this is to do the paired-differences test by employment quartiles (rather than using continuous employment data). Table A-14 reports the results of the paired-sample differences test by employment quartile. While there is an unexplained decrease in the mean difference (and significance) for the second quartile of firms, the mean SEEO-SEKO remains positive for each quartile.

Table A-14: Paired-sample differences, sales per employee for EO firms and KO matches, by employment quartile

Paired Samples Test

	Paired Differences, employment = 10 to 110 (85 cases)							
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
SEEO - SEKO	66996	275706	29905	7528	126465	2.240	84	.028
	Paired Differences, employment = 111 to 210 (81 cases)							
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
SEEO - SEKO	11046	165569	18397	-25565	47656	.600	80	.550
	Paired Differences, employment = 211 to 450 (85 cases)							
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
SEEO - SEKO	62358	201017	21803	19000	105717	2.860	84	.005
	Paired Differences, employment 451 and above (77 cases)							
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
SEEO - SEKO	35249	257631	29360	-23227	93724	1.201	76	.234

Questionnaire on worker participation in firm management in employee-owned firms

City University of New York, Dept. of Economics **Brent Kramer, PhD candidate**

Survey instructions

- **Please fill this out to the best of your ability, and mail it back in the enclosed SASE.**
- **Questions about "workers" refer to *(all) non-management* workers.**
- **If you feel any answer needs qualification or explanation, please star (*) your answer and attach a separate page with the explanation.**
- **If your firm has more than one location, please photocopy this survey and fill it out as appropriate for each location (U.S. locations only). Thank you.**

Firm _____

Location(s) (see instruction above)

_____

Industry product type (most general classification) _____

NAICS _____ EIN _____

Please check here if your firm is no longer employee-owned _____
(do not complete the survey)

Percent of company value owned by employees (through ESOP or other means) _____

Total number of employees at this location ____ Number participating in ESOP _____

Number of non-management (including "production") workers at this location _____

Number of workers at this location represented by a union _____

Estimated ratio of managers* to non-management workers _____
*only those with managerial or supervisory functions, not clerical or solely administrative

Do workers choose any members of the Board of Directors? _____
If yes, how many? ____ members out of _____ total on the board.

PLEASE COMPLETE QUESTIONS ON OTHER SIDE AS WELL

For verification purposes (in case I have questions about your responses):
Your name _____
Your company position _____
Phone number _____ Email _____

Company-specific details will not be revealed to anyone, verbally or in print.
Questions: bkramer@gc.cuny.edu, or 917-887-5640 (10 am – 4 pm EST)
Return to: Brent Kramer, 477 17th St., Brooklyn, NY 11215

For each type of decision, please indicate the extent of non-management worker influence at this location. Come as close as you can to the most common extent of influence.

	Workers have no influence at all	Workers may make suggestions	Workers are asked their opinions and these are taken seriously	Workers have formal mechanisms for input, and receive feedback	Workers have the power to make decisions on their own
Innovation in work processes					
Safety procedures					
Physical layout of the work environment					
Quality control					
Investment policies					
Hiring and promotions					
Equipment maintenance					
Company philanthropy					
Wage levels					
Overtime allocation					
Work schedules					
New products					
Marketing					
Evaluating supervisors					
Equipment purchases					
Benefit offerings					
Profit allocation					

PLEASE COMPLETE QUESTIONS ON OTHER SIDE AS WELL
Company-specific details will not be revealed to anyone, verbally or in print.

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