The Sociology of Groups and the Economics of Incentives: Theory and Evidence on Compensation Systems

William E. Encinosa III
University of Michigan

Martin Gaynor
Carnegie Mellon University and NBER

James B. Rebitzer
Massachusetts Institute of Technology

April 15, 1997

Acknowledgments: We would like to thank Daron Acemoglu, Ashish Arora, Linda Babcock, George Baker, Erik Brynjölfson, John Engberg, Rob Fairlie, Reuben Gronau, Bengt Holmström, Steve Jones, Bentley MacLeod, John Mullahy, John Penrod, Steve Pischke, David Sappington, Scott Stern, Lowell Taylor, Bill Vogt, and participants in seminars at Carnegie Mellon, Harvard, Illinois, MIT, Princeton, UC Santa Cruz, the NBER conference "What Do Employers Do?" and the World Congress on Health Economics for helpful comments and discussion. The usual caveat applies.

ABSTRACT

This paper incorporates the sociological concept of “group norms” into an economic analysis of pay systems. We use a behavioral microeconomic model and a unique survey of medical groups to examine the theoretical and empirical relationship between group norms and incentive pay. Our findings suggest that, at least for medical groups, norms are binding constraints in the choice of pay practices. While group norms matter, the patterns in the data suggest that they are not *all* that matters. Analysis of the preferences and activities of individual physicians indicate that factors highlighted by the economic theory of agency, notably income insurance and multi-task considerations, also shape pay policies. The conclusion we draw from these results is that the sociological concept of group norms *augments* rather than replaces more conventional economic analyses of pay practices.

William E. Encinosa III
Department of Health Management and Policy
School of Public Health
University of Michigan
109 Observatory
Ann Arbor, MI 48109-2029

Martin Gaynor
H. John Heinz III School of Public Policy and Management
Carnegie Mellon University
Pittsburgh, PA 15213-3890
and NBER

James B. Rebitzer
Sloan School of Management
MIT
Cambridge, MA 02139

1. Introduction

In his Nobel Prize winning essay “The Nature of the Firm”, Ronald Coase (1937) observed that the received microeconomic theory did not offer the conceptual tools needed to analyze the internal operation of organizations. Coase’s paper stimulated the development of a new branch of economics**, the economics of organizations,** that features rigorous theoretical models of the internal workings of organizations and employment relationships (Holmström and Tirole, 1989). One of the central concerns of this literature is the structure of compensation.

Economic models of compensation treat pay practices as a solution to an incentive problem. High levels of performance require high levels of effort and, beyond some minimal point, providing this effort is costly. Firms desiring high levels of performance from employees should, therefore, link economic rewards closely to an individual’s productive contribution. Yet this tight linkage is hardly a universal characteristic of pay systems. Firms exhibit enormous variation in the degree to which compensation responds to individual performance.[1] Explaining this diversity is one of the fundamental tasks for labor economics and for the economics of organizations (Baker, Jensen and Murphy, 1988; Baker, Gibbons and Murphy, 1994, Holmstrom and Tirole, 1989, Gibbons, 1996).

---

1 There appears to be more variation in compensation contracts than can credibly be explained by standard economic models of contracting (Alston and Higgs, 1982; Jensen and Murphy, 1990; Baker, Jensen, and Murphy, 1988; O’Reilly, Main, and Crystal, 1988; Gibbons, 1996), although there are varying opinions on this point (e.g., Haubrich, 1994; Lazear, 1991). Further, although there is clear econometric evidence that compensation incentives affect productivity (see Gaynor and Pauly, 1990; Lazear, 1996; Brown, 1992; and the survey by Gibbons, 1996), there is also econometric evidence that “other things,” such as job design, human resource policies, and participative decision making, affect productivity in important ways that are not necessarily consistent with standard theory (Ichniowski, Shaw, and Prennushi, forthcoming; Pencavel and Craig, 1994).

This paper incorporates the sociological concept of "group norms" into an economic analysis of the variation observed in pay systems. Optimal incentive design requires that the marginal benefits of incentives equal their marginal costs. We argue below that group norms influence both the benefits and costs of incentives and therefore the kind of incentive arrangements that firms will use.

The term "group norms" is a shorthand expression for certain kinds of social interactions. When working together, individuals compare their effort and pay levels to others in the group. We use "group norms" to refer to the social interactions that result from these comparisons. The phenomena we have in mind, envy, shame, guilt and peer pressure, are of self-evident importance in social and economic life, but have so far played only a peripheral role in modern microeconomic studies of compensation systems.[2] It is not hard, however, to see how interpersonal comparisons could influence incentive design. If, for example, employees resent having a low rank in the firm's income hierarchy, firms may prefer to avoid workplace tensions by adopting incentive pay schemes that do not create too much of a gap between high performers and others.[3]

---

2 There have been scattered contributions to economic theory of the social interactions we include under "group norms," notably the work of Gary Becker (1974) on social interactions, including envy, George Akerlof (1995, 1980) on conformity and status seeking, Robert Frank (1985) on status seeking, Bernheim (1994) and Jones (1984) on conformism, Kreps on corporate culture (1990), Varian (1974) on envy, and Young (1994) on equity. There have also been a few scattered papers (e.g., Milgrom, 1988; Lazear, 1989; Arnott and Stiglitz, 1991; Kandel and Lazear, 1992; Lazear,1991) analyzing the importance of social interactions for the economics of organizations. The vast bulk of the literature, however, has given little weight to such considerations.

3 Recent work by Bewley (1996) adds weight to these observations. Bewley interviewed managers in a large number of firms in Connecticut. He states "Perhaps the most important function of [internal pay] structure is to achieve internal pay equity. Equity is vital for the operation of a

Two alternative explanations for variations in incentive pay come out of the economic theory of agency. The first explanation stresses risk aversion. Risk aversion strictly bounds compensation contracts away from incentives based purely on individual productivity in order to insure the agent against random shocks to their productivity (see e.g., Stiglitz, 1974 for a seminal piece on sharecropping, or Sappington, 1991 for a recent survey). There is evidence supporting the hypothesis that risk aversion leads to compensation contracts with weakened incentives, (Higgs, 1973; Garen, 1994; Gaynor and Gertler, 1995; Lang and Gordon, 1995), but also some evidence that there is significant variation in compensation contracts that cannot be explained by risk aversion (Alston and Higgs, 1982; Allen and Lueck,1996).

The second explanation for variation in incentive pay that emerges from the agency literature concerns multi-tasking (Holmström and Milgrom, 1991; Baker, 1992; Lazear, 1986). Consider a situation in which individuals can devote effort to two different tasks, one which is easily measured and one which is not. If compensation is based entirely on productivity in the easy to measure task, then agents will supply too much effort to that task and too little effort to the hard to measure task. For example, piece rates tied solely to quantity can cause workers to devote insufficient attention to quality. Multi-tasking, like risk aversion, causes optimal compensation to be strictly bounded away from pure productivity pay.

In what follows, we present a unified model of incentive pay that incorporates risk

---

company, for perceptions of inequity and favoritism embitter and antagonize employees." Additionally, individuals feel that they know what their co-workers' are paid, and further, their perceptions are quite accurate. In a survey undertaken by Krueger and Rouse, 54 percent of workers in a unionized manufacturing company reported that most know each others' pay. Further, most workers estimates of co-workers' pay were quite accurate, with a mean error of 21 cents (Alan Krueger, personal communication).

aversion, multi-tasking, and group norms. Using this model we develop an empirical test of the **(null)** hypothesis that group norms are irrelevant to the design of incentive pay systems. Our findings indicate that group norms matter for compensation systems. The evidence also suggests that norms are not the whole story. The patterns in the data are most consistent with a model in which **risk aversion**, multi-task considerations and group norms simultaneously influence the incentive pay policies of organizations.

As an empirical matter, studying the effect of group norms on compensation practices requires the identification of a "reference group" against whom individuals make comparisons. Both empirical studies and introspection suggest that individuals in the same profession and firm are more likely to be in each other's reference group than others in more distant and dissimilar economic settings (Baron and Pfeffer, 1994). For this reason, we focus our attention on the compensation of professionals working in professional partnerships. In particular, we utilize a unique data set on medical group practices, which includes detailed information on the compensation policies of the group.

Two additional features of professional partnerships make them a convenient vehicle for studying pay for performance. First, in many partnerships it is relatively easy to identify the revenues generated by an individual and therefore easy to link pay and performance. This is especially true of the partnerships featured in our empirical analysis: physician groups. Second, as many observers have noted, partnerships rely upon administrative rules under which individual partners share in the income generated by other partners in the firm (Farrell and Scotchmer, 1988; Gaynor, 1989; Gilson and Mnookin, 1985; Kandel and Lazear, 1992; Landers, Rebitzer and Taylor, 1996). These "sharing rules" offer a parsimonious expression of the link between pay and performance that prevails within the group.

The problem of incentive design applies to many settings. It is worth noting, however, that our specific empirical application, incentive design for physicians, has recently received considerable attention from managers and policy makers. Throughout the nation, health care providers are in the process of rethinking and restructuring the ways in which they deliver services. A central (and unresolved) issue in this restructuring is the specification of incentive contracts for physicians. For the most part, the discussion of optimal payment systems has overlooked the potential influence of group norms. This omission may have important consequences. If group norms matter, then even in settings where risk aversion and multi-tasking are not very important, optimal incentive systems should employ less than first-best, high powered incentives.

The paper proceeds as follows. The next part, Section 2, sketches the social-psychological assumptions upon which we construct our analysis of group norms. Section 3 lays out the microeconomics of our unified model of incentive pay. Empirical findings are reported in Section 4. The paper concludes by considering the implications of our results for the economic analysis of organizational design.

2. Social-Psychological Assumptions

Models of group norms highlight the interpersonal comparisons that take place in groups. In order to bring these interpersonal comparisons into a microeconomic model, we need to specify how individuals assess (and react to) differences between themselves and others. Conventional economic theory does not offer much insight into the ways in which these comparisons are made. We rely, therefore, on three behavioral regularities that have emerged from experimental studies of economic behavior:

Reference Dependence:

Utility is determined by absolute and relative income and effort. For any given earnings level, an increase in the earnings of the reference group reduces an individual's utility. Similarly, for any given effort level, an increase in the effort of the reference group reduces an individual's utility.

Loss Aversion:[4]

The marginal utility gain from doing "better" than the reference group (more income, less effort) is less than the marginal utility lost by doing "worse" than the reference group (less income, more effort).

Saliency:

The effect on utility of interpersonal income and effort comparisons increases with an individual's similarity, proximity and exposure to the reference group. Similarly, the effect of interpersonal comparisons increases the more directly individuals compete for important resources.

2.1. Interpersonal Comparisons of Earnings

Experimental studies suggest that people act as if they care (and expect others to care) about absolute and relative incomes. The clearest evidence along these lines comes from studies of the "ultimatum" game. In the simplest version of this game, player 1 decides how to divide a given amount of money between himself and player 2. Player 2, in turn, can either accept this division of the pie or reject it. If she accepts, then both players get the allocated money. If she rejects, then neither player gets anything. If individuals care only about their own income, the optimal strategy in a one period ultimatum game is clear. Player 1 should allocate all (or nearly all) the money to himself. Player 2 should always accept this offer because she would be no

4 For more extensive discussion of loss aversion in income see Tversky and Kahneman (1991).

worse off (even though player 1 might be considerably better off) than under the alternative strategy of rejection. Surprisingly, ultimatum game participants do not behave in this manner. In diverse countries, with differing amounts of money at stake, with games having differing numbers of rounds, with participants who are assigned roles in varying ways and who have various degrees of experience playing the game, experimenters find that: (1) a substantial number of first round offers are rejected; and (2) observed opening offers tend towards an equal division of the monetary pie.[5,6]

These ultimatum game anomalies are consistent with a bargaining model built using behavioral assumptions 1 and 2 above (Bolton, 1991). Assume that individuals care about both absolute and relative income and can substitute one for the other. If bargainers care enough about relative earnings, they would be willing to sacrifice absolute income to avoid experiencing wage differentials. Not knowing the weights that different individuals place on absolute and relative income creates uncertainty about preferences that leads to rejected first offers. Loss aversion dictates that offers will tend towards a 50-50 split. This follows because the utility gain to player 1 from claiming more than 50 percent of the pie will generally be less than the utility loss to player

---

5 See, e.g., Camerer and Thaler (1995), Prasnikar and Roth (1992), Roth, Prasnikar, Okuno-Fujiwara and Zamir (1991). The lessons from ultimatum game experiments are complicated, however, by results from experiments using other simple games in which participants produce the highly unequal outcomes predicted by conventional economic models of behavior (Roth, Praznikar, Okuno-Fujiwara and Zamir, 1991; Bolton, 1991; Praznikar and Roth, 1992).

6 Ultimatum game results are not the only experimental support for these assumptions. Kahneman, Knetsch, and Thaler (1986) examine the issue of fairness in economics by surveying the response of individuals to hypothetical transactions. They conclude that the fairness of an exchange is typically judged relative to a reference transaction. The reference transaction is not always unique and subjects can disagree about which reference to invoke, but the reference point is strongly influenced by what is typical or normal or “status quo” for the individual.

2 from receiving less than 50 percent of the pie.

Loss aversion induces a bias that favors the status quo over other options. Loss aversion also implies that improvements from a reference point will generally be preferred to choices that offer improvements along some dimensions and reductions along others. Experiments that manipulate the "status quo" reference point of individuals bear out this prediction (Tversky and Kahneman, 1991), as do some recent studies of wage determination.[7]

Our third assumption concerns the saliency of income comparisons. Frank (1985, Chapter 2) offers a review of the biological, psychological and sociological evidence concerning saliency. Frank suggests a simple unifying principle governing income comparisons, "...people care most about those with whom they compete most directly for important resources."[8] Levine (1993) also finds that compensation managers were more willing to narrow wage differentials for occupations closely aligned on a job ladder than for differentials across broad occupational groupings.

---

7 Babcock, Wang, and Loewenstein (1995) find that teacher unions and public school boards rely on reference wages in other school districts when evaluating contracts. The more dissimilar the wages in each side's *chosen* reference districts, the greater the likelihood of a strike and the longer the duration of strikes. Levine (1993) surveyed compensation managers at Business Week 1000 companies and asked them to make wage recommendations under a variety of different conditions in the labor and product markets. The striking result is that variations in unemployment rates, application rates, vacancy rates, quit rates, return on assets and productivity had little or no effect on the wage adjustments suggested by compensation managers. These same managers, however, recommended aggressive wage increases for lower paid individuals in order to maintain "internal equity" for employees in closely related positions.

8 Baron and Pfeffer (1991) reach similar conclusions "Less reward inequality will be present under conditions in which social comparisons operate more vigorously--specifically when fewer ascriptive or organizational distinctions exist among employees, and when workers are in closer contact to each other" (p. 200).

2.2. Interpersonal Comparisons of Effort:

When applied to interpersonal comparisons of effort, the assumptions of reference dependence and saliency can be given either a behavioral or a conventional economic interpretation.[9]

Under the behavioral interpretation, reference dependence results from feelings of guilt or shame when not carrying one's "fair share" of the group's work (Kandel and Lazear, 1992). Variations in the saliency of these perceived effort obligations may be due to the difficulty of feeling empathy with others in more distant or dissimilar settings. Under the conventional economic interpretation, the disutility derived from performing below group norms results from the informal processes of monitoring and sanctions within the work group. From this perspective, similarity and proximity increase the saliency of effort comparisons because they make it easy for members of the group to keep an eye on one another.

For the purposes of our analysis, either the behavioral or the conventional economic interpretation of the effort norms assumptions is acceptable. In real world settings, it is likely that the behavioral and economic aspects of group effort comparisons are mutually reinforcing.

3. Theory

In this section we derive propositions about the role group norms play in the design of optimal incentives. The key propositions focus on a group's decision whether or not to divide revenues equally among the partners. We demonstrate that group income and effort norms make

---

9 In the social psychology literature, much of the empirical research on group norms in employment relationships focuses on income comparisons. This appears to be due to the fact that income is easier to observe and manipulate experimentally than effort. The theoretical discussion of group norms in social psychology, however, clearly indicates that both income and effort comparisons matter for utility (Baron and Pfeffer, 1994).

small groups more likely to adopt equal sharing rules than large groups. In contrast, risk aversion and multi-tasking make equal sharing more likely in large groups. Thus, if we observe that small groups are more likely to adopt equal sharing rules, then we can reject the hypothesis that group norms are irrelevant to incentive design.

We divide our exposition into two sections. In Section 3.1, we construct a model of group norms and optimal linear incentives in partnerships. In Section 3.2 we develop 3 propositions concerning a group's decision to adopt equal sharing rules. Proposition 1 establishes the conditions under which groups will choose to share revenues equally among partners. Propositions 2 and 3 identify conditions for rejecting the hypothesis that group norms are binding constraints in choosing incentive pay systems.

3.1. Optimal Incentives and Norms in Groups

3.1.1. Model Set-Up

We analyze a setting in which doctors form groups in order to share fixed costs. Some of these costs may be specific to a given specialty (e.g. special purpose equipment or nurses with particular skills) while others are generic to any medical practice. In every case, however, the group shares a common administrative structure that collects revenues from patients and insurance companies.[10] This common accounting system makes it easy and convenient for physicians to share revenues. In what follows we consider the design of optimal sharing arrangements within groups.

Consider a partnership of *n* doctors. Each individual doctor generates revenue according

10 Sharing space and costs are key parts to the American Medical Association's definition of a medical group practice (Havlicek, 1993).

to

(1.) $$\mathrm{R}_i = R(e_i) + \varepsilon_i , \quad \text{with } R(0) = 0,\ R' > 0,\ R'' \le 0$$

where *R*, gross revenue, is concave in e_i, the effort exerted by partner *i*. We capture the random aspect of revenue by ε_i, a mean zero random variable having variance σ^2_ε. For simplicity we assume that all individuals in the partnership are identical and the error term is distributed independently across individuals.[11]

The group allows each partner to keep a fraction, α, of her revenues and puts (1-α) into a common pool that is divided equally among the *remaining* partners.[12] Taking the number of partners in the group to be exogenously determined at *n*, we can write the expected income of individual *i* as

(2.) $$\mathrm{E}(Y_i) = \alpha R(e_i) + (1-\alpha)\frac{\sum_{j \ne i} R(e_j)}{n-1} \quad 0 \le \alpha \le 1 .$$

---

11 Our analysis focuses on groups comprised of physicians who put forward identical amounts of effort for any given level of incentives. This homogeneity assumption is reasonable if work propensities and abilities are observable by others in the group. Given any amount of income sharing, high output partners will end up subsidizing low output partners. Thus the best any physician can do would be to join a group comprised of other, equally productive, individuals (Farrell and Scotchmer, 1988). The assumption of homogeneity within groups is consistent with the data we use in our empirical work. In our data, within-group variation in individual physician characteristics is smaller within than between groups.

12 This specification of the sharing rule may seem artificial. An alternative set-up might be to have all partners put *(1-*$\hat{\alpha}$ *)* into the pool and to then divide the pool among all partners. Formally this rule requires that each partner receives $\hat{\alpha} + (1-\hat{\alpha})/n$ of each dollar of revenue he or she generates. Using α instead of $\hat{\alpha}$ simplifies the set-up so that each partner keeps exactly α of each dollar he or she generates.

We assume that individual doctors derive utility from income and that there is a private cost of effort, $C(e_i)$, which is convex in effort with $C(0)=0$. Preferences for physician *i* are represented by

(3.) $U_i = E(Y_i) - C(e_i) - E[\mathit{Cost\ of\ Incentives}]$.

The expected cost of incentives term, E[*Costs of Incentives*], is central to our analysis. If the marginal cost of incentives were negligible, the group's incentive problems would always be solved by setting $\alpha=1$.

Economic explanations for variation in incentive pay revolve around the costs created by high-powered incentives. In the next three sections we build a unified model that incorporates the three sources of incentive costs discussed in the economics literature: risk aversion, group norms, and multi-tasking. As we shall see, the marginal cost of incentives due to risk aversion and multi-tasking increase with group size. In contrast, the marginal cost of incentives due to group norms falls with group size. These features will ultimately allow us to develop a simple empirical test of the proposition that group norms are irrelevant to incentive design.

3.1.2. Incentive Costs Due to Risk Aversion[13]

Risk aversion makes high powered incentives costly. In this section, we demonstrate that the marginal costs of incentives due to risk aversion are greater in large groups than small groups. The intuition for this result is straightforward. Large groups are more effective in providing income insurance than small groups. The cost of increasing α (in terms of foregone income

---

13 The following model of optimal linear incentives with risk averse partners is adapted from Gaynor and Gertler (1995) and Lang and Gordon (1995). For a more general discussion of optimal linear incentive contracts see Holmstrom and Milgrom (1991) and Milgrom and Roberts (1992) .

insurance) is greater in large groups.

Mean-variance utility functions offer a convenient framework for analyzing incentive costs due to risk aversion.[14] We write individual utility as

(4.) $U_i = E(Y_i) - C - \mathrm{rs}\ _Y^2$

where s_Y^2 is the variance of income and r is 1/2 the coefficient of absolute risk aversion. Thus mean-variance utility provides the simple expression *E(Costs of Incentives)* = $\mathrm{r}\,\mathrm{s}_Y^2$. The cost of incentives is the variance in income created by the incentives. Hence, to derive the marginal costs of incentive pay, we must analyze the relationship between the incentive parameter, a, and s_Y^2.

For partner *i*, the variance of income is $\mathrm{s}_{Y_i}^2 = E(Y_i - E(Y_i))^2$. Since the error terms are independent and the partners put forth identical levels of effort in response to a, the variance of income reduces to:

$$(5.)\ \mathrm{s}_{Y_i}^2 = E\left\{\mathrm{ae}_i + (1-\mathrm{a})\frac{\sum_{j\neq i}^{n-1}\mathrm{e}_j}{n-1}\right\}^2 = \mathrm{s}_{\mathrm{e}}^2\Lambda \quad \text{with } \Lambda \equiv \left[\mathrm{a}^2 + \frac{(1-\mathrm{a})^2}{n-1}\right].$$

The preceding discussion establishes that when doctors share income ($\mathrm{a} < 1$), the variance of income is influenced by the intensity of incentives, a, and the size of the group, *n*. Taking the derivative of $\mathrm{s}_{Y_i}^2$ with respect to a we can derive the expected marginal cost of incentives due to risk aversion:

---

14 While mean-variance utility is a somewhat restrictive specification, it is more general than commonly thought (Meyer, 1987).

(6.) $$\rho \frac{d\sigma^2_{y_i}}{d\alpha} = \rho\sigma^2_e \Lambda_\alpha \geq 0 \quad \text{with} \quad \Lambda_\alpha \equiv 2\left(\alpha - \frac{1-\alpha}{n-1}\right).$$

Two features of this equation are worth noting. First, the marginal cost of incentives is non-negative because groups will never set $\alpha < 1/n$.[15] Second, so long as $\alpha <1$, the marginal cost of incentives is influenced by the size of the group as well as its pay policies.

The relationship between the variance of income, incentive pay and group size is illustrated in Figure 1. When physcians share income ($\alpha <1$), large firms provide more income insurance than small firms because risk is spread over a larger number of physicians. This size related difference in σ^2_Y narrows as incentives increase. At $\alpha=1$, physicians bear all their own risk, so the variability of income is identical across all group sizes.

The slope of the curves in Figure 1 describe the marginal cost of incentives due to increased income variation. It is clear from the picture that the higher levels of income insurance possible in large groups (or equivalently, the lower levels of $\sigma^2_{Y_i}$) increase the marginal cost α.[16]

3.1.3. Incentive Costs Due To Income Norms.

If individuals care about relative income, then the income differentials resulting from high

---

15 Should α be less than $1/n$, each doctor gets a larger portion of her income from *others* in the group than from her own efforts. In a two partner group, $\alpha = 1/3$, means that partner A expects to get 2/3 of her income from partner B and 1/3 from her own efforts. Utility maximizing groups will not choose $0 \leq \alpha < 1/n$ because for any such α there exists an $\alpha >1/n$ offers the same level of income variation with higher levels of work incentives.

16 This point is established formally in Appendix A. In this appendix we also show that this result persists even when we relax the assumption that random shocks are i.i.d.

powered incentives can cause tensions within the group. We call these social tensions the cost of incentives due to income norms.

In this section we model the costs of incentives due to income norms. Our analysis parallels that for risk aversion, but we will reach the opposite conclusion. Whereas risk aversion causes the marginal cost of incentives to *increase* with group size, income norms cause the marginal cost of incentives to *decrease* with group size. This difference will later form the basis for our empirical investigation of group norms.

Our model of inter-personal income comparisons follows directly from the behavioral assumptions presented in Section 2. *Reference dependence* specifies that an individual's utility is affected by the comparison of her earnings to others in the reference group. *Loss aversion* requires that the utility gain from earnings above the reference group be more attenuated than utility losses from earnings below the reference group. *Saliency* suggests that partners will constitute each other's reference group.

We can capture these relationships with the following utility function for partner *i* in a group with *n* partners

(7.)

$$U_i = E(Y_i) - C(e_i) - E(Inequity_i), \quad \text{with}$$

$$E(Inequity_i) \equiv E\left(\frac{\left\{ b_1 \sum_{j \neq i} \max(0,\ Y_j - Y_i) \right\} \text{ - } \left\{ b_0 \sum_{j \neq i} \min(0,\ Y_j - Y_i) \right\}}{n-1} \right).$$

Parameters b_1 and b_0 reflect the utility consequences of unequal earnings within the firm. The first expression in braces is the total utility lost to individual i due to others in the reference group having greater earnings. The second term in braces is the utility gain to i from having earnings greater than others in the reference group. The loss aversion assumption is introduced by specifying that $\beta_1 > \beta_0 \geq 0$. We simplify our exposition (with no loss of generality) by setting $\beta_0 = 0$.

Conditional on partner i's income, expected inequity is :

$$(8.)\quad E[Inequity_i|Y_i] = \frac{\beta_1}{n-1}\sum_{j\neq i}\int_{Y_i}^{\infty}(Y_j - Y_i)f(Y_j)dY_j$$

where $Y_j - Y_i = [\alpha - \frac{1-\alpha}{n-1}][(R(e_j)+\varepsilon_j) - (R(e_i)+\varepsilon_i)]$.

Assuming that the error terms are i.i.d, it is straightforward to re-express equation (8) as:

$$(9.)\quad E[Inequity_i|\varepsilon_i] = \frac{\beta_1}{n-1}\sum_{j\neq i}\left[\alpha - \frac{1-\alpha}{n-1}\right]\int_{\varepsilon_i}^{\infty}((\varepsilon_j - \varepsilon_i + R(e_j) - R(e_i))f(\varepsilon_j)d\varepsilon_j$$

for $\alpha \geq 1/n$.[17] Integrating over ε_i, $E[Inequity]$ is

$$(10.)\quad E(Inequity_i) = \beta_1 A\theta + \frac{\beta_1 A}{2}\left(\frac{\sum_{j\neq i}R(e_j)}{n-1} - R(e_i)\right)$$

---

17 Groups will not choose $0 \leq \alpha < 1/n$ because for any value of α in this range there exists an α ‡ 1/n which achieves the same level of income inequity with higher incentives.

where $A \equiv \left[\alpha - \frac{1-\alpha}{n-1}\right]$ and $\theta \equiv \int_{-\infty}^{\infty}\int_{\varepsilon_i}^{\infty}(\varepsilon_j - \varepsilon_i) f(\varepsilon_j) d\varepsilon_j f(\varepsilon_i) d\varepsilon_i > 0.$

Note that $A \geq 0$ with the equality holding only when firms adopt the equal sharing rule $\alpha = 1/n$. The expression $A\theta$ represents the expected earnings differential between partners *i* and *j* due to differences in *random* shocks. The parameter β_1 captures the degree of social tension resulting from interpersonal income comparisons.

Figure 2 is a graphical representation of the relationship between expected inequity, incentive pay and group size. For any group size, expected income differentials increase with α. When physician's share income (α <1), however, big groups have higher levels of expected inequity than small groups. This difference narrows and eventually disappears as α approaches 1.

The differences across group size in Figure 2 are easy to explain. Doctor *i* compares herself to other doctors in the group who are more fortunate then her. A more fortunate doctor gets to keep α of his good luck and shares $(1-\alpha)/(n-1)$ with doctor *i*. It follows from this that so long as α <1, relative earnings differentials will, ceteris paribus, be greater in larger groups.

The relationship between *E(Inequity)* and group size depicted in Figure 2 is the opposite of the relationship between risk aversion and group size depicted in Figure 1. Large groups are better at providing income insurance than small groups and the marginal cost of incentives due to risk are, therefore, greater in large groups. Small groups are better at equalizing incomes than large groups. Thus the marginal cost of incentives due to income inequality (represented by the slopes of the curves in Figure 2), are greater in *small* groups.

3.1.4. Effort Norms and Mutual Monitoring.

Effort norms, in contrast to income norms, do not create incentive costs. Effort norms are central to the incentive design problem, however, because the severity of the free-riding created by low powered incentives ($\alpha<1$) is determined by the ability of the group to enforce effort norms.

In this section we model the interpersonal effort comparisons that support effort norms. We have in mind a setting where it is more efficient for the group to resolve its incentive problems through a combination of incentive pay and peer pressure rather than through legally binding contracts or the threat to dismiss group members who work below the group norm. This presumption is not unreasonable. In many instances work effort is non-contractible because it is assessed in subjective ways that are difficult to record and difficult for a third party to verify. Even if effort were contractible, dismissing employees who work below the group norm may not be desirable if dismissal or subsequent hiring entails substantial costs.

Our analysis of effort norms parallels the analysis of income norms. We begin by modifying the utility function to accommodate the behavioral assumptions of reference dependence, loss aversion and saliency in work effort. We specify the cost of effort for the ith partner to be [18]:

(11.)Cost of Effort: $C(e_i) + \gamma(\sum_{j\neq i} \frac{e_j}{n-1} - e_i)$, with $\gamma > 0$.

---

[18] This representation of effort norms is adapted from Kandel and Lazear (1992). Our model differs from theirs, however, in two respects: (1) we consider the interaction of income and effort norms; and (2) we derive optimal incentive pay rather than assuming equal sharing ($\alpha=1/n$) prevails.

In this expression, reference dependence appears because the disutility of effort depends on relative as well as absolute effort levels. Ceteris paribus, increases in the effort level of the comparison group increases the cost of effort to an individual. The loss aversion assumption is satisfied because the marginal utility gain from having effort below the group norm is less than the marginal utility lost from having effort above the group norm. Saliency is satisfied because group members constitute a part of each other's reference group.

The parameter γ is a positive constant indicating the size of the penalty that sub-norm performers receive. The larger is γ, the greater is the penalty for working below norm. In this model, we interpret γ as representing the subjective feelings of shame or guilt at doing less than one's "fair share" as well as the informal (and costless) monitoring and sanctions among group members that constitutes peer pressure.

3.1.5. The Marginal Benefit of Incentives

The marginal benefits of incentives derive from the increased levels of effort and attention they elicit from physicians in the group. We analyze the benefits of incentives effects by writing the utility of physician *i* as :

$$
\begin{aligned}
U_i &= \alpha R(e_i) + (1-\alpha)\sum_{j\neq i}\frac{R(e_j)}{n-1} - C(e_i) - \\
&\rho\Lambda\sigma_{\varepsilon}^{2} - \beta_1 A\left[\theta + \frac{R(e_j)-R(e_i)}{2}\right] - \gamma\left(\sum_{j\neq i}\frac{e_j}{n-1} - e_i\right)
\end{aligned}
\tag{12.}
$$

where the last three expressions describe the effects that risk aversion, income norms and effort norms (or equivalently, mutual monitoring) have on utility. The effort supply function, e= $\hat{e}(\alpha\ \rho,\ \beta_{1,}\ \gamma,\ n)$, consists of those effort levels that satisfy the following first-order condition:

$$(13.)\ \frac{dEU_i}{de_i} = (R' - C') - (1-\alpha)R' + \frac{\beta_1}{2}AR' + \gamma = 0.$$

Equation (13) is important for analyzing the effect of income norms on effort. When $\alpha = 1/n$, all partners share equally in the revenues of the group ($A = 0$). In this case income differentials have no effect on effort supply because the pay system doesn't generate any differentials. Things are different when $\alpha > 1/n$. In this case higher expected income differentials enhance work effort by creating returns to *relative* effort. So long as $\alpha > 1/n$, random events will sometimes cause partner *i* to earn less than partner *j*. Partner *i* can reduce the expected disutility from this eventuality by working harder than partner *j*. These gains from relative effort are, of course, dissipated in equilibrium because every partner supplies identical effort. The result is a kind of "rat race" that calls forth more effort from all partners. This "rat race" in effort becomes more important the larger are the expected income differentials in the group.[19]

In Figure 2 we demonstrated that for any given level of $\alpha < 1$, income differentials are greater in large groups than small groups. In light of equation (13), this means that, ceteris paribus, "rat race" incentives are more intense in large groups. This, in turn, means that the marginal benefit of heightened incentive pay is reduced in large groups. To see this point differentiate (13) with respect to α

$$(14.)\ \frac{de_i}{d\alpha} = \frac{-R'\left[1 + \frac{\beta_1}{2}A_\alpha\right]}{\alpha R'' - C'' + \frac{\beta_1}{2}AR''} > 0.$$

---

19 For a general discussion of the externalities and distortions created by relative income comparisons see Frank (1985).

We know from Figure 2 that A_α, A_n>0 and that $A_{\alpha n}$ <0. It follows that $\frac{d^2 e_j}{d\alpha\, dn} < 0$. "Rat race" effects resulting from income comparisons cause the marginal benefit of incentive pay to *decline* as group size *increases*.

3.1.6. Optimal Incentives in Groups

In equilibrium all partners supply the same level of effort. Thus the level of α that maximizes the utility of a representative partner solves:[20]

$$\max_{\alpha} \; U = R(e) - C(e) - \rho\,\Lambda\sigma_{\varepsilon}^{2} - \beta_1 A\theta$$

(15.)

$$\text{s.t. } e = \hat{e}(\alpha, \rho, \beta_1, \gamma, n) ;$$

The organizational design problem presented in (15) has a straightforward economic interpretation. Groups select the value of α that balances the net marginal benefit from additional effort against the marginal costs due to heightened variation of income and increased intra-group income differentials. We have demonstrated that the marginal cost of incentives due to risk aversion *increases* with group size while the marginal incentive cost due to income norms *declines* with group size. We have also demonstrated interpersonal income comparisons cause the marginal benefits of incentives to *decline* with group size. This last feature causes the solution to (15) to yield ambiguous, comparative static results. However, intra-group income

---

20 The following three assumptions ensure that the second order conditions hold: $R'' - C'' < 0$; U is concave in α; and $\alpha R'' - C'' + \frac{\beta_1}{2}\left[\alpha - \frac{(1-\alpha)}{n-1}\right] R'' < 0$

differentials disappear when groups set $\alpha = 1/n$. We can, therefore sharpen the empirical predictions of our analysis by focusing attention on the group's decision to adopt equal sharing rules. This is the subject of the next section.

3.2. The Decision To Adopt Equal Sharing Rules

In the previous section, we analyzed the group's optimal incentive design problem when the group has risk averse members and group income and effort norms. In this section, we focus on a subset of the incentive design problem, i.e. the decision whether or not to adopt equal sharing rules. This problem is analytically more tractable than the one analyzed in 3.1. It also has considerable empirical relevance for, as we shall see in Section 4, a substantial proportion of medical groups decide to adopt equal sharing rules.

Our analysis centers around β_1, the parameter, that reflects the degree of social tension arising from intra-group differences in pay and effort. We define the *equity boundary* of the group (Γ) as the minimum value of β_1 for which the group is best off with an equal sharing rule. The equity boundary is determined by both income norms and effort norms. If the social tension resulting from pay comparisons are above a certain threshold ($\beta_1 > \Gamma$), the partnership is best served by eradicating all pay inequities by setting $\alpha = 1/n$. If, group effort norms, are sufficiently stringent ($\gamma = \gamma^*$), a group can achieve first-best effort levels at $\alpha = 1/n$ even when the value of β_1 is zero.[21]

---

[21] Group norms can cause partners to supply more than first-best effort levels if $\gamma > \gamma^*$. Since, in this case, groups elicit too much effort, optimal incentives require $\alpha < 1/n$. It is hard to find real world settings where $\alpha < 1/n$. For this reason we restrict our discussion to cases where $\gamma \leq \gamma^*$. All of our theoretical results hold if we allow γ to be greater, less than or equal to γ^*.

In this section we establish two propositions about the equity boundary of the group that are the basis for the subsequent empirical investigation.

Proposition 1: The Equity Boundary Characterizes Conditions For Adopting Equal Sharing Rules
A group sets $a = 1/n$ if and only if $b_1 \geq \Gamma$. Γ is the equity boundary of the group. Formally, Γ is defined as:

$$\Gamma \equiv \begin{cases} \infty & \text{if } \left(q - \frac{1}{2}\Pi_0'\right) \leq 0 \\ b^* & \text{if } \left(q - \frac{1}{2}\Pi_0'\right) > 0 \end{cases}$$

where $g^* \equiv \frac{n-1}{n} R'$, $b^* \equiv \frac{\frac{n-1}{n}\Pi_0}{\left(q - \frac{1}{2}\Pi_0'\right)}$, and $\Pi_0' \equiv \frac{-(R' - C')R'}{\frac{1}{n}R'' - C''} > 0$. [22]
The function b^* describes that part of the equity boundary where equal sharing is possible. It has two segments:
(1) $b^* = 0$ and $\hat{e} = e^*$ for $g = g^*$ [group norms sustain first-best effort at $a = 1/n$]

(2) $b^* > 0$ and $\hat{e} < e^*$ for $g < g^*$ [group norms don’t sustain first best effort at $a = 1/n$]

Proposition 2: Group Size, Group Norms and Equal Sharing Rules
Income and effort norms make small groups more likely to adopt equal sharing rules than large groups. Put more formally, group norms make small groups more likely to have $b_1 \geq \Gamma$ than large groups.

3.2.1. Discussion of Proposition 1: When To Adopt Equal Sharing Rules

Groups choose equal sharing rules because: (1) work norms are sufficient to induce first-best effort levels regardless of pay arrangements; or (2) work norms don’t produce first-best effort levels, but the costs of the social tensions resulting from income comparisons exceed the marginal benefits of additional incentives. Proposition 1 covers both these cases.

---

22 The expressions γ^*, b^*, and Π_0' are evaluated at the effort level sustainable under the equal sharing rule, i.e. the value of e that solves $\frac{1}{n}R'(e) - C'(e) + g = 0$.

We use the function γ^* to indicate the minimum group effort norm (γ) sufficient to achieve first-best effort levels when $\alpha = 1/n$. From (13) we know that under equal sharing rules partners choose an effort level, $\hat{e}$, satisfying:

$$(16.)\quad R' - C' - (1 - \frac{1}{n})R' + \gamma = 0 .$$

At first-best effort levels $R' - C' = 0$. Thus we can rewrite (16)

$$(17.)\quad R' - C' = \frac{n-1}{n} R' - \gamma = \gamma^* - \gamma$$

It follows, by concavity, that $\hat{e} \le e^*$ for $\gamma \le \gamma^*$. Equation (17) also implies that $\frac{d\gamma^*}{dn} > 0$. The intuition behind this result is straightforward. The larger the group, the weaker are the incentives under equal sharing rules. In order to achieve first-best effort under equal sharing, larger groups will need more stringently enforced work norms, i.e. an environment with greater peer pressure.

We now turn our attention to the case where work norms are insufficient to ensure first-best effort. In this case, groups will choose equal sharing when the marginal benefit of increasing incentives at $\alpha = 1/n$ is less than or equal to the marginal cost of heightened incentives. Formally β^* is the smallest value of β_1 for which

$$(18.)\quad \frac{d(EU_i \mid \alpha = \frac{1}{n})}{d\alpha} = \left(R' - C'\right)\frac{de}{d\alpha} - \beta_1 \theta A_\alpha \le 0 \quad \text{where} \quad A_\alpha \equiv \frac{n}{n-1}.$$

The first expression on the left hand side of the inequality is the marginal net benefit of incentives. The second expression is the marginal costs due to increased inequity. Using (14) and setting α

$=1/n$ we find that:

$$(19.)\quad \frac{de}{d\mathrm{a}} = \frac{-R'\left[1+\tfrac{1}{2}A_{\mathrm{a}}\mathrm{b}_1\right]}{\tfrac{1}{n}R''-C''} > 0 .$$

Substituting (19) into inequality (18) we write

$$(20.)\quad \frac{d(EU_j \mid \mathrm{a} = \tfrac{1}{n})}{d\mathrm{a}} = \Pi_0' - \mathrm{b}_1 A_{\mathrm{a}}\left[\mathrm{q} - \frac{\Pi_0'}{2}\right] \le 0 \text{ where } \Pi_0' \equiv \frac{-(R'-C')R'}{\tfrac{1}{n}R''-C''} \text{ as in Proposition 1.}$$

Intuitively, the function Π_0' describes what the marginal effect of increased incentives would be in the absence of income norms (at $\mathrm{a}=1/n$). Since we are considering the case where effort norms are insufficient to sustain first-best effort under equal sharing, $\Pi_0'>0$. The second expression captures the marginal effect of incentives due to the presence of income norms. Given that $\Pi_0'>0$, a necessary condition for inequality (20) to hold is $\mathrm{q} - \tfrac{1}{2}\Pi_0'>0$.

The function b^* is comprised of the values of b_1 for which the expression in (20) holds with equality. Thus

$$(21.)\quad \mathrm{b}^* = \frac{\Pi_0'}{\left(\mathrm{q} - \tfrac{1}{2}\Pi_0'\right)A_{\mathrm{a}}} .$$

If the denominator in (21) is positive, groups with $\mathrm{b}_1 > \mathrm{b}^*$ groups will choose equal sharing even if their work norms can't sustain first-best incentives. It is also easy to show that $d\mathrm{b}^*/dn>0$. This means that level of social tension required to sustain equal sharing rules increases with group size.

In contrast, if the denominator in (21) is negative, groups with weak work norms will *never* adopt equal sharing rules. In this case, we describe the equity boundary of the group as $\Gamma=\infty$.

3.2.2. Discussion of Proposition 2: Group Size and the Equity Boundary.

The probability that a group is on the equity boundary is determined by the distribution of parameter values across groups. The parameters of interest describe: income norms (β_1), effort norms (γ), and stochastic features of the revenue stream (θ). Represent the cumulative distribution of income norm, effort norm, and stochastic feature parameters by $F(\beta_1)$, $G(\gamma)$, and $H(\theta)$ respectively. Assume, further, that the three distributions are independent. The probability that a group exhibits equal sharing is:

(22.) $\text{Prob}(\beta_1 \geq \Gamma) = [1-H(\tfrac{1}{2}\Pi'_0)][[1-F(\beta^*)]$

Taking derivatives with respect to group size yields.

$$(23.)\quad \frac{d\text{Prob}(\beta_1 \geq \Gamma)}{dn} = [1-\text{H}(\tfrac{1}{2}\Pi'_0)]\left[-f(\beta^*)\frac{d\beta^*}{dn}\right] - \frac{h}{2}\frac{d\Pi'_0}{dn}[1-F(\beta^*)] < 0$$

Thus small groups are more likely to set $\alpha = 1/n$ than large groups. These results would only be strengthened if we assumed a joint distribution in which γ and β_1 were positively associated.

3.2.3. Extending Proposition 2 To Include Multi-Tasking

We have so far analyzed a setting with risk aversion and group norms. In this section we introduce multi-task considerations into the framework presented in the previous section.

Let the expected gross profit of the firm be determined by the sum of expected revenues brought in, $R(e_i)$, and the expected change in the group's reputational capital, V. We assume that V is a function of the actions taken by individual partners. We represent this action by v_i

(24.) $V = V(v_i),\ V' > 0$ and $V'' < 0$.

For concreteness, let us suppose that *e* refers to the action of seeing a patient in his office and ν refers to making oneself available to consult with other physicians in the group about their cases. These consultations, by increasing the overall quality of care provided by the group, also improve the group's reputation.

Reputational capital is hard to measure. So too are the sorts of formal and informal consultations physicians undertake in the course of their work day. For this reason, we stipulate that ν is observable but noncontractable. Making oneself available for consultation is costly in so far as it takes time and energy away from activities that directly generate revenue, e_i. We capture this opportunity cost in the following cost of effort function:[23]

(25.) Cost of Effort $\equiv C(e,v)$, $\qquad C_e, C_v,\ and\ C_{ev} > 0.\ C_{vv} = 0.$

Notice that we modify our notation here to distinguish inputs to the cost of effort function. We now write the derivative of cost with respect to *e* as C_e, the cross partial derivative with respect to *e* and *v* as C_{ev}, and the second derivatives of cost with respect to *v* and *e* are C_{vv} and C_{ee}.

Introducing multi-tasking requires us to modify the expression describing each individual's utility

---

23 The positive cross partial derivative, C_{ev}, is necessary so office visits, *e*, and consultations, *v*, are substitute activities. The assumption that $C_{vv} = 0$ is made for convenience.

$$
\begin{aligned}
(26.)\quad U_i = {} & \alpha R(e_i) + (1-\alpha)\sum_{j\neq i}\frac{R(e_j)}{n-1} + \frac{V(\nu_i) + \sum_{j\neq i} V(v_j)}{n} - C(e_i,\nu_i) \\
& - \beta\Lambda - \beta_1 A\left[\theta + \frac{(R(e_j) - R(e_i))}{2}\right] - \gamma_e\left(\sum_{j\neq i}\frac{e_j}{n-1} - e_i\right) - \gamma_\nu\left(\sum_{j\neq i}\frac{\nu_j}{n-1} - \nu_i\right)
\end{aligned}
$$

where γ_e and γ_v are the effort norms applying respectively to the two types of tasks, e and ν.

In this multi-task framework, task e will be supplied so that the following first-order condition holds:

$$
(27.)\quad \frac{dU_i}{de_i} = \left(R' - C_e\right) - \left(1-\alpha\right)R' + \frac{\beta_1}{2}AR' + \gamma_e = 0.
$$

The value of reputational capital accrues equally to all partners. Since no incentive payments are possible, physicians will provide v such that

$$
(28.)\quad \frac{dU_i}{d\nu_i} = \frac{V'}{n} - C_v + \gamma_\nu = 0.
$$

Notice that e (office visits) and ν (availability for consultation) are simultaneously determined because an increase in one also increases the marginal cost of the other ($C_{e\nu}$ >0).

The problem for the partnership is to choose a level of α that maximizes the expected utility of a representative partner

$$
\begin{aligned}
(29.)\quad & \max_{\alpha}\; EU = R(e) + V(\nu) - C(e,\nu) - \beta\Lambda - \beta_1 A\theta \\
& \text{s.t. } e = \hat{e}(\alpha,\rho,\beta_1,\gamma_e,\gamma_\nu,n) \text{ and } \nu = \hat{\nu}(\alpha,\rho,\beta_1,\gamma_e,\gamma_\nu,n).
\end{aligned}
$$

Groups increase incentive pay up until the point where expected marginal benefits equal expected marginal costs. In a multi-task context, the costs of increasing α must also include the diversion of energy and attention from task v (consultation) to task *e* (seeing ones own patients).

We focus our analysis on the decision whether or not to adopt equal sharing rules. More specifically, at the equity boundary, we can compare the null hypothesis that group norms do not matter ($b_1=g_e=\gamma_v=0$) against the alternative that norms do matter ($b_1>0$ and/or g_e, $\gamma_v>0$). In the appendix to this paper we prove the following proposition:

Proposition 3: Group Size and the Equity Boundary in a Unified Model

> If income and effort norms have no influence on incentive pay, then multi-tasking makes *large* groups more likely to be on the equity boundary (i.e. to adopt equal sharing rules) than small groups. Thus, if the probability of being on the equity boundary falls as group size increases, we can reject the hypothesis that group norms are irrelevant.

The intuition for this result is straightforward. Under the null hypothesis, a group will be on the equity boundary only if the marginal costs of incentives due to multi-tasking exceed the marginal benefits of incentive pay. Since each individual keeps only 1/nth of the value they generate by action v, the return to an individual from action *v* is inversely related to group size. It follows that the marginal cost of increasing a, i.e. the distortion in the allocation of effort between *e* and *v*, *increases* with group size. The heightened marginal cost of a under multi-tasking will cause large groups to operate with weaker incentives than small groups. In our framework, then, the only way that the probability of being on the equity boundary can *decrease* with size is if there are income or effort norms.

4. The Empirical Relationship Between Group Size and Incentive Pay

In this section we examine the empirical variation in incentive pay across a sample of medical groups. Our analysis addresses three questions. Do group norms matter in the decision to adopt equal sharing rules? If group norms matter, can we distinguish the effects of income and effort norms? If group norms matter, do other factors (notably risk aversion and multi-tasking) matter as well?

Our answer to the first question rests on our finding that large groups are substantially less likely than other groups to adopt equal sharing. It follows from Proposition 3 that we can reject the hypothesis that group norms are *irrelevant* for the determination of incentive pay in medical groups. We address the second question by comparing the work intensity prevailing in groups on the equity boundary with those off the equity boundary. In large groups we find that average work intensity is lower for groups with equal sharing rules. In contrast, work intensity in small groups is not effected by the choice to adopt equal sharing. These results suggest that effort norms are binding constraints in small groups.

The third question concerns the importance of factors other than group norms. Consistent with risk aversion models, we find that individuals with a preference for more stable income flows are more likely to be found in groups with low levels of incentive pay. Consistent with multi-task models, we also find that groups with lots of incentive pay are characterized by less frequent intra-group medical consultations. We conclude that models of group norms *augment* rather than replace more conventional economic explanations.

4.1. Data

The data we use in this study are from a national random sample of group practices collected during the period March-June of 1978. These data are uniquely suited for our purposes because they contain information about key group level characteristics (a measure of incentive pay, group size, characteristics of the group's practice and clientele) as well as survey data from individuals who are members of the group.[24]

Information on incentive pay comes from a question asking each group about the compensation of physicians who had an ownership stake in the practice:

> "Excluding fringe benefits, what percentage of the total amount the group distributes to owner physicians is distributed on the basis of productivity?"[25]

The answers to this question are coded in the variable *Incentive Pay I* with responses ranging from 0 to 100. *Incentive Pay I* differs from the empirical measures of incentives used in other studies in that it describes the incentive *policy* of the group without reference to the ex-post realizations of that policy, individual earnings.

Incentive Pay I does not correspond exactly to the theoretically appropriate incentive parameter, a, because it does not include the incentive effect of revenues that individuals receive

---

24 The surveys were conducted by Mathematica Policy Research. A group was defined as a medical practice having three or more full-time equivalent physicians. Information was collected at the group level by interviewing either the office manager or, if none were available, anyone else who had the necessary information. In addition, individual doctors practicing in the group were surveyed. In no group were more than 11 physicians interviewed. The final sample included 957 groups and 6,353 physicians practicing in those groups. Five medical practice specialties were sampled: general practice, internal medicine, pediatrics, general surgery, and obstetrics/gynecology. Roughly 60 percent of all office-based physicians practiced in these specialties. See Gaynor and Pauly (1990) for more details.

25 The question forces the respondent to allocate *compensation* across four categories: productivity, straight salary, equal shares, and other. The emphasis on the allocation of *compensation* rather than gross revenues to the partnership is important. If the question asked about the allocation of gross revenues, then fixed employment costs (if they rose less rapidly than group size) would reduce the fraction of revenues devoted to incentive pay or any other sort of pay.

after the money is pooled and divided among partners. For this reason we construct a second incentive pay variable, *Incentive Pay II* = *Incentive Pay I* + (100-*Incentive Pay I*) / *Group Size*). The key variable for our purposes, *Equal Sharing*, is a dummy variable equal to 1 when *Incentive Pay II* = 1/*Group Size* and 0 otherwise.

Table 1 presents descriptive statistics for the distribution of the variables *Equal Sharing*, *Incentive Pay I* and *Incentive Pay II* by group size. Information on the size of the group was collected in six categories, each measuring the number of full-time equivalent physicians: 3-5, 6-7, 8-15, 16-24, 24-49 and 50+. [26] At the time of this survey, physicians tended to work in small groups: 46% of the 794 groups in our sample were in groups with 3-5 physicians and only 2.4 % were in groups with 50+ physicians. This last figure is inflated because very large physician groups were over sampled in the original survey.

Column 4 in Table 1 presents the proportion of groups on the equity boundary by group size. Increased group size is associated with a reduced propensity to adopt equal sharing rules. Similarly both the mean and median values of *Incentive Pay I* and *Incentive Pay II* increase with size for all except the 2.4% of groups in the largest size category. In our view, this break in pattern suggests that many of the largest groups are quite different organizations than smaller groups. Specifically, we suspect that the largest groups in our sample are more likely than smaller groups to be associated with research and teaching entities. In academic medicine, high

---

26 In the regressions that follow in Tables 3-5, each group was assigned the mid-point of its size category. The top category was assigned a value of 113.5, a figure derived by assuming that the empirical distribution of the two largest group sizes follows a Pareto distribution. We also experimented with different values (ranging from 60 to 160) and found our basic results were not sensitive to these different assumptions about the mean size in groups with 50+ physicians.

powered incentives linked to such revenue generating activities as seeing patients are likely to be counterproductive.

Figure 3 presents the entire distribution of *Incentive Pay II* by *Group Size*. The size of the circles are proportional to the number of groups in a given size-incentive category. The most striking feature of these scatter plots are the large number of groups operating with equal sharing rules (*Incentive Pay II* = 1/*Group Size*).

4.2. Do Group Norms Matter? Group Size and The Equity Boundary

Table 2 presents probit estimates of the relationship between group size and the probability of being on the equity boundary. The estimates in column (1) regress *Equal Sharing* against dummy variables indicating group size categories and a vector of variables that condition on characteristics of the practice and its clientele. The omitted size category is the smallest size category. Thus the negative sign on the size dummy variable coefficients indicate that larger groups are *less* likely to be on the equity boundary than smaller groups. The magnitude of these effects, however, are not directly interpretable from the probit coefficients. Converting the coefficients to derivatives, we find that increases in group size substantially reduce the probability of being on the equity boundary. Moving from the smallest group size (3-5 physicians) to the next larger (6-7) reduces the probability of being on the equity boundary by 8.5 percentage points. Moving from the smallest group size to the fourth largest (16-24 physicians) reduces the probability of being on the equity boundary by 28.5 percentage points. This is a substantial change given that the probability of being on the equity boundary is 38% for the sample as a whole. The effect of being in the largest group size (50+) is also negative but the magnitude is small. As noted above, this may be due to the presence in this category of groups involved in academic medicine. The small number of groups in this largest size category (19) make it difficult to estimate size effects precisely. The 95% confidence intervals for this coefficient range from -1.30 to 0.57. Thus, while we cannot reject the statement that the true size coefficient for groups greater than 50 is zero we also cannot reject the thesis that the true coefficient is the same as that for groups having 24-49 physicians.

Column (2) repeats the analysis of incentive pay presented in column (1) but replaces group size dummy variables with *Inverse Group Size.* Log-likelihood tests do not reject the restrictions implicit in the use of the inverse of group size variable.[27] The point estimates are also close to those derived from the dummy variable specification. For example, moving from a group with 4 physicians to one with 20 physicians reduces the estimated probability of being on the equity boundary by 32 percentage points.

One possible concern with the analysis presented so far is that we may not be using the appropriate size variable. The theoretical discussion focused on the number of partners while our group size variables measure the total number of physicians in the group. For groups in the bottom five size categories this discrepancy is not likely to pose a substantial problem because a large fraction of the physicians working in a group are owners (in 63.54% of the groups with 3-5 doctors, all physicians had an ownership stake in the group). Things are different in the very large group practices. Here only 25.93% of groups were comprised solely of physicians who were owners/shareholders. As a check on the importance of this measurement error, we re-estimated

---

27 Twice the difference in the log-likelihood between Columns 2 and 1 in Table 2 is 4.93. For a 95% confidence level, critical value of the chi-square distribution with four degrees of freedom is 9.48. We therefore cannot reject the restrictions.

the results in column 2 for groups composed only of physician owners. These estimates are reported in column 3 . Restricting the sample in this way does not alter the relationship between group size and the probability of being on the equity boundary.

An alternative explanation for the results in Table 2 might be that introducing performance incentives requires a fixed expenditure on systems of monitoring individual performance. If these expenditures are substantial, small groups may be unwilling to make the investment. According to this logic, it is the fixed costs of setting up incentive pay systems, rather than group norms, that produces our results. The fixed cost argument has a compelling economic logic, but it may not apply in our empirical setting. In most medical groups, all that would be needed to set up an incentive system would be information about physician billings and/or patient visits. This information must be collected by all groups in order to obtain reimbursement from insurers. Any group employing a manager should therefore be able to generate the information required for incentive pay systems at little extra cost. To investigate the importance of fixed costs, we re-estimated our incentive equation looking only at groups having full-time managers. The results are presented in Column 4 of Table 2. Here again, we observe from the positive coefficient on the *Inverse Group Size* variable that the probability of being on the equity boundary falls as size increases.

The results presented in Table 2 might also reflect the importance of joint production between physicians in a practice. Consider a hypothetical practice composed of two hand surgeons and an anesthesiologist. If these three doctors perform their surgeries together, then an equal sharing rule might only reflect the fact that it is impossible to attribute revenues to any single individual. We can investigate the importance of joint production by restricting attention to specialties where revenues are generated by individual physicians seeing patients individually in their offices. For this reason we re-estimated equation 2 for the groups composed entirely of general practitioners, internists and/or pediatricians--specialties for which joint production is unlikely to be important. These estimates, presented in column 5, reveal the same negative relationship between size and the probability of equal sharing rules observed in column 2.

Our discussion so far assumes that groups choose a and that individuals then choose their optimal effort levels. An alternative incentive instrument would be to require that individuals, on average, achieve a certain level of performance as a condition of employment. We can investigate the importance of productivity guidelines for our key results using data collected from our survey of group practices. Groups were asked to respond to the following yes/no question

> "Does the group have a formal policy or explicit guidelines on expected productivity for physicians?"

Roughly 17% of groups reported having productivity guidelines.

Column 6 of Table 2 presents estimates of incentive equations for groups without productivity guidelines. For these groups there is the same strong negative relationship between size and equal sharing that we observed in earlier estimates. In unpublished estimates for groups having productivity guidelines, however, *Inverse Group Size* does not have a significant effect on the probability of being on the equity boundary. This pattern is what we would expect if productivity guidelines are substituting for incentive pay. It is worth noting, however, that this result might also be due to the fact that only 123 groups had productivity guidelines.

In our theoretical analysis, groups were composed of physicians with identical work propensities. We also assumed away cross-group differences in risk aversion and the stochastic determinants of revenues (although we relax this last assumption in Appendix A). In the real world, however, these intra-group and cross-group sources of variation are likely to matter in the design of optimal incentive systems. If, for example, large groups are composed of physicians with heterogeneous work propensities, they may prefer high powered incentives as a means of reducing the transfer of income from high earners to low earners. Similarly, large groups might be able to function with higher powered incentives because the variance of demand for their services is smaller than for other groups.

We examine these possibilities in column 7 of Table 2. We assess risk aversion by taking the group's average response to a question asking about the importance of regular income (*Importance of Regularity of Income*). [28] We use the within-group standard deviation of hours worked (*Within Group Variation in Office Hours*) and office visits (*Within Group Variation in Office Visits)* in the previous week to capture within group heterogeneity and across group differences in the variance of random shocks.[29] The coefficient on our measure of risk aversion was positive and statistically significant. This indicates that groups having more risk averse physicians are more likely to be on the equity boundary than other groups. The *Within Group*

---

28 The wording of the question was "Listed below are some factors that physicians might consider when choosing a new practice. Please check in the columns below how important each of the factors....is to you." The factor measuring risk aversion is "Regularity of income (lack of fluctuation)". Responses are coded in a four point scale with 1= of little or no importance and 4 = very important.

29 We constructed *Within Group Variation in Office Hours* in two steps. First we estimated an office hours equation in which the dependent variable was the number of office hours a physician reported working the previous week. The right-hand side variable was a dummy for each group. In the second step we calculated the standard deviation of the within group residual of this hours equation. *Within Group Variation in Office Visits* was constructed similarly to *Within Group Variation in Office Hours* except that the dependant variable in the first step was the average number of patients the physicians saw in their office in the previous week.

Variation in Hours variable had no statistically significant effect on the probability of being on the equity boundary. In contrast, *Within Group Variation in Office Visits* had a negative and statistically significant relationship to *Equal Sharing*. More importantly, introducing these variables did not much alter the coefficient on *Inverse Group Size*. We conclude that the results in Table 2 are not likely to be the result of within group heterogeneity of work propensities or between group differences in risk aversion.

The results in Table 2 cannot be explained by models in which *only* risk aversion or multi-tasking considerations determine incentive pay. The results, however, do suggest that risk aversion plays some role in shaping incentive pay. If risk aversion matters, then for any given group size, groups off the equity boundary should be comprised of physicians with a greater tolerance for income variation. This is consistent with the positive, statistically significant coefficient on *Importance of Regularity of Income* that we report in column 7 of Table 2.

4.3. Do Effort Norms Matter? Work Intensity On and Off The Equity Boundary

Earlier we observed that two types of groups adopt equal sharing rules. The first type has such effective work norms that it can achieve first-best effort at $a = 1/n$. In terms of our formal model, these groups were on the part of the equity boundary where effort norms were the binding constraint ($\Gamma=0$). The second type of group with equal sharing rules opts for minimal incentive pay even though its effort norms *cannot* sustain first-best effort. These groups are found on the segment of the equity boundary where income norms may also bind ($\Gamma=\beta^*>0$).

Our data do not allow us to directly observe which type of group is choosing equal sharing rules. We can make indirect inferences, however, by examining the relationship between incentive pay policies and the productive efficiency of group members. Groups operating on the first segment of the equity boundary have first-best effort levels and should, ceteris paribus, exhibit the same (or superior) effort levels as groups operating with more incentive pay. Groups on the second segment of the equity boundary look different. These groups will operate with less intense incentives than other groups and have lower effort levels.

As discussed above, the Mathematica survey asked individual physicians to report the number of office visits and office hours they worked in the week prior to the survey. We use the number of office visits relative to office hours as a measure of the work intensity prevailing in the group at the time of the survey. Specifically, we regress *Log of Office Visits* against *Log of Office Hours*, *Equal Sharing* and a set of variables that capture other relevant characteristics of the group and its clientele. The results are presented in Table 3.

We focus our discussion of Table 3 on the key variable, *Equal Sharing*. In interpreting the coefficient on *Equal Sharing*, it is important to note that it is the result of both incentive effects and selection effects. Groups with more incentive pay or more stringent work norms will, by virtue of these features, elicit higher levels of work intensity from their members than other groups. These same groups will, however, tend to attract physicians better able to tolerate high levels of work intensity. Both incentive and selection effects operate in our model, but in ways subtly different than in other settings. Lazear (1986) argues that individuals with a low marginal cost of effort will be drawn to firms offering piece rates. In our setup, individuals for whom high effort is not very costly will be drawn to groups with lots of incentive pay *or* to groups with little incentive pay but stringent work norms.

The coefficient on *Equal Sharing* in column 1 is -0.076. Thus, all else equal, being on the equity boundary reduces the number of office visits per office hour by 7.6 log points. Column

2 of Table 3 interacts *Equal Sharing* with *Inverse Group Size*. While *Equal Sharing* and the interaction between *Equal Sharing* and *Inverse Group Size* are jointly significant, the positive coefficient on the latter variable suggests that the productivity differential between groups on and off the equity boundary grows with group size. For the smallest groups, i.e. those with 3-5 physicians, there is no difference between groups who adopt equal sharing rules and those who don't. In larger groups, however, a sizable difference exists.

The effect of group size on the productivity loss from choosing equal sharing rules is most clearly presented in columns 3 and 4 of Table 3. Column 3 estimates the office visit equation for groups in the smallest size category. The coefficient in *Equal Sharing* is negative, but small and statistically insignificant. In contrast, the coefficient on *Equal Sharing* for larger groups is negative and quite substantial. The adoption of equal sharing rules for groups with 6 or more members is associated with a drop in the number of patient visits per office hour of 15.7 log points. Similar results are found if we substitute *Incentive Pay II* for the *Equal Sharing* variable (see columns 5 and 6).

We infer from the results in Table 3 that groups in the smallest size category who adopt equal sharing rules are on the first segment of the equity boundary. This means that in small groups, effort norms are capable of sustaining first-best effort levels under equal shring rules. Groups in larger size categories pay a productivity price for choosing equal sharing rules. In terms of our theoretical framework, this means that larger groups with $a=1/n$ are on the segment of the equity boundary where income norms may bind. We find additional support for our interpretation of Table 3 from data on the distribution of productivity guidelines across groups. Large groups with equal sharing rules are more than twice as likely to adopt productivity guidelines as other groups. This pattern suggests that larger groups on the equity boundary are trying to find alternatives to costly incentive pay an ineffective group norms. [30]

It is interesting to speculate why small groups with $a=1/n$ can sustain first-best effort levels while larger groups cannot. The explanation we emphasized in our theoretical analysis is perhaps the simplest. When $a=1/n$, incentive intensity falls as group size increases. Thus less stringent effort norms are required to sustain first-best work effort in smaller groups. An alternative explanation is suggested by our *saliency* assumption. It may be that the psychological sanctions for violating group effort norms (guilt, shame, etc.) are more keen in smaller groups.[31] Untangling these competing explanations would require data that is not currently available.[32]

4.4. The Costs of Incentives

Our analysis of optimal incentive design assumes that incentive pay is costly. In this section we investigate the empirical relationship between our measure of incentive pay practices and plausible indicators of the costs of incentives.

4.4.1. Random Shocks, Incentives, and Income Differentials

In this section we analyze incentive costs that arise from stochastic features of the revenue generating process. Random shocks will cause physician income in any period to deviate from its

---

30 For groups in the smallest size category, 12.6 % of those with equal sharing rules and 13.7% with more high powered incentives adopted productivity guidelines. For bigger groups, the analogous figures are 31% and 13.3%.

31 In terms of our theoretical framework, this would suggest that γ increases as group size falls.

32 The relationship between team size and effort is different in the medical group context than in conventional settings. In conventional models, increasing the number of agents reduces the ability of the principal to monitor. In the partnership setting, adding an additional owner physician increases the number of principals and agents by an equal amount.

mean. This is obviously costly to risk averse individuals. These shocks will also cause an individual's income to deviate from others in the group. Depending on an individual's position in the income hierarchy, this can be costly to individuals having income norms.

If random shocks matter for revenue generation, it is reasonable to expect that groups with more incentive pay have larger intra-group income differentials at any moment in time. In our framework, the empirical relationship between incentive pay and σ_g depends on what is causing groups to vary the incentive pay parameter, α. If α varies due to cross group differences in the variance of the random shock term, σ^2_ε, then our model could generate either a positive or negative relationship between α and intra-group income differentials. If cross group differences in σ^2_ε are relatively unimportant, then increases in incentive pay should increase intra-group income variation. We examine the relationship between incentive pay and income differentials in Table 4.

The dependent variable in Table 4 is *Within Group Income Variation,* σ_g. We construct this variable in two steps. First, we estimate the following earnings equation

(30.) $\textit{Earnings From Group}_{ig} = aX_i + bG_g + \mu_{ig}$,

where X_i is a vector of individual characteristics for physician *i*, G is a vector of dummy variables indicating membership in group *g*, and μ_{ig} is a mean zero error term for individual *i* in group *g* . [33] Second, we calculate within-group variation in earned income . For group *g*, the standard

---

33 We use income levels rather than logs because, for our sample of physicians, income appears to follow a normal rather than a log-normal distribution. The individual level variables used in our first-stage regression were: *years in group, years since graduation,* and 4 specialty dummies indicating whether respondent was an internist, pediatrician, obstetrician/gynecologist, or general practitioner. The omitted group was a small number of internist specialties not otherwise classified, e.g. allergists.

deviation of within group income is

$$(31.)\ s_g = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}(m_{ig})^2}\ .$$

An important feature of s_g is that it is independent of the average level of income in the group.

The equation presented in column 1 of Table 4 analyzes the determinants of s_g. The positive and significant coefficient on *Incentive Pay II* means that groups with more incentive pay also have greater intra-group income variation. In a group with 4 physicians, moving from equal sharing to full incentives increases the standard deviation of within group income by $3,254.40. By way of comparison, the within group standard deviation of income for groups in this size category is $11302.5

In column 2 we re-estimate the equation in column 1 by interacting the incentive pay and group size variables. The large negative coefficient on *Inverse of Group* Size and the smaller positive coefficient on its interaction with *Incentive Pay II* means that: (1) large groups have greater income differentials than small groups and (2) the marginal effect of incentive pay on intra-group income inequality is greater in small groups than in large ones. This result is consistent with our theoretical setting, depicted in Figure 2, in which cross group differences in s_ε are assumed to be unimportant.

4.4.2. Multi-tasking

In this section, we consider whether multi-tasking considerations might also play a role in determining incentive intensity. Specifically we look for evidence that physicians in groups with lots of incentive pay supply less of some valuable, but hard to meter, service. The focus of our investigation is the frequency with which physicians consult one another about cases.

Making oneself available for consultation is just the sort of activity highlighted by multi-task models. Agreeing to discuss another partner's case is likely to help the other doctor deliver medical services to his or her patients. Increasing incentive pay increases the opportunity cost of providing this help. Evidence that physicians in groups with high powered incentives engage in less consultation would thus be indirect evidence that multi-tasking considerations may also shape incentive pay decisions.

The Mathematica survey asked individual physicians how frequently they consulted with other doctors in their group about their patients. We use the group average response to this question to indicate the amount of time and energy doctors devote to mutual consultation. Table 5 presents estimates of the relationship between incentive pay and the frequency of consultation within the group.

The consultation equation is presented in column 1. The negative and significant coefficient on *Incentive Pay II* suggests that increases in incentive pay are associated with reductions in the frequency with which doctors in the group consult one another. The estimated coefficient appears to be behaviorally as well as statistically significant. In a group of 4 physicians, increasing incentives from equal sharing to full incentive pay reduces the frequency of consultations by 0.19 per day. The average group in this size category reports 1.5 consultations per day. Column 2 replaces *Incentive Pay II* with *Equal Sharing*. The positive coefficient on *Equal Sharing* suggests that physicians in groups with equal sharing rules have an average of 0.22 more consultations per day than physicians in other groups, Unfortunately our data do not allow us to tell if this fall-off in consultations would produce a significant change in the quality, cost or quantity of medical care provided by the group.

5. Conclusion

This paper uses a behavioral microeconomic model and a unique survey of medical groups to examine the relationship between group norms and incentive pay. Our findings suggest that group norms are binding constraints in the determination of incentive pay. While group norms matter, the patterns in the data suggest that they are not *all* that matters. Analysis of the preferences and activities of individual physicians suggests that income insurance and multi-task considerations also play a role in the determination of pay policies. The conclusion we draw from these results is that the sociological concept of group norms *augments* rather than replaces more conventional economic explanations of incentive pay.

Our theoretical exposition distinguished between group pay norms and group effort norms (or mutual monitoring). As a practical matter, it is likely that the sociology of groups are determined by the simultaneous operation of both income and effort norms. Groups where individuals care about relative compensation will, all else equal, rely less on incentive pay. In such groups, it will be particularly important to recruit (or train) members willing to engage in mutual monitoring and to otherwise enforce group effort norms.

The coexistence of effort and pay norms has implications for a fundamental issue in the economics of organizations: the separation of distributional outcomes from efficiency outcomes. If efficiency and distribution were separable, efficient organizations would first choose the incentive structure that maximizes efficiency and then figure out who gets what slice of the resulting surplus. If efficiency and distribution are not separable, rational firms may pass up (seemingly) efficient policies in favor of other policies that consider group norms regarding earnings and effort. Our analysis suggests that the relationship between efficiency and distribution may be rooted in group psychology and sociology. If so, then the economics of organizations will need to carefully consider aspects of human behavior that have so far been largely overlooked. The current restructuring of incentive contracts for physicians may need to consider the interaction between economic incentives and group (or professional) norms.

References

Akerlof, George A. "Social Distance and Social Decisions." Fischer-Schultz Lecture, Econometric Society World Congress, September, 1995.

Akerlof, George A. and Yellen, Janet L. "The Fair Wage-Effort Hypothesis and Unemployment." *The Quarterly Journal of Economics,* May 1990, pp.255-283.

Allen, Douglas W. and Lueck, Dean. "Risk-Sharing and Agricultural Contracts." Mimeo, North Carolina State University, 1996.

Babcock, Linda; Wang, Xianghong and Lowenstein, George. "Choosing the Wrong Pond: Social Comparisons that Reflect Self Serving Bias." Manuscript, Carnegie Mellon University, 1995.

Baker, George P. "Incentive Contracts and Performance Measurement." *Journal of Political Economy*, June 1992, 100, pp. 598-614.

Baker, George P.; Gibbons, Robert and Murphy, Kevin J. "Subjective Performance Measures in Optimal Incentive Contracts." *Quarterly Journal of Economics* , November 1994.

Baker, George P.; Jensen, Michael C. and Murphy, Kevin J. "Compensation and Incentives: Practice vs. Theory." *The Journal of Finance,* July 1988, 43(3), pp. 593-616.

Baron, J. N. and Pfeffer, J. "The Social Psychology of Organizations and Inequality." *Social Psychology Quarterly*, 1994, 57(3), pp. 190-209.

Becker, Gary S. "A Theory of Social Interactions," *Journal of Political Economy*, 1974, 82(6), pp. 1063-1091.

Bernheim, B. Douglas. "A Theory of Conformity." *Journal of Political Economy*, October 1994, 102(5), pp. 841-877.

Bewley, Truman F. "Internal Pay Structure and Equity." Chapter 8 in *A Depressed Labor Market as Explained by Participants*, unpublished manuscript, October 1996.

Bolton, Gary E. "A Comparative Model of Bargaining: Theory and Evidence." *American Economic Review*, December 1991, 81(5), pp. 1096-1136.

Brown, Charles. "Wage Levels and Methods of Pay." *Rand Journal of Economics,* Autumn 1992, 93, pp. 366-375.

Camerer, Colin and Thaler, Richard. "Ultimatums, Dictators and Manners." *Journal of Economic Perspectives* , Spring 1995, 9(2), pp. 209-219.

Dunlop, John T. "The Task of Contemporary Wage Theory." *The Theory of Wage Determination,* edited by John T. Dunlop, London: Macmillan and Co.,1957.

Farrell, Joseph and Scotchmer, Suzanne. “Partnerships.” *Quarterly Journal of Economics,* May 1988, 103(2), pp.279-298.

Frank, Robert H. “The Demand for Unobservables and Other Nonpositional Goods.” *American Economic Review,* March 1985, 75(1), pp. 101-116.

Frank, Robert H. *Choosing the Right Pond: Human Behavior and the Quest for Status*. New York: Oxford University Press,1985.

Gaynor, Martin. “Compensation Within the Firm: Theory Plus Some Evidence from Medical Group Practice.” *Rand Journal of Economics,* Spring 1989, 20(1), 59-70.

Gaynor, Martin and Gertler, Paul J. “Moral Hazard and Risk Spreading in Partnerships.” *Rand Journal of Economics*, Winter 1995.

Gaynor, Martin and Pauly, Mark V. "Compensation and Productive Efficiency in Medical Partnerships: Evidence from Medical Group Practice." *Journal of Political Economy* , June 1990, 98(3), pp. 544-573.

Gilson, Ronald and Mnookin, Robert. "Sharing Among Human Capitalists: An Economic Inquiry into the Corporate Law Firm and How Partners Split Profits." *Stanford Law Review,* January 1985, 37(2), pp. 313--92.

Holmström, Bengt and Milgrom, Paul. “Multi-task Principal-Agent Analyses: Incentive Contracts, Asset Ownership, and Job Design.” *Journal of Law, Economics and Organization,* Spring 1991, 7, pp. 24-52.

Ichniowski, Casey; Shaw,Katheryn and Prennushi, Giovanna. “The Effects of Human Resource Management Practices on Productivity: A Study of Steel Finishing Lines.” *American Economic Review*, forthcoming.

Kahneman, Daniel; Knetsch, Jack L. and Thaler, Richard H. “Fairness as a Constraint on Profit Seeking Entitlements in the Market.” *American Economic Review,* 1986, 76(4), pp. 728-741, 1986.

Kandel, Eugene and Lazear, Edward P. “Peer Pressure and Partnerships.” *Journal of Political Economy,* August 1992, pp. 801-817.

Kreps, David M. “Corporate Culture and Economic Theory.”in James Alt and Kenneth Shepsle, eds., *Perspectives on Positive Political Economy*, Cambridge, MA : Cambridge University Press, 1990, pp. 90-143.

Landers, Renee, Rebitzer, James B. and Taylor, Lowell J. “Rat Race Redux: Adverse Selection in the Determination of Work Hours.” *American Economic Review*, forthcoming.

Lang, Kevin and Peter-John, Gordon. "Partnerships as Insurance Devices: Theory and Evidence." *Rand Journal of Economics,* Winter 1995.

Lazear, Edward P. “Peformance Pay and Productivity.” National Bureau of Economic Research (Cambridge, MA) Working Paper No. 5672, 1996.

Lazear, Edward P. "Salaries and Piece Rates." *Journal of Business*, July 1986, 59, pp. 405-431.

Lazear, Edward P. "Pay Equality and Industrial Politics." *Journal of Political Economy*, 1989, 97(3), pp. 561-580.

Levine, David I. "Fairness, Markets and Ability to Pay: Evidence from Compensation Executives." *American Economic Review*, December 1993, 83(5)**,** pp. 1241-1259

Levine, David I. "Cohesiveness, Productivity and Wage Dispersion."*Journal of Economic Behavior and Organization*, 1991, 15**,** pp. 237-255.

Meyer, J. "Two-Moment Decision Models and Expected Utility Maximization."*American Economic Review*, June 1987, 77, pp. 421-450.

Milgrom, John and Roberts, Paul. *Economics, Organization and Management*, New Jersey, Prentice Hall, 1992.

Milgrom, Paul and Roberts, John. "The Efficiency of Equity in Organizational Decision Processes." *American Economic Review*, May 1990, 80(2)**,** pp. 154-159.

Pencavel, John and Craig, Ben. "The Empirical Performance of Orthodox Models of the Firm: Conventional Firms and Worker Cooperatives." *Journal of Political Economy*, 1994, 102, pp. 718-744.

Pfeffer, Jeffrey, and Langton, Nancy. "The Effect of Wage Dispersion on Satisfaction, Productivity and Working Collaboratively: Evidence from College and University Faculty." *Administrative Science Quarterly*, 1993, pp. 382-407.

Prasnikar, Vesna and Roth, Alvin E. "Considerations of Fairness and Strategy: Experimental Data From Sequential Games." *Quarterly Journal of Economics*, August 1992, pp. 865-888.

Roemer, David. "Why Do Firms Prefer More Able Workers?" University of California at Berkeley Working paper, October 1992.

Roth, Alvin E.; Prasnikar, Vesna; Masahiro, Okuno-Fujiwara and Zamir, Shmuel. "Bargaining and Market Behavior in Jerusalem, Ljubljana, Pittsburgh, and Tokyo: An Experimental Study." *American Economic Review*, December 1991, 81(5), pp. 1068-1095.

Tversky, Amos and Kahneman, Daniel. "Loss Aversion in Riskless Choice: A Reference Dependent Model." *Quarterly Journal of Economics*, November 1991, pp. 1039-1061.

Varian, Hal R. "Equity, Envy, and Efficiency." *Journal of Economic Theory*, September 1974, 9(1), pp. 63-91.

Young, H. P. (1994). Equity: In Theory and Practice. Princeton, New Jersey, Princeton University Press.

.

Appendix A.

A Pure Income Insurance Model of Incentive Pay in Groups

In this appendix we present a model in which physicians are risk averse but there exist no group norms or multi-tasking. We also generalize the presentation in the text by allowing the individual error terms to co-vary within a group.

We begin by writing the variance of income:

$$\text{(A1)}\quad \sigma_y^2 = E\left(\alpha\varepsilon_i + \frac{(1-\alpha)\sum_{j\neq i}^{n-1}\varepsilon_j}{n-1}\right)^2$$

and

$$\text{(A2)}\quad \sigma_y^2 = E\left(\alpha^2\varepsilon_i^2 + \frac{(1-\alpha)^2\sum_{j\neq i}^{n-1}\varepsilon_j^2}{(n-1)^2} + \frac{2\alpha(1-\alpha)\sum_{j\neq i}^{n-1}\varepsilon_j\varepsilon_i}{n-1} + \frac{(1-\alpha)^2}{(n-1)^2}\sum_{j\neq i}^{n-1}\sum_{k\neq j,i}^{n-2}\varepsilon_j\varepsilon_k\right)$$

Letting σ_{ij} represent the co-variance of error terms across individuals i and j, we rewrite (2) as:

$$\text{(A3)}\quad \sigma_y^2 = \sigma_\varepsilon^2\left(\alpha^2 + \frac{(1-\alpha)^2}{(n-1)^2}\right) + 2\alpha(1-\alpha)\sigma_{ij} + \frac{(1-\alpha)^2(n-1)(n-2)\sigma_{ij}}{(n-1)^2}$$

Differentiating with respect to α yields

$$\text{(A4)}\quad \frac{d\sigma_y^2}{d\alpha} = \frac{2\sigma_\varepsilon^2(n\alpha-1)}{n-1} + 2\sigma_{ij} - 4\alpha\sigma_{ij} - \frac{2(1-\alpha)(n-1)(n-2)}{(n-1)^2}\sigma_{ij}$$

Collecting terms we find

$$\text{(A5)}\quad \frac{d\sigma_y^2}{d\alpha} = \frac{2\sigma_{ij}(n\alpha-1)}{n-1} - \frac{2\sigma_{ij}(n\alpha-1)}{n-1} = \frac{2(n\alpha-1)(\sigma_\varepsilon^2-\sigma_{ij})}{n-1}$$

Notice that so long as σ_{ij} <0, increases in α must increase variability of income.

The utility of a representative partner is: $U = R(e) - C(e) - \rho\, \sigma_Y^2$

The comparative statics of α with respect to n are determined by:

(A6) $$\frac{d\alpha}{dn} = -\frac{\dfrac{\partial^2 E(U)}{\partial \alpha \partial n}}{\dfrac{\partial^2 E(U)}{\partial \alpha^2}}$$ where $\dfrac{\partial^2 E(U)}{\partial \alpha^2} < 0$ from second order conditions.

From the preceding analysis

(A7) $$\frac{d^2 E(U)}{d\alpha dn} = -\frac{d^2 \sigma_y^2}{d\alpha dn} = -2(\sigma_\varepsilon^2 - \sigma_{ij})\frac{1-\alpha}{(n-1)^2} + \frac{2(n\alpha - 1)}{n-1}\frac{d\sigma_{ij}}{dn} < 0 .$$

From this it follows that when $\dfrac{d\sigma_{ij}}{dn}$ <0 and $\dfrac{d\sigma_y^2}{d\alpha}$ > 0, (A6) is negative. Two conclusions follow from this result. First, if only risk aversion mattered for our sample of medical groups, we should observe α moving inversely with group size. Secondly, this conclusion is only strengthened if the random shocks experienced by members of large groups are less correlated than those in smaller groups. Both of these conclusions are due to the fact that increases in α require physicians in large groups to give up more income insurance than their counterparts in small groups. This means that the marginal cost of incentive pay is greater in big groups and these groups will therefore use less of it.

Appendix B

A Multi-Task Model of Incentive Pay in Partnerships.

Recent theoretical work suggests that incentive pay may be muted when partners perform multiple tasks, someof which incentives cannot be metered. In this appendix we develop such a multi-task model and show that, in the absence of group norms, the likelihood of adopting equal sharing rules *increases* with group size.

Let the expected gross profit of the firm be determined by the sum of expected revenues brought in, $R(e_i)$, and the expected change in the group's reputational capital, V. We assume that V is a function of the actions taken by individual partners. We represent this action by v_i

(B1) $V = V(v_i),\ V' > 0$ and $V'' < 0$.

We stipulate that V is observable but non-contractible. The actions required to enhance a group's reputation are costly in so far as they take time and energy away from activities that directly generate revenue, e_i. We capture this opportunity cost in the following cost of effort function:[34]

(B2) Cost of Effort $\equiv C(e,v)$, $\quad C_e, C_v,\ and\ C_{ev} > 0.\ C_{vn} = 0.$

Notice that we modify our notation here to distinguish the two inputs to the cost of effort function. Thus we now write the derivative of cost with respect to e as C_e, the cross partial derivative with respect to e and v as C_{ev}, and the second derivatives of cost with respect to v and

---

34 The positive cross partial derivative, C_{ev}, is necessary so that both types of activities, e and v, are substitutes. The assumption that $C_{vv} = 0$ is made for convenience.

e are C_{vn} and C_{ee} .

We assume, as before, that doctors provide effort to maximize

$$\text{(B3)}\ U_i = \alpha R_i + \frac{(1-\alpha)\sum_{j\neq i} R_j}{n-1} + \frac{V(v_i)+\sum_{j\neq i} V(v_j)}{n} - C - \rho\sigma_Y^2$$

The marginal benefit of income derived from *e*, and *v* equals the marginal cost. Thus physicians will choose revenue generating activity, *e*, to satisfy

$$\text{(B4)}\ \alpha R' = C_e .$$

The value of reputational capital accrues equally to all partners. Since no incentive payments are possible, physicians will provide *v* according to

$$\text{(B4)}\ \frac{V'}{n} = C_v .$$

The problem for the partnership is to choose a level of α that maximizes the expected utility of a representative partner.

$$\text{(B5)}\ U = R + V - C(e,v) - \rho\ \Lambda.$$

As was true in the income insurance model, the solution to this problem requires the group to increase incentive pay up until the point where the expected marginal benefits equal expected marginal costs.

$$\text{(B6)}\ \frac{dE(U)}{d\alpha} = (R' - C_e)\frac{de}{d\alpha} + (V' - C_v)\frac{dv}{d\alpha} = 0$$

Totally differentiating equations (B4) and (B5) and solving for $\frac{de}{d\alpha}$ and $\frac{dv}{d\alpha}$ we can write this first order condition:

$$\frac{dE(U)}{d\alpha} = \frac{(R' - C_e)\left\{-R'\left(\frac{V''}{n} - C_{vv}\right)\right\} + (V' - C_v)(-R'C_{ve})}{D} = 0, \text{ where}$$

(B7)

$$D \equiv (\alpha R'' - C_{ee})(\frac{V''}{n} - C_{\nu\nu}) - (C_{ve})^2 > 0 \text{ by second order conditions}$$

It is also easy to show that $\frac{dD}{dn} < 0$.

The group is on the equity boundary when:

(B8) $$\frac{dE(U)}{d\alpha} = \frac{(R' - C_e)\left\{-R'\left(\frac{V''}{n} - C_{vv}\right)\right\} + (V' - C_v)(-R'C_{ve})}{D} \leq 0$$

Larger groups are more likely to be on the equity boundary when $\frac{d^2E(U)}{d\alpha dn} < 0$ at α=1/*n*.

Taking the derivative of (8) with respect to *n* yields:

(B9) $$\frac{d^2E(U)}{d\alpha dn} = \frac{(R' - C_e)(R'\frac{V''}{n^2})}{D} - \frac{(R' - C_e)\left\{-R'\left(\frac{V''}{n} - C_{vv}\right)\right\} + (V' - C_v)(-R'C_{ve})}{D^2}\frac{dD}{dn} < 0$$

Thus if the costs of incentives came entirely from risk aversion and multi-tasking, we would observe *larger* groups being *more* likely to operate on their equity boundary.

Figure 1
The Relationship Between Variance of Income, Incentive Pay and Group Size

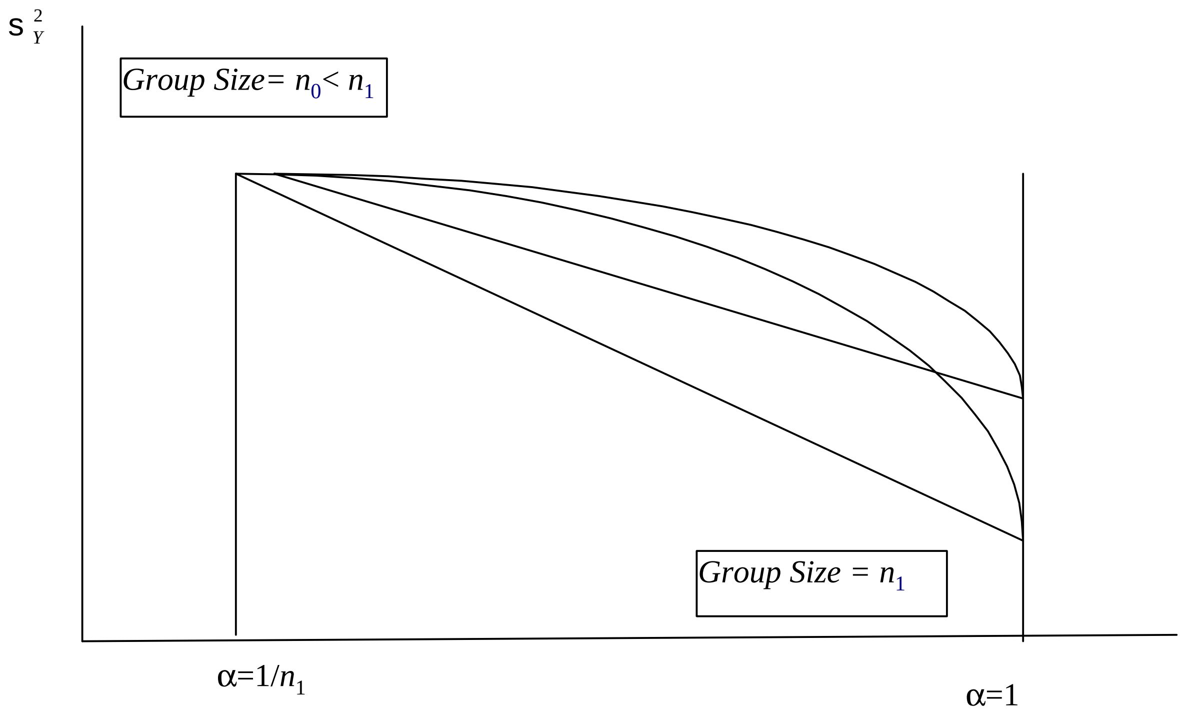
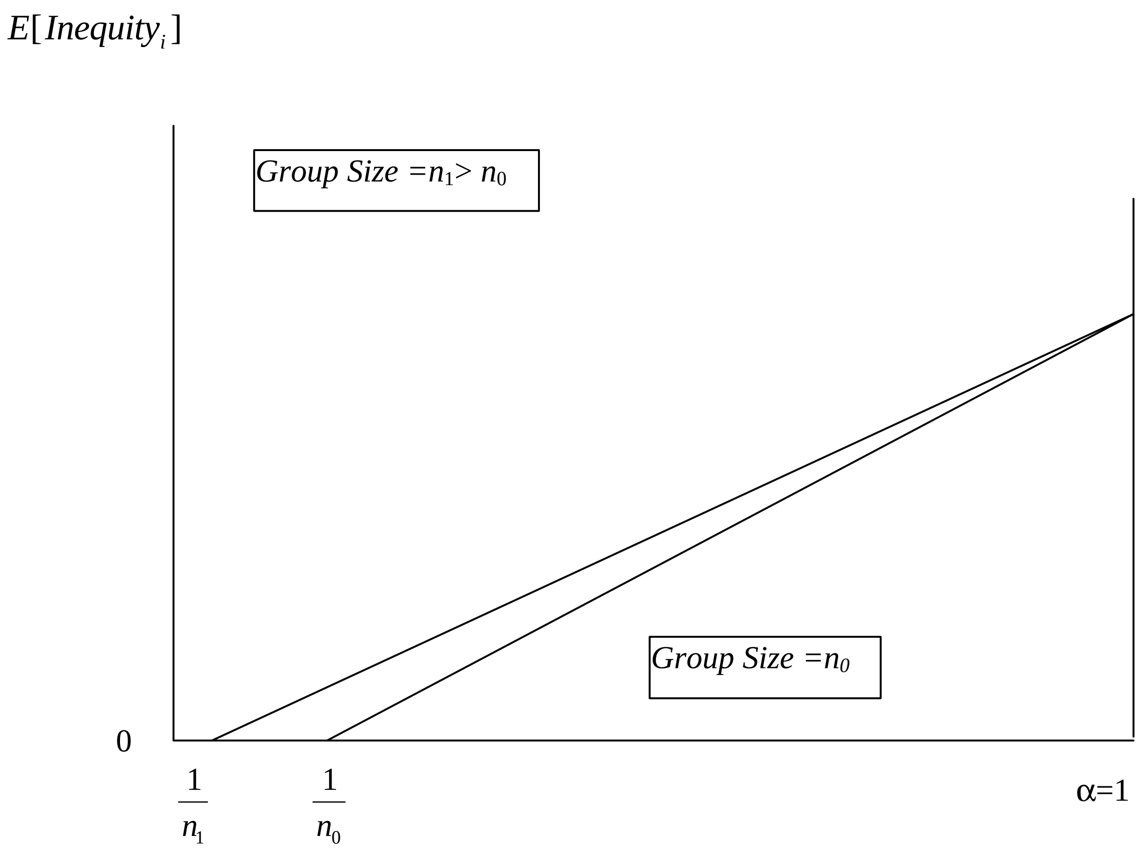


Figure 2
The Relationship Between Expected Inequity, Incentive Pay and Group Size



Incentives and Efficiency

Dependent Variable Independent Variables	*Log Office Visits*	*Log Office Visits* [b]	*Log Office Visits*[c]	*Log Office Visits*[d]	*Log Office Visits*[c]
Log of Office Hours	0.4665	0.4648	0.5084	0.4176	0.5137
	0.0836	0.0835	0.1212	0.1089	0.1239
	(5.5826)	(5.5684)	(4.1935)	(3.8347)	(4.1452)
Incentive Pay II					0.0009
					0.0012
					(0.7688)
Equal Sharing	-0.0761	-0.2266	-0.0115	-0.1575	
	0.0414	0.0847	0.0623	0.0558	
	-(1.8378)	-(2.6760)	-(0.1842)	-(2.8228)	
*Equal Sharing * Inverse Group Size*		0.8543			
		0.4534			
		(1.8842)			
Inverse Group Size	-0.1151	-0.3861		0.0809	
	0.3343	0.3642		0.7881	
	-(0.3443)	-(1.0602)		(0.1026)	
Average Years Experience	0.0195	0.0184	0.0259	0.0029	0.0264
	0.0112	0.0113	0.0185	0.0137	0.0185
	(1.7340)	(1.6202)	(1.4024)	(0.2128)	(1.4299)
(Average Years Experience)^2	-0.0005	-0.0005	-0.0006	-0.0001	-0.0006
[s.e]	0.0003	0.0003	0.0005	0.0003	0.0005
	-(1.9698)	-(1.8095)	-(1.3461)	-(0.4142)	-(1.3876)
Average Tenure in Group	0.0038	0.0042	0.0036	0.0048	0.0028
[s.e.]	0.0042	0.0043	0.0063	0.0050	0.0061
	(0.8895)	(0.9823)	(0.5731)	(0.9748)	(0.4622)
Multi-Specialty Group	0.0166	0.0135	0.0888	0.0087	0.0823
	0.0639	0.0632	0.1197	0.0838	0.1189
	(0.2602)	(0.2133)	(0.7412)	(0.1044)	(0.6917)
% of Revenues From HMO's	-0.0019	-0.0017	-0.0019	-0.0016	-0.0016
	0.0015	0.0015	0.0058	0.0016	0.0057
	-(1.2434)	-(1.0993)	-(0.3302)	-(1.0440)	-(0.2747)
% Revenues From Outside	-0.0008	-0.0006	0.0017	-0.0018	0.0018
[s.e.]	0.0010	0.0010	0.0016	0.0012	0.0016
Speciality Referrals	-(0.7365)	-(0.5789)	(1.0297)	-(1.4388)	(1.1638)
% Group Internal Med.	-0.0022	-0.0020	0.0020	-0.0024	0.0019
	0.0017	0.0017	0.0032	0.0019	0.0032
	-(1.3158)	-(1.1997)	(0.6312)	-(1.2518)	(0.5857)
% Group Gen. Practitioner	0.0035	0.0038	0.0084	0.0028	0.0083
	0.0017	0.0018	0.0034	0.0021	0.0034
	(1.9998)	(2.1181)	(2.4554)	(1.3278)	(2.4483)
% Group General Surgeons	0.0038	0.0041	0.0060	0.0040	0.0060
	0.0023	0.0023	0.0055	0.0028	0.0054
	(1.6700)	(1.8214)	(1.0820)	(1.4130)	(1.0975)
% Group Pediatricians	0.0031	0.0032	0.0079	0.0005	0.0078
	0.0019	0.0019	0.0035	0.0026	0.0034
	(1.6294)	(1.6705)	(2.2747)	(0.2000)	(2.2798)
% Group OB\GYN	0.0019	0.0020	0.0067	0.0000	0.0066
	0.0018	0.0018	0.0032	0.0024	0.0032
	(1.0221)	(1.0984)	(2.0764)	-(0.0086)	(2.0592)
% Group Board Certified	0.0001	0.0001	0.0008	-0.0012	0.0007
	0.0006	0.0006	0.0008	0.0010	0.0008
	(0.2289)	(0.2334)	(0.9167)	-(1.2708)	(0.8760)
% Patients who are White	0.0023	0.0022	0.0040	0.0011	0.0040
	0.0013	0.0013	0.0020	0.0016	0.0020
	(1.8269)	(1.7663)	(2.0080)	(0.6962)	(2.0343)
% Patient Incomes $10-15 K	0.0005	0.0005	0.0007	0.0004	0.0008
	0.0012	0.0012	0.0021	0.0015	0.0020
	(0.4209)	(0.4502)	(0.3575)	(0.2735)	(0.3970)
% Patient Incomes $15K+	-0.0008	-0.0006	-0.0004	-0.0005	-0.0005

	0.0012	0.0012	0.0021	0.0014	0.0021
	-(0.6539)	-(0.4953)	-(0.2070)	-(0.3645)	-(0.2215)
% Patients Under Medicare	0.0009	0.0009	-0.0009	0.0017	-0.0008
	0.0013	0.0013	0.0019	0.0016	0.0019
	(0.6958)	(0.6755)	-(0.4401)	(1.0237)	-(0.4038)
% Patients Under Medicaid	0.0024	0.0025	0.0056	-0.0012	0.0054
	0.0024	0.0024	0.0036	0.0031	0.0035
	(0.9820)	(1.0269)	(1.5506)	-(0.3782)	(1.5116)
Constant	2.4695	2.4853	1.5014	3.0662	1.4561
	0.3947	0.3925	0.5814	0.4811	0.6048
	(6.2566)	(6.3313)	(2.5822)	(6.3732)	(2.4074)
Constant	yes	yes	yes	yes	yes
Number of Groups	488	488	203	285	203
R^2	0.3851	0.3900	0.4075	0.3947	0.4099

[a] Numbers in parentheses are t-statistics calculated using White's formula for heteroskedasticity consistent standard errors
[b] Equal Sharing and Equal Sharing * Inverse Group Size are jointly significant at the 2% level.
[C] Estimated for groups in the smallest size category.
[d] Estimated for groups not in the smallest size category

Grp Size and Equity Boundary

Dependent Variables / Independent Variables	*Equity Boundary* (1) [b]	*Equity Boundary* (2)	*Equity Boundary* (3) [c]	*Equity Boundary* (4) [d]	*Equity Boundary* (5) [e]	*Equity Boundary* (6) [f]	*Equity Boundary* (7)[g]
Group Size: 6-7	-0.2450						
	-(1.4090)						
Group Size: 8-15	-0.7170						
	-(3.8420)						
Group Size: 16-24	-1.0196						
	-(3.9090)						
Group Size: 24-49	-1.0564						
	-(3.2640)						
Group Size: 50+	-0.3673						
	-(0.7680)						
Inverse Group Size		4.3694	4.2692	3.6456	3.6753	5.7284	3.4862
		(4.6110)	(2.8027)	(3.3172)	(2.2976)	(5.4175)	(2.6176)
% of Revenues From HMO's	0.0084	0.0073	0.0055	0.0124	-0.0056	0.0070	0.0115
	(1.4850)	(1.2990)	(0.4725)	(2.0562)	-(0.2805)	(0.9740)	(1.8271)
% Revenues From Outside	0.0032	0.0038	0.0027	0.0048	0.0018	0.0026	-0.0045
Specialty Referrals	(0.8550)	(1.0457)	(0.5296)	(1.0987)	(0.4022)	(0.6546)	-(0.8842)
% Group Board Certified	-0.0051	-0.0050	-0.0047	-0.0023	-0.0007	-0.0043	-0.0022
	-(2.3810)	-(2.3647)	-(1.6736)	-(0.8684)	-(0.2482)	-(1.8085)	-(0.7575)
Multi-Specialty Group	-0.3550	-0.3680	-0.1875	-0.3006		-0.2025	-0.2924
	-(1.6650)	-(1.7351)	-(0.5261)	-(1.2684)		-(0.8919)	-(0.9854)
% Group Internal Med.	0.0023	0.0002	0.0016	0.0046		0.0004	0.0003
	(0.3720)	(0.0451)	(0.1957)	(0.7394)		(0.0626)	(0.0453)
% Group Gen. Practitioner	0.0031	0.0013	-0.0007	0.0074		0.0004	0.0006
	(0.4770)	(0.2240)	-(0.0756)	(1.1146)		(0.0640)	(0.0703)
% Group General Surgeons	0.0062	0.0035	-0.0127	0.0073		0.0025	0.0058
	(0.7090)	(0.4558)	-(0.9009)	(0.8475)		(0.3122)	(0.5394)
% Group OB\GYN	0.0090	0.0068	0.0083	0.0098		0.0080	-0.0010
	(1.3740)	(1.1871)	(0.9530)	(1.4388)		(1.2719)	-(0.1223)
% Group Pediatricians	0.0063	0.0042	0.0079	0.0070		0.0035	-0.0009
	(0.9610)	(0.7276)	(0.9079)	(1.0211)		(0.5414)	-(0.1107)
% Patients who are White	-0.0053	-0.0062	-0.0081	-0.0084	-0.0106	-0.0057	-0.0085
	-(1.4040)	-(1.6426)	-(1.3938)	-(1.9722)	-(1.8572)	-(1.3341)	-(1.7153)
% Patient Incomes $10-15 K	0.0073	0.0075	0.0100	0.0080	0.0106	0.0070	0.0081
	(1.7510)	(1.8253)	(1.7203)	(1.6413)	(1.6913)	(1.5677)	(1.5872)
% Patient Incomes $15K+	0.0055	0.0056	0.0004	0.0080	0.0008	0.0033	0.0061
	(1.3920)	(1.4535)	(0.0692)	(1.7789)	(0.1380)	(0.7759)	(1.2476)
% Patients Under Medicare	0.0027	0.0036	0.0033	0.0008	-0.0022	0.0061	-0.0055
	(0.6040)	(0.8050)	(0.4885)	(0.1540)	-(0.3142)	(1.2129)	-(0.8888)
% Patients Under Medicaid	-0.0048	-0.0056	-0.0024	-0.0026	-0.0030	-0.0095	-0.0080
	-(0.6740)	-(0.8080)	-(0.2181)	-(0.3128)	-(0.3067)	-(1.1610)	-(0.8639)
Within Group Variation in Office Hours							0.0000

							-(0.0029)
Within Group Variation in Office Visits							-0.0284188
							-(2.0798)
Importance of Regularity of Income							0.2953062
1=no importance; 4= very important							(2.2091)
Constant	Yes	Yes	Yes	Yes	Yes	Yes	Yes
# Groups	583	583.0000	299	454	231	500	365
Liklihood Ratio Test	109.50	104.57	61.28	69.04	10.89	104.52	75.63
Log Likelihood	-326.8308	-329.2973	-171.1422	-245.1437	-154.0229	-269.5646	-197.4034

[a] All estimates are probits. Numbers in parentheses are z scores.

[b] *Equal Sharing* = 1 if group has an equal sharing rule (*Incentive Pay II = 1/Group Size*) and 0 otherwise.

[c] Estimates in column (3) are for groups comprised solely of owner physicians.

[d] Estimates in column (4) are for groups having full-time managers.

[e] Estimates in column (5) are for groups comprised only of internists, pediatricians and/or general practictioners.

[f] Estimates in column (6) are for groups having no productivity guidelines.

[g] *Within GroupVariation in Hours* is the standard deviation of office hours worked by group physicians in the week prior to the survey. *Within Group Variation in Office Visits* is the standard deviation office visits handled by group physicians in the week prior to the survey. Both these measures were calculated using data supplied by individual physicians.

Descriptive Statistics

	Distribution of Group Size [a]		**Groups on the Equal Sharing b**			**Distribution of Incentive Pay 1**[c]				**Distribution of Incentive Pay 2** [d]	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Group Size Category	Number of Groups in Size Category	% of Groups in Size Category	% Groups with Incentive Pay 2=1/*n*	Mean	25th Percentile	Median	75th Percentile	Mean	25th Percentile	Median	75th Percentile
3-5	365	46.0	54.2	31.2	0	0	70	48.4	25	25	77.5
6-7	100	12.6	42.0	38.9	0	22.5	75	48.3	15.4	34.4	78.8
8-15	153	19.3	21.6	55.4	15	60	100	59.3	22.4	63.5	100
16-24	85	10.7	23.5	55.5	10	60	95	57	14.4	62	92.3
24-49	72	9.1	6.9	65.2	50	70	95	66	51.3	70.8	95.1
50+	19	2.4	31.4	29.7	0	20	46	30.4	0.88	20.7	46.5
All	794	100.0	38.3	42.49	0	37.5	90	52.67	25	40.8	90

[a] The Group Size in the top category is 113.5, based on the assumption that the top two size categories follow a Pareto distribution.

Group Size is recorded in 6 categories from 3-50+. For every category but the top, groups are assigned to the mid-point of the category

[b] Equal Sharing occurs when Incentive Pay 1=0 (or equivalently, Incentive Pay 2=1/n)

[c] Incentive Pay I is the % of compensation (excluding fringe benefits) the group distributes to owner physicians on the basis of individual productivity

[d] Incentive Pay II = Incentive Pay I + (100-Incentive Pay I)/Group Size)

Incentives and Consulting

Dependant Variable	Intra-Group Consults	Intra-Group Consults
Independent Variable		
Incentive Pay II	-0.0025	
	-(2.0158)	
Equal Sharing		0.2244
		(2.3013)
Inverse Group Size	-1.9002	-2.1081
	-(2.2802)	-(2.5441)
Average Years Experience	0.0081	0.0095
	(0.2624)	(0.3055)
(Average Years Experience)^2	-0.0002	-0.0002
	-(0.2467)	-(0.3207)
Average Tenure in Group	0.0030	0.0026
	(0.2620)	(0.2208)
% of Revenues From HMO's	0.0012	0.0010
	(0.2791)	(0.2216)
	-0.0017	-0.0016
	-(0.6532)	-(0.5815)
% Group Board Certified	0.0024	0.0026
	(1.2619)	(1.3953)
Multi-Specialty Group	-0.3199	-0.3028
	-(2.0131)	-(1.9060)
% Group Internal Med.	0.0016	0.0014
	(0.4009)	(0.3432)
% Group Gen. Practitioner	0.0040	0.0039
	(0.9582)	(0.9254)
% Group General Surgeons	0.0129	0.0126
	(2.4637)	(2.4031)
% Group OB\GYN	-0.0002	-0.0005
	-(0.0423)	-(0.1081)
% Group Pediatricians	0.0049	0.0048
	(1.1790)	(1.1267)
% Patients who are White	-0.0061	-0.0060
	-(2.1275)	-(2.0992)
% Patient Incomes $10-15 K	0.0000	-0.0001
	(0.0073)	-(0.0283)
% Patient Incomes $15K+	0.0009	0.0008
	(0.3220)	(0.2838)
% Patients Under Medicare	-0.0003	-0.0001
	-(0.0974)	-(0.0307)
% Patients Under Medicaid	0.0013	0.0015
	(0.2339)	(0.2659)
Constant	yes	yes
Number of Groups	413	413
R^2	0.076	0.0744

Incentives and Income Diffs

Dependant Variable	Within Group Income Variation, σ_g	Within Group Income Variation, σ_g
Independent Variable		
Incentive Pay II	43.3919	-5.9591
	14.2439	23.8807
	(3.046)	-(0.250)
Inverse Group Size	-30995.2340	-50660.4190
	8584.7378	11833.7260
	-(3.611)	-(4.281)
*Incentive Pay II * Inverse Group Size*		372.8575
		160.7790
		(2.319)
Average Years Experience	-1103.1298	-1066.0371
	334.1526	332.4086
	-(3.301)	-(3.207)
(Average Years Experience)^2	30.6564	29.5945
	8.9487	8.8884
	(3.426)	(3.330)
Average Tenure in Group	79.7920	63.9169
	136.7054	136.7003
	(0.584)	(0.468)
% of Revenues From HMO's	44.9792	44.3776
	26.8822	28.5754
	(1.673)	(1.553)
% Revenues From Outside Speciality Referals	39.0567	37.9479
	27.2693	27.9208
	(1.432)	(1.359)
% Group Board Certified	-4.5643	-7.1065
	17.3769	17.0826
	-(0.263)	-(0.416)
Multi-Specialty Group	-579.2051	-662.0635
	1632.4773	1619.5225
	-(0.355)	-(0.409)
% Group Internal Med.	66.2630	65.1243
	40.4334	41.1758
	(1.639)	(1.582)
% Group Gen. Practitioner	79.8654	75.9428
	42.4495	43.3518
	(1.881)	(1.752)
% Group General Surgeons	-27.9139	-28.6670
	51.9679	52.6266
	-(0.537)	-(0.545)
% Group OB\GYN	109.8035	108.1933

	47.7540	48.4998
	(2.299)	(2.231)
% Group Pediatricians	25.0277	27.5567
	42.8616	43.7059
	(0.584)	(0.631)
% Patients who are White	-22.5383	-16.0741
	26.8728	26.4128
	-(0.839)	-(0.609)
% Patient Incomes $10-15 K	6.2402	6.4446
	29.3400	29.2544
	(0.213)	(0.220)
% Patient Incomes $15K+	-2.9726	-6.2725
	29.2962	28.8403
	-(0.101)	-(0.217)
% Patients Under Medicare	-19.5886	-17.0627
	34.0887	33.3772
	-(0.575)	-(0.511)
% Patients Under Medicaid	-47.2468	-46.2168
	52.6986	53.5678
	-(0.897)	-(0.863)
Constant	18369.6620	21079.9950
	6256.5677	6500.0250
Constant	yes	yes
Number of Groups	395	395
R^2	0.1868	0.2010

[a] All estimates are OLS. Numbers in parenthesis are t-statistics calculated from Heteroskedasticity consistent standard errors.

Fig_j3.do

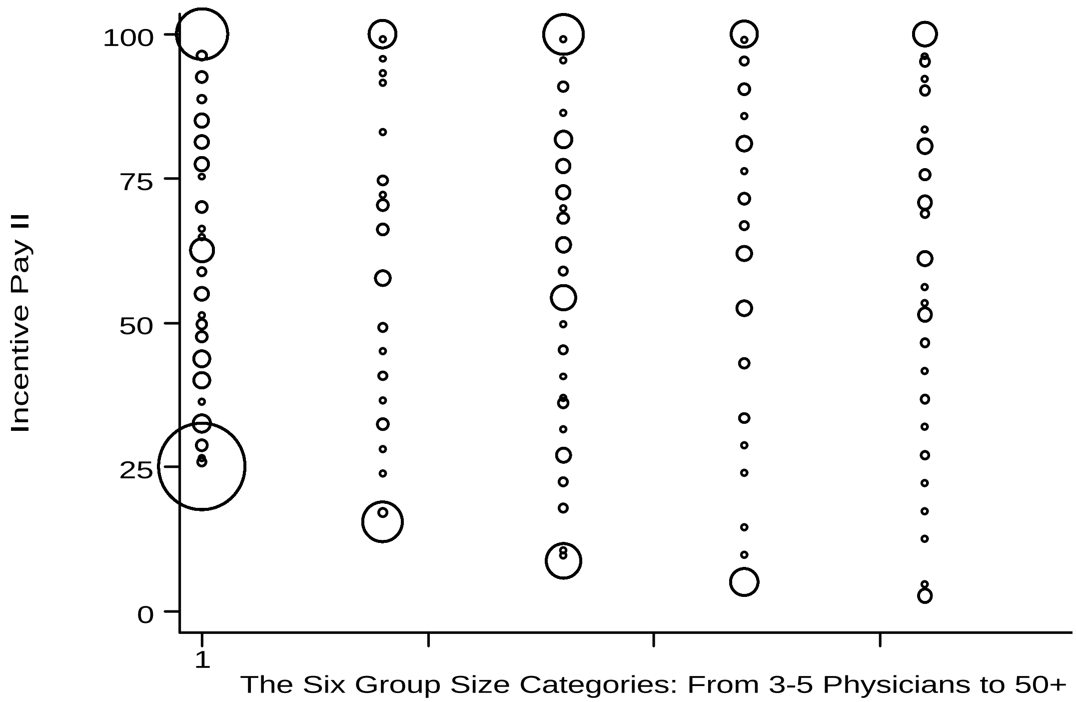


Figure 3: Incentive Pay By Group Size

Data Appendix

Variables in Tables 1-5	Mean	Std. Dev.	Notes
Average Years Experience	19.319	7.236	Average years since medical school for physicians in the group
Average Tenure in Group	13.293	7.022	Average years with medical group for physicians in the group
Equal Sharing	0.384	0.487	A dummy variable equal to 1 if Incentive Pay II=1/Group Size.
Frequency of Intra-Group Consult	1.485	0.836	Group average of the number of consults per day that an individual physician reports having with other physicians in the group, about medical problems of his or her patients
Importance of Regular Income	2.826	0.616	Group average of individual's assessment of the importance of regularity of income (lack of fluctuation) in deciding to move to a new practice. Scoring ranges from 1=no importance to 4= very important
Incentive Pay I	42.460	41.373	The % of compensation (excluding fringe benefits) that the group distributes to owner physicians on the basis of individual productivity
Incentive Pay II	52.670	33.604	*Incentive Pay I* + (100-*Incentive Pay I)/Group Size*
Inverse Group Size	0.157	0.091	Inverse of the number of full time equivalent physicians in the practice.
Log of Office Hours	3.248	0.393	Log of the average of physician office hours worked in the week prior to the survey.
Log of Office Visits	4.477	0.510	Log of the average of group office visits handled by physicians in the week prior to the survey.
Multi-Specialty Group	0.574	0.495	A dummy variable equal to 1 if multi-specialty group and 0 if single specialty.
% Group Board Certified	75.221	29.131	
% Group Gen. Practitioner	33.257	39.029	
% Group General Surgeons	8.115	11.991	
% Group Internal Med.	24.126	31.608	
% Group OB\GYN	11.643	25.059	
% Group Pediatricians	12.385	26.002	
% of Revenues From HMO's	8.947	24.077	Percentage of your patient care revenues are from prepaid or capitation payments? Data is collected in 4 categories (1=under 25% 2=25-49% 3=50-74% 4=75+%) and group is assigned mid-point of the category.
% Patient Incomes $10-15 K	43.835	18.746	
% Patient Incomes $15K+	30.889	20.020	
% Patients Under Medicaid	10.801	10.001	
% Patients Under Medicare	22.453	13.279	
% Patients who are White	81.316	17.207	
% Revenues From Outside Specialty Referrals	13.736	18.472	What percent of this office's practice is made up of specialty referrals from physicians outside the group?
*Within Group Variation in Office Hours**	6.042	5.057	Within group standard deviation of physician office hours in the week prior to the survey.
*Within Group Variation in Office Visits**	10.312	8.038	Within group standard deviation of patient office visits handled by physicians in the week prior to the survey.
Within Group Income Variation s_g*	13818.720	9116.384	