TEAM-BASED COMPENSATION IN PROFESSIONAL SERVICE FIRMS

Mina Pizzini

School of Management
The University of Texas at Dallas
Richardson, TX 75083-0688
972-883-6337
Pizzini@utdallas.edu

Draft: January, 2005

Team-based Compensation in Professional Service Firms

Abstract

This paper examines factors influencing the use of team-based compensation in professional service partnerships and the relation between team-based compensation and performance. Using data on 10,098 physicians in 866 medical groups, I find that team-based compensation plans are more prevalent in groups that enjoy benefits from coordination and in small groups composed of members with similar training, experience, and work tasks. In contrast to prior research on partnerships, groups that use team-based incentives are not less productive than those that use individual incentives. In fact, physicians in groups that use team-based incentives earn higher incomes than those in groups with individual incentive plans that have large salary components. Consistent with prior research, groups that use team-based incentives exhibit less variation in productivity than those that use individual incentives.

Team-based Compensation in Professional Service Firms

1. Introduction

The purpose of this paper is to identify factors that influence the use of team-based compensation in professional service partnerships and to determine the effects of team-based compensation on performance. Partnerships are the predominant form of organization in human-capital intensive professional services such as accounting, law, consulting, and medicine. Professionals form partnerships to exploit productive interactions, share resources, and spread risk. In practice, partnerships employ a wide variety of compensation schemes or "sharing rules," with some partnerships rewarding members based solely on individual performance, while others use a purely team-based approach and divide the group's net proceeds equally among partners.

As compensation moves away from individual performance to team performance, the incentive to shirk and thus free ride on the effort of others increases. Traditional agency theory contends that firms tradeoff the benefits arising from team-based compensation, such as greater cooperation among group members and risk sharing, with losses in output from diminished incentives (e.g., Alchain and Demsetz, 1972; Newhouse, 1973; Holmstrom, 1982). More recent work indicates that in certain settings, team-based compensation induces mutual monitoring and thereby leads to higher levels of effort (Kandel and Lazear, 1992; Miller, 1997; Che and Yoo, 2001; Huddart and Liang, 2004). Taken together, this research suggests two fundamental insights. First, firms will be more likely to use team-based compensation when cooperation among members leads to synergies in production. Second, small firms composed of homogeneous members will be more likely to use team-based compensation because mutual monitoring costs in such firms are relatively low. An extensive theoretical literature analyzes compensation arrangements and free riding in teams;[1] yet, there is correspondingly little empirical research on the determinants and performance effects of team-based compensation (Leibowitz and Tollison, 1980; Gaynor and Pauly, 1990; Lang and Gordon, 1995; Gaynor and Gertler, 1995; Encinosa, Gaynor, and Rebitzer, 1997).

This paper investigates the determinants and performance effects of team-based compensation using a database of physician group practices. This setting and data set offer several advantages. First, physician compensation contracts tend to provide a relatively simple expression of the sharing rules or link between pay and performance used by the group. This simplicity provides reliable measures of the compensation risk imposed on group members. Second, although medical group practices operate in the same service sector (thereby controlling for confounding industry effects), compensation methods vary by practice. Some groups base compensation entirely on individual performance, while others base compensation entirely on group performance, with all members sharing equally in the group's net proceeds. This variation in compensation methods even exists within the same specialty. Third, physician-level data measure factors that potentially influence both the use of team-based compensation and the effects of team-based compensation on individual performance. Variations in these factors allow for powerful tests of hypotheses suggested by models of compensation practices in partnerships. Finally, physician incentives have become a fundamental issue for policy makers, as well as the insurers, corporations, and private citizens who pay for physician

[1] See, for example, Alchain and Demsetz (1972), Holmstrom (1982), Farrell and Scotchmer (1988), Holmstrom and Milgrom, 1990; Legros and Mathews (1993), and Narayanan (1995), among others.

services. Expenditures for physician and clinical services, which currently average over $1,200 per capita, have been rising for the past decade.

The analysis is conducted using survey data collected by the Medical Group Management Association (MGMA) in 1999. The sample covers 10,098 individual physicians in 866 practices. Consistent with theory, physicians that work in inpatient settings (for e.g., emergency medicine and surgery), where work is shared among group members, are significantly more likely to use team-based compensation plans than physicians in the office-based specialties of internal medicine and family practice. Team-based compensation is also more prevalent in small groups in which members have a similar level of experience and most members practice in the same specialty. In contrast to prior empirical research on partnerships, productivity levels for groups that use team-based compensation are not significantly lower than those that use individual compensation plans. In fact, physicians in groups with team-based plans earn significantly more income than those on salary-based plans. Finally, groups that use team-based incentives exhibit significantly less variation in productivity than those that use individual plans.

The remainder of this paper is organized as follows. Section 2 develops the research hypotheses. Section 3 discusses the sample and measures. Empirical tests are reported in Section 4. Conclusions and limitations are presented in Section 5.

2. Research Hypotheses

2.1 Background

The majority of medical doctors work in group practices that our owned by the physicians themselves.[2] Non-owner physicians working in physician-owned practices are typically new hires that will be granted an ownership interest after a few years of service (Lee, 1990). Medical group practices range in size from three physicians to upwards of 500, although most groups contain between five and 50 members.[3] The terms "partnership" and "group" are used interchangeably throughout this paper to refer to the provision of health care services by three or more physicians who are formally organized as a legal entity governed by physicians and who share business, clinical, and administrative facilities. This is consistent with the American Medical Association's definition of a medical group practice (Havlicek, 1999, p. 1).

Medical group practices are normally organized as limited liability corporations (LLC), limited liability partnerships (LLP), or partnerships. In all three organizational forms, the net proceeds of the entity pass through to its owners who are taxed at the individual level. The health care literature gives several reasons for the predominance of group practices in the medical profession. Groups enable physicians to exploit economies of scale (Pauly, 1996), smooth work schedules, and internalize referrals (Gaynor and Gertler, 1995). Pauly (1996) posits that some groups have the potential to structure and coordinate care so as to achieve higher quality and greater satisfaction.

---

[2] Medical practices that are not owned by physicians are typically owned by hospitals and foundations. Such practices are excluded from the analysis as physicians in this setting are simply employees of the outside entity that owns the practice.

[3] American Medical Association, Division of Survey and Data Resources. *Medical Group Practices in the U.S., 1999 Edition*.

Getzen (1984) suggests that groups enable members to benefit from reputational economies of scale. Outside of the health care literature, Levin and Tadelis (2004) show analytically that partnerships assure clients of higher levels of quality in human-capital intensive organizations where it is difficult for customers to observe product quality.

Although most physicians belong to group practices, physicians tend to work independently in treating patients (Pauly, 1996). As discussed in Ittner, Larcker, and Pizzini (2004), physicians independently examine patients, diagnose ailments, perform medical procedures, and provide other health care services. Differences in work habits, work pace, specialty, "bedside manner", and other factors produce intra-group variations in quantity of care provided, the value of care provided, and the amount of resources consumed in care provision. This results in different contributions to the group's net earnings.

Physician groups distribute earnings based upon individual performance or team performance. Under individual performance plans, each physician receives some combination of salary and annual cash bonus based which is usually based primarily upon his or her productivity (see Ittner et al., 2004 for a discussion of individual incentive schemes for physicians). Under a team performance plan, each physician receives an equal share of the net proceeds of the group, regardless of her individual output and effort. Equal sharing arrangements enable risk-averse professionals to insure themselves against idiosyncratic shocks to human capital (Gaynor and Gertler, 1995; Lang and Gordon, 1995). For physicians, idiosyncratic shocks include difficulties in fee collection, reputational damage due to malpractice, variations in insurance coverage, claims denial, no-shows, shifts in demands for specialties, and simply luck.

2.2 Determinants of team-based compensation

Theoretical literature on team-based compensation posits that a number of factors influence sharing rules within partnerships. This paper examines two key factors from this literature, the gains that accrue to the partnership when its members cooperate and the ability of group members to monitor each other.

2.2.1 Gains from cooperation

Professionals often use team-based compensation to encourage cooperation. Holmstrom and Milgrom (1990) and Itoh (1993) demonstrate that in cases where it is Pareto-efficient for agents to coordinate their efforts, it is optimal for principals to use simple group incentive plans to encourage this activity. Che and Yoo (2001) show that when productive interdependence is high, team-based compensation schemes increase members' incentives to monitor each other and increase the power of peer sanctions. Thus, the greater the potential productivity gains from cooperation, the more likely these gains will outweigh losses from free riding and reduce incentives to free ride.

Gains from cooperation are most significant when output requires productive interactions between multiple team members. In such cases, it is difficult, if not infeasible, to directly link output to individual members' actions. For example, physicians sometimes work in teams to perform complex surgeries or administer emergency care, and a team of lawyers works together to prepare significant cases. Even when output is not purely team-based, coordination can still improve collective output and reduce members' disutility for effort. Physicians often care for other partners' patients so that each member of the group practice is not constantly "on call." Physicians consult each other on difficult cases, work together to coordinate patient care, and refer patients to each other. This improves patient satisfaction and the quality of outcomes, which in turn, improves the group's' reputation and increases the value of the partnership.

Thus, the first hypothesis:

Hypothesis 1: The probability that a professional partnership uses team-based compensation is increasing in the degree of productive interaction and cooperation that takes place among group members.

2.2.2 Mutual monitoring

When it is advantageous to use team-based compensation, monitoring by team members can mitigate free-riding (e.g., Kandel and Lazear, 1992; Legros and Mathews, 1993; Narayanan, 1995; Miller, 1997; Che and Yoo, 2001; Huddart and Liang, 2004). If public signals of partners' individual efforts exist, group members can use these signals as grounds for imposing explicit or implicit sanctions upon fellow group members. Such signals are common in professional partnerships. Hansmann (1996) argues that quality and quantity of inputs are easily and closely monitored in professional service firms. For example, law and consulting firms regularly track the number of hours each partner bills to clients, while medical groups often use charges to measure performance. Most theoretical models rely on explicit contractual sanctions such as monetary penalties or the threat of expulsion.[4] However, some models demonstrate that peer pressure and social norms can create implicit sanctions, including guilt, shame and envy, that deter free

[4] In one-period models with budget-balancing, explicit sanctions require that a partner or group of partners outside the group being evaluated serve as the "sink" to administer punishments and rewards (Miller, 1997). Huddart and Liang (2004) preserve budget-balancing with explicit sanctions by distributing the risk associated with the payment schedule across the other partners of the firm. Narayanan (1995) and Che and Yoo (2001) use multi-period games to relax the budget-balancing constraint and enable partnerships to correlate reward with effort through threat of output or non-cooperation in future periods.

riding (e.g., Milgrom, 1988; Lazear, 1989; Arnott and Stiglitz, 1991; Kandel and Lazear, 1992; Encinosa et al, 1997).

Whether explicit or implicit, the effectiveness of mutual monitoring is expected to increase in the homogeneity of team members. Quite simply, it is easier (i.e., less costly) for a group member to monitor someone who is like himself in training and job responsibility than it is to monitor someone with a different skill set and job requirements (Kandel and Lazear, 1992; Encinosa, et al, 1997). In this way, homogeneity reduces the cost of monitoring, and correspondingly, the incentive for partners to shirk their monitoring responsibilities. Kandel and Lazear (1992) suggest that "peer pressure" to carry one's "fair share" of the group's work is stronger between partners that have similar backgrounds and training. Peer pressure relies on partners' feeling empathy for each other and empathy is likely to be stronger between partners that are similar. In such cases, shirking produces significant shame and/or guilt. Encinosa et al. (1997) contend that work norms create disutility for underperformers and that this disutility is enhanced when similarity and proximity facilitate effort comparisons.

Group size also affects mutual monitoring (Kandel and Lazear, 1992; Encinosa et al., 1997; Huddart and Liang, 2004;). Clearly, partners have more incentive to shirk the monitoring task as group size increases. However, Kandel and Lazear (1992) suggest that up to a point, monitoring effort may actually increase as group size increases if peer pressure becomes much larger with size. Kandel and Lazear give the example that in a firm of ten, the shirker has nine angry partners to face, while in a firm of three, she only has two. It is unlikely that mutual monitoring will be effective in very large firms because shirking of the monitoring task will dominate the effects of peer pressure. In a firm of 500 physicians, one physician may be able to observe 50 other partners, but the benefits of his monitoring are shared with the other 499 workers. Similarly, Encinosa et al. (1997) propose that larger groups require more stringently enforced work norms and greater social tension than small groups to induce the same level of effort. Thus, team-based production should favor smaller groups. They tested this proposition using survey data on 585 groups from 1978 and found that larger groups were significantly less likely to adopt equal sharing arrangements.

The literature on mutual monitoring suggests the following hypothesis:

Hypothesis 2: The probability that a professional partnership uses team-based compensation is increasing in the homogeneity of group members, and it is decreasing in partnership size.

2.3 Effects of team-based compensation on performance

Firms chose compensation systems to encourage workers to take appropriate actions. Therefore, I consider evidence on the relation between team-based competition and performance in the sections that follow.

2.3.1 Individual productivity

Ceteris paribus, agency theory generally contends that productivity per worker will be lower under team-based compensation arrangements than under individual incentive arrangements because team-based compensation schemes weaken the link between individual performance and compensation (e.g., Alchain and Demsetz, 1972; Newhouse, 1973; Holmstrom, 1982; Holmstrom and Milgrom, 1990). However, recent theoretical studies suggest that in certain settings, team-based compensation arrangements may be associated with greater productivity than individual schemes. As previously discussed, Kandel and Lazear (1992) and Encincosa et al. (1997) contend that team-based compensation in relatively small groups can produce sufficient peer pressure to counteract free-riding. Che and Yoo (2001) show that team-based incentives result in higher output in groups characterized by long-term, repeated interactions and production synergies. In such groups, team-based compensation creates implicit incentives for individuals to institute peer sanctions and it increases the resultant penalty associated with peer sanctions. Huddart and Liang (2004) show that team-based compensation schemes can lead to gains from improved incentives to monitor when only a subset of partners engage in monitoring.

Despite the large theoretical literature on team-based compensation, direct empirical evidence of the relation between team-based compensation and productivity is sparse (Newhouse, 1973; Leibowitz and Tollison, 1980; Weis, 1987; Hanson, 1997). Three particularly relevant empirical studies draw upon a 1978 survey of 6,353 physicians in 957 medical groups practices (Pauly and Gaynor, 1990; Gaynor and Gertler, 1995; Encinosa et al., 1997). Using data on 905 groups, Pauly and Gaynor (1990) found that perceived individual pay-performance intensity was positively associated ($p < 0.10$, two-sided) with productivity per physician and negatively associated ($p < 0.10$, two-sided) with group size. In a related analysis of a subset of 1,230 individual physicians, Gaynor and Gertler (1995) found that reductions in productivity associated with decreased pay-performance intensity were significantly greater ($p < 0.01$, two-sided) in larger groups. They concluded that individual productivity would be reduced when individual incentives were weakened either by introducing a fixed salary component to individual compensation or by increasing the degree of revenue sharing among group members. However, neither study directly tested the relation between team-based incentives and individual productivity. A third paper by Encinosa et al. (1997) used a subset of 488 groups from the 1978 survey to assess the effects of equal sharing arrangements on group productivity.[5] They found that in the smallest groups, productivity was not significantly associated with the use of equal-sharing plans, while in the largest groups, group productivity was significantly lower in equal-sharing groups. This analysis uses a more comprehensive and recent data set to revisit some of the issues addressed in Encinosa et al.'s study.[6]

In contrast to empirical studies of partnerships, research using large corporations does not provide evidence of free-riding. Weiss (1987) and Hansen (1997) consider agents' responses to the introduction of team incentive plans in large corporations where individual performance measures are available. Both studies find that the use of team-based compensation improves the performance of those who were less productive on individual schemes but decreases the performance of those that were more productive. Weiss also examines employee turnover and finds that team-based compensation plans tend to drive out the low-ability and high-ability workers, while retaining medium-ability workers. This suggests that the most able leave for firms that use individual compensation plans, while the less able leave because peer pressure makes their jobs too

---

[5] The following question was used to determine whether a group had a adopted equal sharing or not, "Excluding fringe benefits, what percentage of the total amount the group distributes to owner physicians is distributed based upon productivity?" (p. 27, Encinosa et al., 1997). It was assumed that equal sharing occurred when none of the proceeds was distributed based upon productivity.

[6] This study uses data collected in 1999 from 866 medical group practices. The data contain physician-level data on every member of the practice, including experience, productivity, specialty/subspecialty, and non-clinical responsibility. This enables us to conduct analyses at the physician-level as well as the group level. This study also uses a more direct measure of team-based compensation and include a more diverse set of specialties than prior studies. Moreover, the composition of physician groups, incentive arrangements in physician groups, and the health care environment in which physicians operate has changed dramatically since 1978. Most notably, group size has increased, group heterogeneity has increased, bills receive greater scrutiny from insurers, and substantially more physicians work in groups.

unpleasant. Other empirical work on team-based compensation in large corporations considers employee wages and pensions based upon the profits of the firms (see Prendergast, 1999, p. 42 for a review). These studies find that firms with profit-sharing plans outperform those that do not use profit-sharing plans.

Given that theoretical research on the performance effects of team-based compensation is mixed and empirical evidence is limited, following hypothesis is stated in the null:

Hypothesis 3: There is no difference in the productivity of professional partnerships that use team-based compensation plans and those that use individual compensation plans.

2.3.2 Intra-group variation in productivity

Team-based compensation plans also have implications for intra-group variability in performance. Under team-based compensation arrangements, partnerships composed of high-ability professionals will be reluctant to admit the low-ability professionals to the partnership so that they can avoid subsidizing less-able partners (Farrell and Scotchmer, 1988). Conversely, highly proficient professionals will select partnerships with members' whose ability matches their own. As a result, professionals will sort into partnerships of roughly equal ability. Aside from the selection effects created by team-based compensation plans, Kandel and Lazear (1992) suggest that peer pressure creates incentives that minimize deviations from group productivity norms. Underperforming partners feel shame and guilt, while those that outperform the group shame the remaining partners. Weiss's (1987) and Hansen's (1997) aforementioned empirical results were consistent with Kandel and Lazear: under team-based compensation plans, the output of low-performing and high-performing workers converged toward average output levels and firms retained works of medium ability. In summary, research on the selection and incentive and effects of team-based compensation suggests the following hypothesis:

H4: Intra-firm variation in productivity is lower in professional partnerships that use team-based compensation than those that use individual compensation plans.

3. Research Design

3.1 Sample

The data come from a nationwide survey developed and conducted by the Medical Group Management Association (MGMA). Surveys were mailed to 5,193 MGMA member practices in February of 1999 asking about their 1998 operations. Responses were received from 1,772 practices. The MGMA staff eliminated 114 surveys due to incomplete data reporting or duplication and 49 surveys due to late submission, yielding an adjusted response rate of 30.98%.

Consistent with the American Medical Association's definition of a group practice, we delete observations from practices with two or fewer members and practices that are not owned by physicians (Havelick, 1999, p. 1). The size restriction is also imposed because a minimum of two members is necessary for moral hazard to be present and three members to prevent shirking from being directly traceable. The final sample consists of 10,098 physicians in 866 medical group practices.[7]

[7] Practices in the sample tend to be somewhat larger than medical group practices in the American Medical Association (AMA) membership database, but are very comparable with respect to specialty composition. Medium group size is similar to AMA group size (7 vs. 6), but average group size for the MGMA sample is larger (13 vs. 10). The sample has relatively more medium-sized groups with 10 to 49 members (41% of all groups vs. 30%) and fewer groups containing from five to nine members (54% vs. 66%). The proportion of single-specialty groups in the sample (38% single-specialty and 62% multi-specialty) is very similar to that of AMA groups (40% single- specialty vs.60% multi-specialty). Also, specialty composition is quite comparable. In this sample, the proportions of physicians that work in primary care, non-surgical

3.2 Variable definitions

3.2.1 Team-based compensation and its hypothesized determinants

Team-based compensation. The dependent variable for the first three hypotheses is a dichotomous variable indicating whether the group uses team-based compensation or not. This variable is calculated from a survey question that asks respondents to indicate, for each physician in the practice, the method used to determine compensation from the following list: 100% salary (0% individual productivity), 50-99% salary (1-50% individual productivity), 50-99% individual productivity (1-50% salary), 100% individual productivity (0% salary), or 100% equal shares.[8] The first four categories reflect compensation plans that are based on individual performance.[9] Examples of productivity measures given in the survey instructions include gross charges, encounters, and relative value units (RVUs). Consistent with evidence in the practitioner literature (Hurley et al, 1996; Latham Consulting Group, 2001), this question assumes that individual performance-based compensation is a function of clinical productivity in this setting. The amount of compensation not based on productivity is defined as "fixed" or "guaranteed salary." Measures of individual performance that are not reflected in clinical productivity such as quality, patient satisfaction, and administrative responsibility, are typically incorporated into the fixed portion of an individual's compensation. The fifth category, 100% equal shares, captures team-based compensation. The variable *equal*

---

specialties, and surgical specialties are 30 percent, 47 percent, and 23 percent respectively. The corresponding proportions for AMA group physicians are 32 percent, 45 percent, and 23 percent.

[8] The survey also allowed an "other" response to this question. Of the 24,541 physicians in the MGMA database, only 217 (0.88%) gave this response. These responses are eliminated from our analyses.

[9] One could argue that anything less than 100% individual productivity-based pay indicates sharing among group members. We partition the sample by individual compensation category to address this.

shares equals one if the majority of group members indicated that the group used an equal-sharing plan to compensate physicians, and 0 otherwise.[10] In appendix B, Data on individual physician productivity and dollar compensation are used to validate the categorical survey responses. These tests suggest that categorical responses accurately represent the actual compensation method reported by the group.

Coordination and productive interaction. In medicine, the degree of cooperation that takes place within a practice is influenced by the importance of continuity in the physician-patient relationship, *individual* physician control over patient panel and work flow, and intra-group opportunities for teamwork. These factors vary dramatically by specialty. Consequently, in tests of hypothesis 1, *specialty* proxies for the degree of cooperation that takes place within a physician group. The manner in which continuity of care, control over patient panel, and opportunities for teamwork influence coordination and productive interaction within physician groups is discussed below.

Continuity of care refers to the longitudinal interpersonal relationship between patients and physicians that transcends multiple illness episodes and includes responsibility for preventative care and care coordination (Saultz, 2003). When continuity is important to care delivery, one physician cannot be easily substituted for another without compromising patient satisfaction and, possibly, quality. Essentially, the patient's welfare is tied to a *specific* physician. Continuity of care is a fundamental to primary care specialties, which include general pediatrics, internal medicine and family

[10] On average, 85% of members in groups classified as using equal shares actually receive an equal share of the groups proceeds. Often, new group members are compensated based upon salary for two-to-three years before being included in the division of firm proceeds.

practice (Nutting, et al.). Conversely, continuity is relatively unimportant in specialties like general surgery and anesthesiology, which provide care on an episodic basis, and continuity is nonexistent in consultative specialties, such as radiology and pathology, which require no direct patient contact (Taylor, 2003. The more important continuity is for a specialty, the less opportunity physicians have to share caseloads, and consequently, the less likely that groups in that specialty will use team-based compensation.

An individual physician in a group practice can potentially exert substantial influence on the size and nature of his patient panel, and hence, his own productivity (AIS, 2002). A physician can distinguish his services from those of others in the same specialty by building a strong reputation, which in turn leads to referrals from patients and/or other physicians and requests for consultations. Additionally, physicians can attract patients by marketing their services and/or offering extended hours. Some physicians can even influence the nature and size of the patient panel through the insurance plans they accept. Finally, individual work pace and lifestyle considerations all potentially influence the number of cases a physician chooses to handle. At one extreme, physicians in specialties like dermatology, ophthalmology, and plastic surgery can exert substantial control over their patient panel and work flow because they rely on their individual reputations to attract referrals and individually determine how many patients they choose to see in a day (Taylor, 2003). Conversely, physicians in hospital-based specialties (for e.g., emergency medicine, radiology, and pathology) have little control over their individual workflow, which is driven by overall patient volume at the hospital. The more influence any one individual physician can exert on his patient panel and work flow, the stronger the link between individual effort and output. Accordingly, specialties in which individual physicians exhibit considerable influence on their respective patient panels and work flow would be less likely to use team-based compensation plans.

Teamwork in medicine can take various forms.[11] Although rare, multiple physicians may work simultaneously on a single patient (Pauly, 1996). Examples of this include a team of surgeons that perform a complex surgery and a group of emergency room physicians that provide urgent care to a critically injured patient. A more common form of teamwork occurs when physicians share responsibility for the group's case load. Examples of this general surgeons sharing call, an obstetrician covering a prenatal visit for a partner who was called to the hospital to deliver a baby, and hospital-based radiologists dividing up the x-ray films that need to be reviewed on a particular day (AIS, 2002). Teamwork can also include intra-group consultations, knowledge-sharing, and mentoring.

Intra-group cooperation and productive interaction is operationalized by rating each specialty with respect to continuity, physician control over patient panel, and teamwork.[12] Specialties with lower ratings exhibit greater intra-group coordination, and hence, should be more likely to use team-based compensation. Details of the ratings are contained in Appendix C. An indicator variable for each of the twenty most prominent specialties is included in the regression tests of hypothesis 1. The omitted specialty is internal medicine. Predicted signs for each specialty are included in the regression results and Appendix C.

---

[11] Teamwork is prominent hospital-based specialties, where cases are driven by overall volume at the hospital and physicians group is responsible for processing cases as they come. Teamwork is also prominent in specialties in which hours are unpredictable because of the acute nature of ailment.

[12] Ratings based upon physician interviews and literature on medical careers.

Diversity in specialty, non-clinical responsibility, experience, and gender. Physicians within the same groups can differ on several important dimensions that influence the effectiveness of mutual monitoring including specialty, non-clinical responsibility, experience, and gender. For example, physicians in the sample practice in one of 36 different general specialties.[13] While all physicians receive the same basic training in medical school, the skills, knowledge, and experience acquired in residency and private practice differ dramatically by specialty. Thus specialty diversity increases monitoring costs and reduces peer pressure to meet group work norms. Within-group heterogeneity in specialties is measured by scaling the number of different specialties in a group by the number of physicians in the group. When the value of this variable (denoted *Specialty Diversity*) equals its maximum of one, every member of the group is in a different specialty.[14] The diversity measure, *Specialty Diversity*, is expected to be negatively associated with the use of team-based compensation.

Similarly, differences in non-clinical responsibility, experience, and gender increase group members' monitoring costs and decrease feelings of loyalty and empathy within the group. The survey provides information on the proportion of a physician's time devoted to non-clinical activities such as research, administrative work, and teaching (denoted *Non-clinical).* Heterogeneity in non-clinical responsibility is measured with the

---

[13] Physicians in these 36 general specialties can be further divided into 84 different specialties/subspecialties. For example, the general specialty of orthopedic surgery includes sub-specializations in hand and upper extremities, hip and joint replacement, spine, sports medicine, trauma, and pediatrics. I also computed a measure of specialty diversity using all 86 different specialties/subspecialties. This measure gives similar results in subsequent tests. Appendix A shows the relation between the 36 general specialties and the 86 specialty/subspecialty classifications.

[14] I also computed specialty diversity using the sum of the squares of the proportion of group members in each specialty and the log of the number of different specialties in the group. These measures yielded materially similar results in subsequent tests of the hypotheses.

within-group standard deviation of the proportion of time a physician devote to non-clinical task. This variable is called *Non-clinical Diversity*. The variable *Experience* represents the number of years since residency that each physician has been practicing in his specialty. Intra-group diversity in physician experience, denoted *Experience Diversity,* is measured with the within-group standard deviation of *Experience.* I predict that the variables *Non-clinical Diversity* and *Experience Diversity* will be negatively associated with probability that a group uses team-based compensation. The variable *%same gender* is the percentage of a group's physicians that are of the same gender. Higher values of the variable *%same gender* indicate less gender heterogeneity; therefore, I expect this variable to be positively associated with the use of team-based compensation.

Experience. Monitoring and peer pressure will be more effective with partners who have worked together and/or have known each other for a long period of time when compared with partners that have spent little time working together (Kandel and Lazear, 1992; Encinosa et. al., 1997). Che and Yoo (2001) specifically predict that long-term working relationships favor team-based compensation. Moreover, the longer a physician has been in practice, the greater the information on his ability. This enables the physician to find a group with doctors of similar ability and for such groups to find him. The variable *Ln Avg. Experience* is the log of the average experience level for the group. The average experience level of the group is expected to be positively associated with the use of team-based compensation.

Group size. As practice size increases, mutual monitoring becomes less effective, reducing the benefits of team-base compensation. Group size is measured with the variable, *Ln Size*, which is the log of the number of physicians in the practice. Recall that Kandel and Lazear (1992) suggest that the benefits from monitoring may initially increase with the number of employees before it decreases. To accommodate changes in the direction of the relation between size and the use of team-based compensation, I also measure group size with five indicator variables. The variables *7-10 Physicians, 11-15 Physicians, 16-20 Physicians, 21-30 Physicians*, and *>31 Physicians* equal one if the number of physicians in the group falls within the respective size categories, and zero otherwise. The omitted category represents practices with six or fewer physicians.[15] I predict that *Ln Size* and the indicator variables for the larger size categories to be negatively associated with team-based compensation.

3.2.2 Productivity measures

Individual productivity. The fourth hypothesis examines that relation between productivity and the use of team-based compensation. Productivity is measured with two variables, gross professional charges and total compensation. Gross professional charges (denoted *Charges*) are the total gross patient charges attributed to all professional services before reduction by charitable adjustments, professional courtesy adjustments, and contractual adjustments, etc. Gross charges capture both the time and intensity of treatment administered. Gross charge may also reflect quality, as more skilled physicians may demand higher prices. Total compensation (denoted *Income*) includes salary, bonuses, incentive payments, research stipends, and distribution of profits. Total compensation reflects effort in both clinical and non-clinical tasks.

[15] Only 3 groups that used team-based compensation had more than 30 members.

Intra-group variation in productivity. The dependent variable for our fifth hypothesis is intra-group variation in charges, and it is measured using the within-group standard deviation of charges for each group (denoted *Std Dev Charges*).

3.2.4 Control Variables

Other specialties. As previously discussed, physicians can practice in one of 36 different general specialties. Predictions relevant to the most prominent specialties are contained in Appendix C. However, there were six specialties (ophthalmology, otolaryngology, urology, allergy, neurology, and pulmonary medicine) for which no prediction was made. The degree of cooperation and productive interaction in these specialties is not expected to differ from that of internal medicine, the omitted control. However, indicator variable for these specialties are included in test of hypotheses to control for systematic variations in practice style and market conditions that potentially affect the choice of compensation contract.

Capitation. The proportion of revenues derived from capitation plans potentially influences the choice of incentives and physician productivity (Pauly and Gaynor, 1990; Gaynor and Gertler, 1995). Capitation (denoted *Ln Capitation*) is measured using a logarithmic transformation of the percentage of revenues derived from capitation plans because this distribution is highly skewed.[16] While capitation levels range from 0% to 100% (mean = 5.0%), the majority of practices (64.6%) receive no capitation payments.

Market conditions. Compensation methods in medical practices are likely influenced by market factors, such as the degree of competition, the extent of HMO

[16] *Ln capitation* = ln[(capitated revenues/ total revenues)*100 + 1]. We repeated the analysis using the straight percentage of revenues derived from capitation (capitation revenues/total revenues). The use of this alternative variable had no material affect on the results.

penetration, and the demand for physician services (Hurley et al., 1996; Leone, 2002). I control for these factors with regional indicator variables (*Northeast, North Atlantic, Mid-Atlantic, Rocky Mountain, Northwest, Southwest, Eastern Midwest, Lower Midwest, Upper Midwest, Southern California, and Northern California*) and metropolitan indicator variables (*Urban, Suburban,* and *Rural)*. The Upper Midwest and Urban indicator variables are excluded from the models.

Physician characteristics. To test the relation between team-based compensation and productivity (hypothesis 4) the following physician-level variables are introduced: specialty, non-clinical responsibility, experience, gender, and the pay-performance intensity of individual contracts. I include a different indicator variable for each individual specialty in tests of the relation between team-based compensation and productivity. The indicator variables equal one if a physician practices in a particular specialty, and zero otherwise. The omitted specialty is internal medicine. The specialty variables also potentially control for market factors and risk aversion. Moreover, different specialties have different risk exposure and will attract physicians with difference risk preferences. I control for a physician's non-clinical responsibility the variable *Non-Clinical*, which equals the percentage of full-time-equivalent (FTE) units that a physician devotes to non-clinical work. The extent of a physician's non-clinical responsibilities (resident training, research, and administration) is expected to reduce clinical productivity, as non-clinical responsibilities decrease the time available for clinical tasks. Physician age and experience have also been shown to influence clinical productivity. Pauly and Gaynor (1990) find that physician productivity improves with experience for most of a physician's work life, but is eventually counteracted by increasing age.[17] In contrast, research outside of the health care sector predicts that productivity will decline with experience because less experienced professionals will work harder in the absence of individual performance-based contracts in order to convince other partners that they have high potential and/or to increase the likelihood the less experienced professional will survive in the group long enough to attain the high compensation earned by more experienced partners (Akerlof and Katz, 1989; Lazear, 1991; Landers et al., 1996; Gompers and Lerner, 1999). To control for experience, I use both the log and the square of the number of years the physician has practiced beyond residency (denoted *Ln Experience* and $Experience^2$, respectively). The indicator variable, *Male,* potentially controls for risk preferences. The economics and psychology literatures generally suggest that men are less risk-averse than women.[18] *Male* equals one if the physician is a male and zero otherwise.

Finally, I also include a set of variables to control for the pay-performance intensity of individual performance contracts in firms that do not use equal sharing arrangements. As discussed in section 3.2.1, survey respondents indicated the method used to determine compensation from the following list: 100% salary (0% individual productivity), 50-99% salary (1-50% individual productivity), 50-99% individual productivity (1-50% salary), 100% individual productivity (0% salary), or 100% equal

[17] Using the same dataset, Gaynor and Gertler (1995) and Encinosa et al. (1997) find the same result.

[18] Surveys of pension allocations provide evidence that the wealth holdings of men are more risky than those of women (Jianakopolos and Bernasek, 1998; Sunden and Surette, 1998; Bajtelsmit, Bernasek, and Jianakopolos, 1999). Experimental research finds that men are less risk averse than women toward investments and gambles (Barsky, Juster, Kimball, and Shapiro, 1997; Levin, Snyder, and Chapman, 1988; Powell and Ansic, 1997). There is also evidence that male mutual fund investors exhibit more risk-taking than their female counterparts (Dwyer, Gilkeson, and List, 2002). If men are less risk-averse, then they should prefer individual performance-based contracts. If this is the case, *%Male* will be negatively associated with team-based compensation.

shares. The first four categories are coded with indicator variables. *100% Salary, 50-99 Salary, 50-99% Productivity,* and *100% Productivity* equal one if the productivity component of a physician's individual compensation contract falls within the respective risk grouping, and zero otherwise. When these variables are included in the regression, the omitted variable represents a 100% equal-sharing contract.

3.3 Descriptive statistics

Descriptive statistics are reported in Table 1. Panel A provides information on individual physician characteristics. Physicians that belong to groups that use team-based compensation plans differ significantly from those that practice in groups that use individual compensation plans. Physicians in team-based compensation groups generate significantly more charges (mean = $1,105,425 vs. $856,424; median $923,00 vs. $637,300) and receive higher total compensation ($351,698 vs. 254,102; median $309,087 vs. $207,837). On average, physicians in team-based compensation groups are more likely to be male (93% vs. 84%) and have somewhat more experience (mean 15.9 years vs. 13.7 years; median 14 vs. 13). When groups use individual compensation plans, they include at least some productivity-based component in 85 percent of the cases. The productivity-based component constitutes more than half of total compensation for 65 percent of physicians that are paid based upon individual (vs. group) performance.

Panels B and C show *group-level* characteristics. Groups using team-based compensation plans exhibit significantly less intra-group variation in charges (mean $280,339 vs. $336,876; median $218,324 vs. $255,205) and income. Team-based compensation also tends to favor the specialties of anesthesiology, radiology, and general surgery. Groups using team-based compensation plans exhibit less variation in specialty (mean 0.17 vs. 0.23), non-clinical responsibility (0.05 vs. 0.07), and experience (7.37 vs. 8.00) than those using individual plans.

3.6 Correlations

Table 2 provides Pearson correlations among the group-level predictor variables. Experience is highly correlated with experience diversity ($r = 0.47$, $p < 0.01$, two-tailed). Other correlations are quite small, suggesting no problems with multicollinearity among variables of interest.

4. Results

4.1 Determinants of team-based compensation

Proxies for interdependence, diversity, size, and competition are used to predict the probability that a medical group uses equal sharing. Results of these group-level tests are reported in Table 3. Partition 1 uses the full sample of 866 groups (137 use equal shares and 729 use individualized plans) and differ only in their proxies for size. In partitions 2 through 4, the sample is divided according to the size of the clinical productivity component of plans employed by the groups that base pay on individual performance. Of the 729 groups in the sample that use individualized plans, 642 groups (88 percent) incorporate at least some clinical productivity-based incentive, 516 groups (71 percent) base at least half of a member's income on clinical productivity, and 300 groups (41 percent) base a member's entire compensation on clinical productivity.[19] Models 2 through 4 compare groups that use equal sharing to those that have an

[19] Note that the percentages for productivity-based incentives do not correspond to those in Table 1 (panel A) because these percentages are computed based upon the predominant method of compensation use by the group, while those in Table 1 (panel A) are based upon individual compensation methods.

individual clinical productivity component that comprises at least one percent of total pay, 50 percent or more of total pay, and 100 percent of total pay, respectively. Negelkerke R^2s in range from 28% to 50%, with partition 4 having the greatest explanatory power.

Consistent with the first hypothesis, equal-sharing plans are significantly more prominent in anesthesiology (p<0.01, one-sided) and the consultative specialties of pathology and radiology (p<0.01, one-sided). The indicator variable for hematology/oncology is positively associated with the use of team-based compensation in all partitions, however the relation is significant (p<0.10, one-sided) only in partitions 2 and 4. This is likely attributable to the relatively low number of groups in this specialty. As predicted, the specialties of cardiology, gastroenterology, and nephrology practices, which have invasive components, are significantly (p<0.01 to p<0.05, depending on partition) more likely to use equal-sharing plans. Similarly, physicians in general surgery and its subspecialties use equal-sharing plans more often than physician in internal medicine. OBGYN groups also tend to favor equal-sharing plans (p<0.10, one-tailed) presumably because the unpredictable timing of deliveries requires them to fill in for one another to effectively care for patients.

One concern with the use of specialty to measure productive interaction is that specialty may also proxy for risk. For example, general surgeons face higher risk of malpractice than physicians in internal medicine, thus they may be more likely to share group proceeds to mitigate risk However, physicians in obstetrics/gynecology face higher malpractice premiums than general surgeons, yet general surgery shows a stronger tendency toward equal-sharing arrangements. Similarly, radiologists and pathologists have relatively low malpractice risk, yet the coefficients suggest that radiologists and pathologists use team-based compensation more often than general surgeons.

The measures for group diversity support hypothesis 2, which predicts that heterogeneous groups will not adopt equal-sharing arrangements. Intra-group diversity in the types of specialties practiced (denoted *Specialty Diversity*) is negatively and significantly ($p<0.05$, one sided partitions 1 and 4; $p<0.01$, one sided, partitions 2 and 3) associated with the probability that groups use team-based compensation. Diversity in experience levels is also negatively and significantly ($p<0.05$, one-sided) associated with equal-sharing. Also consistent with hypothesis 3, *%same gender* is positively and significantly associated with the use of equal-sharing arrangements ($p<0.05$ to $p<0.10$, one-sided) in the first 3 partitions.

Hypothesis 2 also predicts that firm size will be negatively associated with the use of equal-sharing plans. Consistent with this prediction and prior empirical research on physician partnerships, rather large groups (those with 31 or more members) are significantly less likely to adopt equal-sharing plans than very small groups (3-6 physicians). However, in most partitions, groups size has little impact on compensation method when the group contain 30 or fewer members.

4.2 The relation between team-based compensation and productivity

Tests of hypothesis 3 are conducted at the individual *physician level*. Both measures of physician productivity (*Charges* and *Income*) are regressed on indicator variables for the type of compensation plan (*Equal Shares* or *100% Salary, 1-50% Salary, 50-100% Productivity,* and *100% Productivity*), along with physician-specific and group-level characteristics that are likely to influence productivity. I use Huber/White robust standard errors to assess the significance of coefficients because observations from physicians in the same group may not be independent (Huber, 1967; White, 1980). Robust standard errors enable us to relax the assumption of independence within practices.

Table 4 contains ordinary least squares regression estimates for the sample. R-squares for both the charge and income regressions range from 0.35 to 0.37. Models 1 and 3 compare charges and income for physicians in all individual plans to those in equal sharing plans. Models 2 and 4 compare the income of physicians in each different individual incentive plan (*100% Salary, 50-99% Salary, 50-99%, Productivity, 100% Productivity*) to that of physicians in equal-sharing arrangements. There is no significant difference in charges (models 1 and 2) generated by groups that use equal-sharing plans and those that use individual compensation. Conversely, the relation between income and the use of equal-sharing plans depends upon the size of the productivity component (i.e. bonus) in the individual plans. Physicians receiving 100 percent and 50-99 percent of their total compensation as salary earn significantly ($p<0.01$, $p<0.05$, two-tailed, respectively) less than those in equal-sharing arrangements ($65,233 and $35,670 less income, respectively). Physicians in individual plans with productivity components of 50-99 percent also earn less ($23,743) than those in equal-sharing arrangements, however, this difference is only significant at level of 12 percent (two-sided). There is no significant difference in the income earned by physicians whose pay is based entirely on individual productivity and those in equal-sharing arrangements. Compensation plans affect income, but not gross professional charges. Gross charges do not include contractual adjustments,[20] bad debt adjustments, professional courtesy adjustments, etc. Physician income takes into account all adjustments to gross charges, as well as all practice costs. Thus, the results suggest that physicians in equal-sharing and individual productivity-based plans collect a higher percentage of amounts billed and are more effective at controlling practice costs than those on individual plans with a small productivity component or no productivity component.

As expected, several physician-level controls are significantly associated with charges and income. The extent of a physician's non-clinical responsibility has a large and significantly ($p<0.01$, two-sided) negative impact on charges, but not productivity. This seems reasonable, as physicians with significant administrative, teaching, and other non-clinical responsibilities still expend effort which contributes to group proceeds; however, this effort is not captured in charge measures. Consistent with prior research, the log of a physician's experience in a specialty (denoted *Experience*) is significantly ($p<0.01$, two-sided) and positively associated with both productivity measures, while the square of a physician's experience is negatively ($p<0.01$, two-sided) associated with both productivity measures. This suggests that physician productivity improves substantially with experience early in a physician's career, and then declines as a physician nears retirement. Male physicians generate significantly ($p<0.05$, two-side) more charges and earn significantly ($p<0.01$, two-sided) higher income than female physicians. In reviewing the group-level controls, it is interesting to note that intra-firm diversity among specialties is significantly and negatively associated with both charges and income. This is consistent with Pauly's (1996) observation that economies of scope are limited in

[20] Contractual adjustments are pre-established negotiated rates with payers such as private indemnity insurers, health maintenance organizations, Medicare, and Medicaide.

medicine. Contrary to prior empirical research, size is not significantly and negatively associated with productivity in physician groups with 30 or fewer members (Gaynor and Pauly, 1990; Gaynor and Gertler, 1995; Encinosa et. al., 1997). However, as size increases beyond 30 members, charges and income significantly decline. In the sample, physicians belonging to groups with more than 30 members generated approximately $69,209 less in charges and earned $25,433 less on average than groups with six or fewer members.

4.3 Team-based compensation and intra-firm variation in productivity

We conduct tests of hypothesis 4 at the *group* level by regressing the intra-firm standard deviation in gross charges on compensation plan and a set of control variables. Table 5 contains ordinary least squares regression estimates for the sample. Adjusted r-squares for both models are approximately 0.27. As predicted, intra-group variation in gross charges is significantly ($p<0.05$, two-sided) lower in firms that use equal-sharing arrangements when compared with those that use individual compensation plans. This is consistent with the premise that firms use individual productivity-based plans to attract high-performing members.

5. Conclusion

This paper examines factors influencing the use of team-based compensation in professional service partnerships and the relation between team-based compensation and performance. Drawing on the theoretical literature on teams, I predict that team-based compensation plans will be more prevalent in groups that benefit from cooperation, in small groups composed of homogeneous members, and in groups that face little competition from the labor market. The data set of physician practices generally provides support for the first two predictions. Physicians in specialties that require relatively high degrees of cooperation (anesthesiology, pathology, radiology, cardiology and general surgery), are significantly more likely to share group proceeds equally among all members than physicians in the primary care specialties. Small groups (ten or fewer members) composed of members who practice in the same specialty and have similar experience levels are more likely to use equal-sharing plans than groups whose members vary in specialty and experience.

Results on the performance effects of team-based compensation are particularly interesting. In contrast to prior research, physicians in team-based compensation schemes are not less productive than those that use individual plans. In fact, physicians in equal-sharing arrangements earn significantly more income than those in individual salary-based plans. Consistent with prior research, firms that use equal-sharing arrangements exhibit significantly less variation in productivity than those that use individual plans; however, it is not clear as to whether this is due to selection or incentives.

This study is subject to a number of limitations. As with prior compensation research, this study excludes a variety of direct and indirect compensation sources (e.g., pensions, insurance, perquisites, future capital gains from the sale of partnership stakes, etc.). Furthermore, the design of the survey question used to assess compensation presents some concerns. Twenty-five percent of the groups in the sample use individual compensation plans which include salary components equal to 50 percent or more of total compensation. More information on the specifics of salary setting in such plans would be desirable, as salary-based plans suggest some sort of sharing arrangement. Cross-sectional studies such as this can establish associations, but not causality. Future studies using panel data would enable researchers to investigate the performance effects of introducing and discontinuing team-based compensation plans. Finally, analysis of professionals in the single field of medicine limits the ability to generalize the findings to other professions and work settings.

Despite these limitations, this research makes several contributions to the literature on team-based incentives. First, I test for factors, other than group size and risk-aversion, that influence the adoption of team-based compensation. Thus this research provides some of the first evidence on recent theories of the role of cooperation, peer pressure, and mutual monitoring in teams (Kandel and Lazear, 1993; Encinosa et al., 1997; Che and Yoo, 2001; Huddart and Liang, 2004). Second, in sharp contrast to prior research on partnerships, the results suggest that team-based compensation does not necessarily lead to lower productivity. Third, equal-sharing has implications for variation in productivity, potentially suggesting that equal-sharing is best used when workers are of similar ability and/or when groups seek to attract workers of similar ability. Finally, this study also has implications for other professional service firms, as well as corporations that require employees to work in teams.

Appendix A: Table A-1
Number of physicians by subspecialty (5-digit code) and specialty (2-digit code)

Specialty/sub-specialty (5-digit code)			Specialty (2-digit code)		
1	Allergy/Immunology	99	1	Allergy/Immunology	99
2	Anesthesiology	530	2	Anesthesiology	558
2.01	Anesthesiology: Pain Mgt	28	2		
3.01	Cardiology: Invasive	282	3	Cardiology	1084
3.011	Cardiology: Inv-Intervntnl	491			
3.02	Cardiology: Noninvasive	311			
4	Critical Care	9	4	Critical Care	9
5	Dentistry	5	5	Dentistry	5
6	Dermatology	100	6	Dermatology	108
6.01	Dermatology: MOHS Surg	8			
7	Emergency Medicine	86	7	Emergency Medicine	86
8	Endocrinology/Metabolism	38	8	Endocrinology/Metabolism	38
9.01	Family Practice (w/ OB)	358	9	Family Practice	1260
9.02	Family Practice (w/o OB)	893			
9.03	Family Practice: Sp Med	9			
10	Gastroenterology	287	10	gastroenterology	287
11	Genetics	1	11	Genetics	1
12	Geriatrics	9	12	Geriatrics	9
13	Hematology/Oncology	125	13	Hematology/Oncology	150
13.01	Oncology (only)	25	13		
14	Infectious Disease	49	14	Infectious Disease	49
15	Internal Medicine	955	15	Internal Medicine	986
15.01	Internal Med (Hospitalist)	31	15		
16	Neonatal Medicine	12	16	Neonatal Medicine	12
17	Nephrology	115	17	Nephrology	115
18	Neurology	173	18	Neurology	173
20	Nuclear Medicine	11	20	Nuclear Medicine	11
21	Obstetrics/Gynecology	554	21	Obstetrics/Gynecology	626
21.01	Gynecology (only)	56			
21.03	Maternal & Fetal Medicine	16			
22	Occupational Medicine	21	22	Occupational Medicine	21
23	Ophthalmology	274	23	Ophthalmology	315
23.06	Ophthalmology: Retina	36			
23.07	Ophthalmology: Ped	5			
24	Orthopedic Surgery	699	24	Orthopedic Surgery	1195
24.01	Ortho: Foot & Ankle	40			
24.02	Ortho: Hand & Upper Ext	92			
24.03	Ortho: Hip & Joint Repl	78			
24.04	Ortho: Spine	118			
24.05	Ortho: Sports Medicine	138			
24.06	Ortho: Trauma	18			
24.07	Ortho: Pediatric	12			

Appendix A: Table A-1 continued					
Specialty/sub-specialty (5-digit code)			**Specialty (2-digit code)**		
25	Otolaryngology	174	25	Otolaryngology	178
25.03	Otolaryngology: Ped	4			
26.01	Pathology: Anatomic	45	26	Pathology	69
26.02	Pathology: Clinical	24			
27	Pediatrics/Adol Med (Gen)	524	27	Pediatrics - general	566
27.01	Ped: Allergy/Immunology	2			
27.02	Ped: Cardiology	13			
27.04	Ped: Critical Care	1			
27.06	Ped: Endocrinology	7			
27.07	Ped: Gastroenterology	10			
27.08	Ped: Hematology/Oncology	2			
27.09	Ped: Infectious Disease	2			
27.1	Ped: Intensivist	2			
27.12	Ped: Nephrology	3			
27.13	Ped: Neurology	0			
27.14	Ped: Pulmonology	0			
27.15	Ped: Rheumatology	0			
27.16	Ped: Sports Medicine	0			
28	Physiatry (Phys Med & Rehab)	67	28	Physiatry	67
29	Podiatry: Nonsurgical	8	29	Podiatry	43
29.01	Podiatry: Surg-Forefoot Only	8			
29.02	Podiatry: Surg-Foot & Ankle	27			
31	Psychiatry	35	31	Psychiatry	38
31.02	Psychiatry: Child & Adol	3			
32	Pulmonary Medicine	138	32	Pulmonary	177
32.01	Pulm Med: Crit Care-Hosp	39			
33	Radiation Oncology	32	33		32
34.01	Radiology: Diag-Invasive	95	34	Radiology	359
34.02	Radiology: Diag-Noninv	264			
35	Reproductive Endocrinology	5	35	Reproductive Endo.	5
36	Rheumatology	71	36	Rheumatology	71
37	Surgery (General)	429	37	General surgery	934
37	Surg: Cardiovascular	187			
37.01	Surg: Colon & Rectal	10			
37.04	Surg: Neurological	133			
37.05	Surg: Oral	14			
37.06	Surg: Pediatric	8			
37.07	Surg: Plastic & Rec	33			
37.07	Surg: Plastic & Rec - Hnd	17			
37.07	Surg: Thoracic (only)	17			
37.07	Surg: Trauma	3			
37.08	Surg: Vascular (only)	83			
38	Urology	330	38	Urology	335
38.01	Urology: Pediatric	5			
39	Other Physician Specialty	27	39	Other	27
	Total	10,098			10,098

Appendix B
Validity Tests for Compensation Measures

The compensation measures in this study were based on categorical responses to a survey question that asked respondents to select, "the method that most closely represents how each provider's compensation in computed" from the following list: 100% Productivity, 50% to 99% Productivity, 50 to 99% Guaranteed Salary, 100% Straight Salary, and 100% Equal Shares. In this appendix, income and productivity data are used to validate these survey responses.

Table B-1 contains summary statistics on compensation per physician, intra-group variation in compensation, and pay-performance sensitivity for equal-sharing groups and individual-performance groups (100% Productivity, 50% to 99% Productivity, 50 to 99% Guaranteed Salary, and 100% Straight Salary).[21] Agency theory contends that compensation should be higher for those physicians that face greater compensation risk, i.e., those that have a greater percentage of their compensation based upon individual productivity. Consistent with theory, average total compensation per member increased significantly ($p<0.01$, two-sided)[22] as the proportion of total compensation based upon *individual* productivity increased.[23]

---

[21] Groups may use different compensation methods with different members. Therefore, we include in the analysis only those groups that use the same compensation method with at least 60 percent of members (i.e., predominant method of compensation). Furthermore, as we are conducting comparisons across compensation methods at the group level, we compute the various group-level statistics using only those group members that are compensated with the predominant compensation method.

[22] Significance level refers to constants and coefficients from an ordinal logistic regression of compensation category on compensation per member.

[23] Groups that use equal-sharing arrangements are not included in the income analysis as theory does not make a clear prediction regarding the relation between equal-sharing plans and various types of individual productivity-based plans.

In theory, all members of an equal-sharing group should receive the same amount of compensation. In the sample of 118 equal-sharing groups, there were 43 groups in which all members received the exact same amount of compensation. These slight variations in compensation are potentially attributable to differences in vacation time, personal leave (e.g., maternity leave), recognition of additional administrative responsibilities, and other factors. Also, the survey question asked respondents to select the compensation method that most *closely* reflects the method used by group; therefore, slight performance-based variations may exist even if the majority of net proceeds are distribution equally. Still, it is expected that intra-group variation in compensation will be substantially smaller in equal-sharing groups than in individual-performance groups. Consistent with this, the mean and median intra-group standard deviation of compensation were significantly ($p<0.001$, two-sided) smaller for equal-sharing groups ($27,536 and $14,884, respectively) than the corresponding mean and median values for individual-performance groups ($91,515 and $68,337, respectively). The mean and median standard deviation in compensation for equal-sharing groups were even significantly ($p<0.01$, two-sided) smaller than the corresponding values for 100% straight salary groups ($65,494 and $43,006, respectively), which exhibited the least amount of variation of all the individual-performance groups.

Finally, agency theory suggests that pay-performance sensitivities should be relatively low in equal-sharing arrangements and salary-based because these compensation methods weaken the link between individual performance and pay. To see if this premise holds in the MGMA data set, the following model was estimated for each group:

$$\text{Compensation}_i = \alpha_i + \beta * \text{Charges}_i + \varepsilon_{i,}$$

where the subscript *i* refers to the individual physician. The variable, *Charges*, was the total gross amount billed for all services rendered by an individual physician and it measures individual productivity. The coefficient β provided an estimate of the pay-performance sensitivity for the group. The regression was run using cross-sectional data because time-series data for each physician were not available. The coefficient on *Charges*, β, was significant at the ten percent level (two-sided) for only 19 of the 77 equal-sharing groups that had sufficient data to estimate the model, suggesting that individual productivity was not significantly associated with individual compensation in equal-sharing groups. In contrast, among the 263 groups that compensated members based entirely upon individual productivity, charge coefficients for 210 groups were significant at the 10 percent level (two-sided). Consistent with theory, pay-performance sensitivity in individual-performance groups was significantly ($p<0.01$, two-sided) larger in groups that based larger proportions of pay on individual productivity.[24] Moreover, the mean and median estimates of pay-performance sensitivity for equal-sharing groups (0.080 and 0.048, respectively) were significantly ($p<0.05$, two-sided) smaller than corresponding values for 100% straight salary groups (0.147 and 0.126, respectively), which had the lowest pay-performance sensitivity of all individual-performance groups. In summary, these tests suggest that the categorical survey responses are reasonably accurate measures of the actual method used to compensate physicians.

[24] Significance level refers to constants and coefficients of an ordinal logistic regression of compensation category on charge coefficient.

Table B-1
Summary Statistics on Compensation and Estimated Pay-Performance Sensitivity by Compensation Method[1]

		Total Compensation[3]		Standard Deviation of Compensation[4]		Standard Deviation of Compensation as a % of Total Compensation[5]		Estimated Pay-Performance Sensitivity[6]		
	N[2]	**Mean**	**Median**	**Mean**	**Median**	**Mean**	**Median**	**N[2]**	**Mean**	**Median**
All groups	802	299,475	259,466	82,101	59,419	27.3%	26.0%	702	0.243	0.226
Equal shares	118	351,172	320,874	27,536	14,884	8.5%	5.0%	77	0.080	0.048
Individual performance[7]	684	290,557 **	250,842 **	91,515 **	68,337 **	30.5% **	28.8% **	684	0.263 **	0.245 **
100% Salary[8]	*75*	*245,759*	*204,717*	*65,494* **	*43,006* **	*23.6%* **	*20.2%* **	*60*	*0.147* *	*0.126* *
50-99% Salary	*123*	*269,323*	*246,958*	*69,817*	*56,099*	*26.2%*	*23.7%*	*104*	*0.241*	*0.152*
50-99% Productivity	*209*	*298,421*	*260,088*	*80,923*	*64,746*	*28.0%*	*27.2%*	*198*	*0.247*	*0.237*
100% Productivity	*277*	*306,182*	*251,150*	*116,187*	*88,245*	*36.2%*	*34.7%*	*263*	*0.310*	*0.300*
Chi-square[9]		*8.79* **							*37.77* **	
ANOVA F		5.978 **		26.609 **		59.405 **			7.985 **	

**, * Statistically significant at 1% and 5% levels (two-sided), respectively.
[1] Method of compensation used with at least 60% of group members, i.e., predominant method of compensation for the group.
[2] Number of groups used to compute statistics for specified compensation method. The number of groups for estimated pay-performance sensitivity is lower than the number used for the other variables because fewer groups had sufficient data to calculate pay-performance sensitivity.
[3] Average total compensation per group member calculated based upon group members that receive predominant method of compensation.
[4] Standard deviation of total compensation for group calculated based upon group members that receive predominant method of compensation.
[5] Standard deviation of total compensation divided by mean total compensation.
[6] The following model is estimated for each group: $Compensation_i = \alpha_i + \beta * Charges_i + \varepsilon_{i,}$ where the subscript *i* refers to the individual physician. The coefficient β provides an estimate of the pay-performance sensitivity in the group.
[7] ** and ** refer to significance levels for tests comparing means and medians for equal share groups and to all individual-performance groups.
[8] ** and ** refer to significance levels for tests comparing means and medians for equal share groups and to 100% straight salary groups.
[9] Test statistic for ordinal logistic regression of compensation category and pay-performance sensitivity on the four compensation methods based upon individual performance.
[10] ** and ** refer to significance levels for tests comparing means and medians across all 5 compensation categories: equal shares 100% straight salary, 50-99% straight salary, 50-99% productivity, 100% productivity.

Appendix C: Table C-1
Evaluation of degree of cooperation and productive interaction required by specialty for most common specialties in sample

Specialty code	Specialty	Specialty Groupings	No. of physicians	No. of groups	Cooperation Rating (lower values indicate greater cooperation): Continuity (1=lo, 3= hi)	Control (1=lo, 3 = hi)	Teamwork (1=hi, 3=lo)	Total	Sign prediction[b]
2	Anesthesiology	Hosp-based	558	36	1	1	1	3	+
13	Hematology/Oncology	Hosp-based	150	14	1	1	1	3	+
26, 33, 34	Pathology&Radiology[a]	Hosp-based	460	32	1	1	1	3	+
10	Gastroenterology	Hosp-component	287	23	2	2	2	6	+
3	Cardiology: Invasive	Hosp-component	1084	91	2	2	1	5	+
17	Nephrology	Hosp-component	115	11	2	1	1	4	+
24	Orthopedic Surgery	Surg	1195	143	2	3	2	7	?
37.01-37.9	Surgical specialties	Surg	505	61	1	2	2	5	+
37	Surgery (General)	Surg	429	31	1	2	1	4	+
9.02	Family Practice (w/ OB)	Primary w/OB	358	42	3	3	1	7	+
21	Obstetrics/Gynecology	Primary w/OB	626	58	3	3	1	7	+
9.01	Family Practice (w/o OB)	Primary no/OB	902	73	3	3	2	8	0
15	**Internal Medicine**	**Primary no/OB**	**986**	**77**	**3**	**3**	**2**	**8**	**0**
27	Pediatrics (General)	Primary no/OB	524	24	3	3	2	8	0
23	Ophthalmology	Secondary Surg-sub	315	34	2	3	3	8	**?**
25	Otorhinolaryngology	Secondary Surg-sub	178	20	2	3	2	7	?
38	Urology	Secondary Surg-sub	335	36	2	3	2	7	?
1	Allergy/Immunology	Secondary Non-inv	99	11	2	3	3	8	?
18	Neurology	Secondary Non-inv	173	11	2	3	3	8	?
32	Pulmonary Medicine	Secondary Non-inv	177	11	2	3	2	7	**?**
	Other[c]		559	27					?
	Total		10,098	866					

Appendix C: Table C-1 continued

[a]The hospital based consultative hospital-based specialties of pathology, radiology, and radiation oncology were grouped together for tests of hypothesis 1 (table 3) as these specialties are highly similar with respect to continuity, control and teamwork..

[b]Sign prediction: Omitted specialty in table 3 is internal medicine. Sign prediction indicates whether specialty is more (+) or less (-) likely to adopt team-based compensation relative to internal medicine, which has a cooperation rating of 8. '0' indicates that likelihood of using team-based compensation should not differ from internal medicine.

[c]Other: This category includes all specialties (below) with fewer than 10 groups.

	Specialty	no. physicians	no. groups
6	Dermatology	108	8
28	Physiatry	67	4
7	Emergency Medicine	86	3
14	Infectious Disease	49	3
27.01-27.1	Pediatric specialty	42	3
8	Endocrinology/Metabolism	38	1
16	Neonatal Medicine	12	1
29	Podiatry	43	1
31	Psychiatry	38	1
35	Reproductive Endocrinology	5	1
36	Rheumatology	71	1

References

Alchian, A., Demsetz, H., 1972. Production, Information Costs, and Economic Organization. The American Economic Review 62, 777-795.

Atlantic Information Service, Inc. (AIS), 2002. Physician Compensation Plans used by 57 Medical Groups.

Bajtelsmit, V., Bernasek, A., and Jianakopolos, N. 1999. Gender differences in definied contribution pension decisions. Financial Services Review 8, 1-10.

Che, Y., Yoo, S., 2001. Optimal Incentives for Teams. The American Economic Review. June, 525-541.

Encinosa III, W., Gaynor, M., Rebitzer, J., 1997. The Sociology of Groups and the Economics of Incentives: Theory and Evidence on Compensation Systems. Unpublished working paper series.

Gaynor, M. 1989. Competition within the Firm: Theory plus Some Evidence from Medical Group Practice. RAND Journal of Economics Vol. 20, No. 1, 59-76.

Gaynor, M., Gertler, P., 1995. Moral Hazard and Risk Spreading in Partnerships. The RAND Journal of Economics Vol. 26, No. 4, 591-613.

Gaynor, M., Pauly, M., 1990. Compensation and Productive Efficiency in Partnerships: Evidence from Medical Group Practice. Journal of Political Economy Vol. 98, No. 31, 544-573.

Holmstrom, B., 1982. Moral Hazard in Teams. The Bell Journal of Economics Vol. 13, No. 2, 324-340.

Holmstrom, B., Milgrom, P., 1991. Multitask Principal-Agent Analyses: Incentive Contracts, Asset Ownership, and Job Design. The Journal of Law, Economics and Organization Vol. 7, 24-52.

Huber, P. 1967. The behavior of maximum likelihood estimates under non-standard conditions, in Proceedings of the Fifth Berkeley Symposium in Mathemeatical Statistics and Probability. Berkeley, CA: University of California Press.

Itoh, H. 1993. Coalitions, incentives, and risk sharing. Journal of Economic Theory 60, 410-427.

Kandel, E., Lazear, E., 1992. Peer pressure and partnerships. Journal of Political Economy Vol. 100. No. 4, 802-817.

Ittner, C. D., Larcker, D. F., Pizzini, M. J. (2004). Performance-based pay in professional service firms. *Working Paper, University of Pennsylvania.*

Landers, R., Rebitzer, D. and Taylor, L. 1996. Rat race redux: adverse selection in the determination of work hours in law firms. American Economic Review 86, 329-349.

Lang, K., Gordon, P., 1995. Partnerships as insurance devices: theory and evidence. RAND Journal of Economics vol. 26, No. 4. 614-629.

Lee, R., 1990. Monitoring Physicians: A Bargaining Model of Medical Group Practice. Journal of Health Economics 9, 463-481.

Legros, P., Matthews, S., 1993. Efficient and Nearly-Efficient Partnerships. The Review of Economic Studies Vol. 60, No. 3, 599-611.

Leibowitz, A., Tollison, R., 1980. Free Riding, Shirking, and Team Production in Legal Partnership. Economic Inquiry Vol. XVIII, 380-394.

Leone, A. 2002. The relation between efficient risk-sharing arrangements and firm characteristics: evidence from the managed care industry. Journal of Management Accounting Research 14, 99-117.

Levin, J., Tadelis, S., 2004. Profit Sharing and the Role of Professional Partnerships. Unpublished working paper, Stanford University.

Miller, N., 1997. Efficiency in Partnerships with Joint Monitoring. Journal of Economic Theory 77, 285-299.

Narayanan, V.G., 1995. Moral Hazard in Repeated Professional Partnerships. Contemporary Accounting Research Vol. 11 No. 2, 895-917.

Newhouse, J., 1969. The Economics of Group Practice. The Journal of Human Resources Vol. III, No. 1, 37-56.

Nutting, P. A., Goodwin, M. A., Flocke, S. A., Zyzanski, S. J., Stange, K. C., 2003. Continuity of primary care: To whom does it matter and when? Annals of Family Medicine Vol. 1. No. 3, 149-155.

Pauly, M., 1996. Economics of Multispecialty Group Practice. Journal of Ambulatory Care Management 19(3), 26-33.

Pontes, M 1995. Agency theory: a framework for analyzing physician services. Health Care Management Review 20, 57-67.

Prendercast, C., 1999. The Provision of Incentives in Firms. Journal of Economic Literature Vol. XXXVII, 7-63.

Saultz, John, W., 2003. Defining and measuring interpersonal continuity of care. Annals of Family Medicine Vol. 1. No. 3, 134-143.

Scotchmer, S., 1988. Partnerships. The Quarterly Journal of Economics Vol. 103, No. 2. 279-297.

Taylor, A. 2003. How to Choose a Medical Specialty, 4th ed. Elsevier Science (USA). Philadelphia, PA.

Varian, H., 1990. Monitoring Agents With Other Agents. Journal of Institutional and Theoretical Economics 146, 153-174.

White, H. 1980. A heteroskedasticty-consistent covariance matrix estimator and a direct test of heteroskedasticity. Econometrica 50, 1-25.

Table 1
Descriptive statistics on physician and group characteristics

Panel A: Physician-level statistics

	All physicians N = 10,098			**Physicians compensated based on individual performance N= 9069**			**Physicians compensated based on team performance N= 1,029**		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean[d]	Median	Std. Dev.
Charges[a]	879,096	686,526	735,904	856,424	657,300	742,592	1,106,425***	923,000	621,259
Income[b]	263,151	217,746	171,122	254,102	207,837	168,058	351,698***	309,087	175,613
Non-clincal	0.04	0	0.14	0.04	0	0.14	0.04	0	0.12
Male	85%			84%			93%***		
Experience	13.84	12	8.89	13.73	12	9.01	14.85***	14	7.55
Ln Experience	2.35	2.48	0.83	2.34	2.48	0.85	2.54**	2.64	0.62
Experience^2	270.49	144	316.32	269.78	144	320.88	277.61***	196	266.32
Individual compensation[a]									
100% salary	12%			14%			N/A		
50-99% salary	16%			18%			N/A		
50-99% productivity	25%			28%			N/A		
100% productivity	37%			40%			N/A		

Panel B: Group size classifications

	All Groups		**Groups using individual compensation plans**		**Groups using team-based compensation plans**	
	N	%	N	%	N	%
3-6 Physicians	400	46%	341	47%	59	46%
7-10 Physicians	214	25%	172	24%	42	25%
11-20 Physicians	155	18%	131	18%	24	18%
21-30 Physicians	36	4%	25	3%	11	4%
>= 31 Physicians	61	7%	60	8%	1	1%
TOTAL	866	100%	729	100%	137	100%

Table 1, Continued

Panel B: Group-level statistics

	All Groups			Groups using individual compensation plans			Groups using team-based compensation plans		
Specialty	**N**	**%**		**N**	**%**		**N**	**%**	
Anesthesiology	36	4%		22	3%		14	10%	
Radiology&pathology	32	4%		16	2%		16	12%	
Hematology/oncology	14	2%		12	2%		2	1%	
Cardiology	91	11%		67	9%		24	18%	
Gastroenterology	23	3%		17	2%		6	4%	
Nephrology	11	1%		7	1%		4	3%	
General surgery	31	4%		23	3%		8	6%	
Surgical specialties	61	7%		45	6%		16	12%	
Orthopedic surgery	143	17%		132	18%		11	8%	
OBGYN	58	7%		51	7%		7	5%	
Family practice w/OB	73	8%		69	9%		4	3%	
Family pract. w/o OB	42	5%		40	5%		2	1%	
Pediatrics- general	24	3%		21	3%		3	2%	
Allergy/immunology	77	9%		75	10%		2	1%	
Neurology	11	1%		9	1%		2	1%	
Ophthalmology	11	1%		10	1%		1	1%	
Otolaryngology	34	4%		33	5%		1	1%	
Pulmonary	20	2%		19	3%		1	1%	
Urology	11	1%		10	1%		1	1%	
Other	36	4%		27	4%		9	7%	
Total	866	100%		729	100%		137	100%	
	Mean	**Median**	**St. Dev.**	**Mean**	**Median**	**St. Dev.**	**Mean**[b]	**Median**	**St. Dev.**
Variation in charges	328,527	245,919	296,596	336,876	255,202	300,638	280,339**	218,324	268,135
Diversity									
Specialty diversity	0.22	0.20	0.13	0.23	0.20	0.13	0.17***	0.14	0.10
Non-clinical diversity	0.07	0.00	0.10	0.07	0.00	0.10	0.05*	0.00	0.09
Experience diversity	7.89	7.86	3.03	8.00	7.93	3.03	7.27***	7.36	2.96
% Same gender	0.90			0.92			0.89*		
Group size (no. phys.)	12.63	7.00	20.53	13.17	7.00	22.08	9.76*	8.00	7.71

[a] Groups that use individual compensation schemes (and not equal-sharing arrangements) were asked to indicate which of the following combinations of salary and bonus was used to compensate each physician: 100% salary, 50-99% salary with the remainder based upon individual clinical productivity; 50-99% based upon individual clinical productivity and the remainder based upon salary; and 100% based upon individual clinical productivity.
[b] ***, **, * Indicate that null hypothesis of equal means for groups that use individual compensation and those that use team-based compensation can be rejected at significance levels of 1%, 5%, and 10%, respectively.

Table 2
Pearson Correlations with
Two-tailed Significance in ( )

	Specialty diversity	Non clinical diversity	Experience diversity	%same gender	Group size	Ln Avg. Experience
Specialty diversity	1					
Non clinical diversity	0.01 (0.87)	1.00 .				
Experience diversity	0.04 (0.29)	0.18 (0.00)	1.00 .			
%same gender	0.13 (0.00)	-0.19 (0.00)	-0.02 (0.50)	1.00 .		
G roup size	-0.11 (0.00)	0.14 (0.00)	0.08 (0.02)	-0.18 (0.00)	1.00 .	
Ln Avg. Experience	0.00 (0.94)	0.06 (0.08)	**0.47** **(0.00)**	0.18 (0.00)	0.02 (0.52)	1.00 .
Female group	-0.10 (0.00)	0.07 (0.04)	-0.07 (0.03)	**-0.36** **(0.00)**	-0.06 (0.06)	-0.16 (0.00)

Table 3
Logistic regression estimating the probability that a group uses team-based compensation using proxies for cooperation, diversity and size and a set of control variables

Independent Variables[a]	Sign[b]	Partition 1[c] coefficients		Partition 2[c] coefficients		Partition 3[c] coefficients		Partition 4[c] coefficients	
Constant		-1.590		-1.993		-0.972		0.186	
Cooperation (H1)									
Hospital-based									
Anesthesiology	+	2.771	***	2.709	***	2.882	***	3.152	***
Radiology & pathology	+	3.235	***	3.447	***	4.423	***	4.855	***
Hematology/oncology	+	1.404		1.459	*	0.957		1.843	*
Hospital component									
Cardiology	+	2.060	***	1.993	***	2.206	***	2.867	***
Gastroenterology	+	1.853	**	1.541	**	1.747	**	2.511	***
Nephrology	+	2.305	**	2.393	**	4.475	***	4.276	***
Surgery									
General surgery	+	2.117	***	2.057	**	1.751	**	3.045	***
Surgical specialties	+	1.783	**	1.667	**	1.394	*	1.780	**
Orthopedic surgery	+	0.682		0.439		0.245		0.619	
Primary care with OB									
OBGYN	+	1.484	**	1.405	*	1.209	*	1.267	*
Family practice w/OB	+	0.829		0.755		0.596		0.491	
Primary care									
Family practice w/o OB	0	0.872		0.845		0.752		0.686	
Pediatrics- general	0	1.727	*	1.707		1.129		1.649	
Other specialties (included as controls)									
Allergy/immunology	?	1.710		1.522		1.589		1.700	
Neurology	?	0.502		0.408		0.526		0.713	
Ophthalmology	?	-0.632		-0.964		-1.439		-0.942	
Otolaryngology	?	0.007		-0.099		-0.431		-0.288	
Pulmonary	?	0.497		0.274		0.673		1.467	
Urology	?	1.685	*	1.714	*	1.664	*	2.214	**
Other	?	1.310		1.246		1.271		1.291	

Table 3 continued

Independent Variables [a]	Sign	Partition 1[c] coefficients		Partition 2[c] coefficients		Partition 3[c] coefficients		Partition 4[c] coefficients	
Diversity (H2)									
Specialty diversity	-	-2.120	**	-2.446	***	-3.021	***	-2.432	**
Clinical diversity	-	-8.231	**	-6.830	**	-5.723	*	-6.941	*
Experience diversity	-	-0.084	**	-0.087	**	-0.104	**	-0.111	**
% same gender	+	0.020	**	0.023	**	0.022	*	0.015	
Size (H3)									
7-10	?	-0.126		-0.180		-0.365		-0.300	
11-20	-	-0.385		-0.482		-0.869	***	-0.728	
21-30	-	0.085		-0.082		-0.363		0.278	
31 thru hi	-	-2.999	***	-2.913	**	-2.935	**	-3.358	***
Control variables									
Min clinical hours	-	-3.434	***	-3.124	***	-2.919	*	-3.677	***
Ln(experience)	+	0.685	*	0.713	*	0.477		0.688	
Female	+	5.053		6.317		7.076		10.175	
Female x %same		-0.085		-0.104		-0.113		-0.166	
Ln(capitation)		0.030		-0.038		-0.027		0.043	
Suburb		-0.146		-0.180		-0.314		-0.205	
Rural		-1.394	*	-1.539	*	-1.984	***	-1.713	*
Northeast		-0.144		0.024		0.341		0.016	
North Atlantic		0.388		0.926	*	2.103	***	1.457	***
Mid Atlantic		0.059		0.362		1.076		0.613	
Rocky Mountain		-0.810		-0.650		-0.391		-0.636	
Northwest		-1.062	*	-0.934		-1.141	*	-1.576	***
Southwest		-1.084	***	-1.000	***	-0.624		-1.127	*
Eastern Midwest		-0.164		-0.035		0.210		-0.288	
Lower Midwest		-0.187		-0.166		0.101		-0.638	
Southern California		-0.848		-0.140		0.156		-0.722	
Northern California		-0.163		0.173		0.272		-0.433	
Equal Shares		137		137		137		137	
Individual Incentives		729		642		516		300	
Total N		866		779		653		437	
Chi squared statistic		156.72	***	174.48	***	210.80	***	190.40	***
Negelkerke R-square		0.284		0.331		0.430		0.496	
Correct classifications		86%		82%		76%		68%	

Table 3, continued

[a] ***, **, * indicate significance at levels 1%, 5%, and 10% levels, respectively. One-tailed significance if prediction is indicated in "sign" column and two-tailed otherwise..

[c] Specialty variables (*Anesthesiology, Cardiology, etc.)* proxy for cooperation. Specialty variables equal 1 if that specialty is most highly represented in the group and 0 zero otherwise. Internal medicine is the omitted specialty. *Specialty Diversity* is the number of different specialties in the group divided by the number of physicians in the group. *Clinical Diversity* is the standard deviation of FTEs each member devotes to clinical activities. *%same gender* is the percentage of the group's practice that is the same gender. *Experience Diversity* is the standard deviation of the number of years, beyond residency, that a physician has been practicing medicine. *7-10 Physicians, 11-15 Physicians, 16-20 Physicians, 21-30 Physicians,* and *>= 31 Physicians* are indicator variables that equal 1 if group size falls within the specified range and 0 otherwise. The omitted classification is groups with 3-5 members. *Min clinical hours* is the minimum number of hours worked by any group member. *Ln(experience)* is the log of the average experience level of the group. *Female* equals 1 if 50% or more of the groups members are female. *Femalex%same* is the interaction of *Female* and *%same gender. Rural* and *Suburban* are indicator variables that equal 1 if the group is in a rural or suburban location, respectively, and 0 otherwise. *Northeast, Mid Atlantics,* etc. are indicator variables that equal 1 if the group is located in the specified region.

[c] Partition 1 includes all 866 groups that use individual incentives, regardless of whether the individual incentives incorporate salary or not. Partition 2 includes only the individual-incentive groups in which at least 1% of compensation was based upon productivity. Partition 3 includes only the individual-incentive groups in which at least 50% of compensation was based upon productivity. Partition 4 includes only the individual-incentive groups in which 100% of compensation was based upon individual productivity.

Table 4
Physician-level Ordinary Least Squares Regression
of Productivity Measures on Compensation Method[a]

	Charges[b]				***Income[b]***			
Variables[c]	Coef. (t-statistic).		Coef. (t-statistic)		Coef (t-statistic)		Coef. (t-statistic)	
constant	139,586	**	101,917		59,585	***	93,081	***
	(2.03)		(1.11)		(2.89)		(3.56)	
equal0	-28,000				28,395	**		
	(-0.47)				(2.04)			
100% Salary			60,038				-64,207	***
			(0.57)				(-4.63)	
1-50% Salary			-15,380				-35,637	**
			(-0.28)				(-2.34)	
50-99% Productivity			21,566				-20,745	
			(0.38)				(-1.35)	
100% Productivity			49,484				2856.8	
			(0.90)				(0.19)	
Specialty Diversity	-240,023	**	-243,215	**	-65,632	***	-93,994	***
	(-2.17)		(-2.22)		(-2.76)		(-3.91)	
Non-clinical Div.	-791,174	***	-799,693	***	-67,386		-11,927	
	(-12.84)		(-11.49)		(-1.13)		(-0.26)	
Ln Experience	111,440	***	112,439	***	53,722	***	32,400	***
	(8.92)		(6.79)		(14.70)		(10.27)	
Experience^2	-364	***	-367	***	-126	***	-116	***
	(-11.33)		(-11.20)		(-13.80)		(13.63)	
%Male	71,142	**	70,502	**	34,923	***	47,069	***
	(2.11)		(2.18)		(10.67)		(-13.33)	
7-10 Physicians	2,908		-1,084		-7,382		-9,337	
	(0.08)		(-0.03)		(-0.65)		(-0.83)	
11-15 Physicians	108,571		104,742		-8,743		-14,220	
	(1.23)		(1.16)		(-0.63)		(-1.03)	
16-20 Physicians	-65,006		-72,498		-30,915	**	-41,087	***
	(-1.29)		(-1.43)		(-2.41)		(-3.16)	
21-30 Physicians	-49,349		-49,748		-20,486		-24,491	**
	(-0.97)		(-0.97)		(-1.45)		(-1.73)	
>=31 Physicians	-86,522	**	-92,918	**	-30,455	***	-39,283	***
	(-2.53)		(-2.83)		(-3.25)		(-4.10)	
Subspecialty	2,204	***	2,249	***	702	***	717	***
	(4.53)		(4.66)		(5.03)		(5.14)	
groups	863		863		924		924	
N	10,735		10,735		11,076		11,076	
F	46.06	***	43.58	***	28.33	***	26.31	***
r-squared	0.353		0.354		0.360		0.372	

Table 4, Continued

[a] ***, **, * significance at levels 1%, 5%, and 10% levels, respectively.

[b] Dependent variables: *Charges* is gross professional charges for an individual physician. *Income* is total compensation for an individual physician.

[c] Independent variables: *Equal Shares* indicator variable that equals 1 in firm uses equal shares to compensate members and 0 otherwise. *Specialty Diversity* is the number of different specialties in the group divided by the number of physicians in the group. *Non-clinical Diversity* is the standard deviation of the percentage of time each member devotes to non-clinical activities. *%Male* is the percentage of the group's practice that is male. *Experience Diversity* is the standard deviation of the number of years, beyond residency, that a physician has been practicing medicine. *Ln Size* is the log of the number of physicians in the group. *7-10 Physicians, 11-15 Physicians, 16-20 Physicians, 21-30 Physicians,* and *>= 31 Physicians* are indicator variables that equal 1 if group size falls within the specified range and 0 otherwise. Controls for specialty and region were included in regression, but are not shown in table.

Table 5
Group-level Ordinary Least Squares Regression of the Variation in Productivity on Team-based Compensation and Control Variables[a,b]

Variables[c]	Predicted sign	Coefficients (t-statistic)		Coefficients (t-statistic)	
Constant		-170,428	**	-63,293	
		(-2.03)		(-0.80)	
Equal Shares	(-)	-48,178	**	-52,998	**
		(-1.98)		(-2.18)	
Specialty Diversity		114,609	**	84,820	
		(2.03)		(1.55)	
Non-clincial Diversity		316,554	***	309,157	***
		(4.08)		(3.98)	
Experience Diversity		3,561		3,179	
		(1.36)		(1.21)	
% Male		535		502	
		(1.10)		(1.03)	
Ln Experience		-10,436		-7,967	
		(-0.46)		(-0.35)	
ln size		72,388	***		
		(7.46)			
7-10 physicians				98,422	***
				(4.69)	
11-15 Physicians				145,551	***
				(5.68)	
16-20 Physicians				82,726	**
				(2.30)	
21-30 Physicians				142,375	***
				(3.83)	
>=31 Physicians				181,688	***
				(6.42)	
N		1,164		1,164	
F		11.10	***	10.32	***
adj r-square		0.267		0.269	

[a] ***, **, * significance at levels 1%, 5%, and 10% levels, respectively.
[b] Dependent variable is the intra-firm standard deviation in gross professional charges.
[c] *Equal Shares*- indicator variable that equals 1 in firm uses equal shares to compensate members and 0 otherwise. *Specialty Diversity* is the number of different specialties in the group divided by the number of physicians in the group. *Non-clinical Diversity* is the standard deviation of the percentage of time each member devotes to non-clinical activities. *%Male* is the percentage of the group's practice that is male. *Experience Diversity* is the standard deviation of the number of years, beyond residency, that a physician has been practicing medicine. *Ln Size* is the log of the number of physicians in the group. *7-10 Physicians, 11-15 Physicians, 16-20 Physicians, 21-30 Physicians,* and *>= 31 Physicians* are indicator variables that equal 1 if group size falls within the specified range and 0 otherwise. Controls for specialty and region were included in regression, but are not shown in table.