Earnings Inequality and Coordination Costs: Evidence from U.S. Law Firms*

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Abstract

Earnings inequality has increased substantially since the 1970s. Using evidence from confidential Census data on U.S. law offices on lawyers' organization and earnings, we study the extent to which the mechanism suggested by Lucas (1978) and Rosen (1982), a scale of operations effect linking spans of control and earnings inequality, is responsible increases in inequality. We first show that earnings inequality among lawyers increased substantially between 1977 and 1992, and that the distribution of partner-associate ratios across offices changed in ways consistent with the hypothesis that coordination costs fell during this period. We then propose a "hierarchical production function" in which output is the product of skill and time and estimate its parameters. We find that coordination costs fell broadly and steadily during this period, so that hiring one's first associate leveraged a partner's skill by about 30% more in 1992 than 1977. We find also that changes in lawyers' hierarchical organization account for about 2/3 of the increase in earnings inequality among lawyers in the upper tail, but a much smaller share of the increase in inequality between lawyers in the upper tail and other lawyers. These findings indicate that new organizational efficiencies potentially explain increases in inequality, especially among individuals toward the top of the earnings distribution.

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1 Introduction

The returns to skill have risen substantially in the United States since the 1970s, and increases in earnings inequality have been rapid and continuous in the upper half of the earnings distribution (Katz and Murphy (1992), Autor, Katz, and Kearney (2008)).[1] These increases have taken place at the same time as large changes in many firms' organizational structure which have resulted in increases in managers' "spans of control" (see e.g. Rajan and Wulf, 2006). This raises the issue of whether changes in inequality have organizational underpinnings as well. If, as Lucas (1978) and Rosen (1982) argue, highly-skilled managers are assigned greater spans of control than less-skilled managers in equilibrium, and if managers' spans are limited by coordination costs, then decreases in coordination costs can increase earnings inequality through their impact on spans of control. Recent research indicates that changes in spans are important for understanding increases in earnings inequality among at least one set of individuals; Gabaix and Landier (2008) and Tervio (2008) provide evidence that changes in firm size account for much of the post-1980 increase in earnings inequality among CEOs at very large U.S. firms.[2]

This paper examines these issues in the context of U.S. lawyers. How much has earnings inequality increased, how much have the coordination costs associated with hierarchical production declined, and how much of the increase in earnings inequality reflects lawyers' organizational response to changes in these costs? We propose an analytic framework based on Garicano (2000) and Garicano and Rossi-Hansberg (2006), and use this framework to answer these questions using law-office level data from the 1977, 1982, 1987, and 1992 Census of Service Industries.[3]

We first describe some general patterns regarding how lawyers' earnings and hierarchical organization changed during our sample period. We show that earnings inequality across lawyers increased substantially and steadily between 1977 and 1992. We then document some first-order facts that suggest that coordination costs related

[1] See also Autor and Katz (1999) and Card and DiNardo (2002); Autor (2014) provides a recent summary.

[2] See also Kaplan and Rauh (2010) who find support in a wide range of settings for the idea that scale effects can account for a large portion of the change in earnings inequality at the very top.

[3] Our sample ends in 1992 because this is the most recent year in which the Census asked law offices which fields lawyers cover; we have found that absent this information, we are unable to reliably estimate lawyers' earnings from the data the Census collects.

to working with associates also decreased over this period. First, the share of lawyers who work in offices without any associates decreased between 1977 and 1992 by one-third from about 30% to about 20%. Second, the distribution of associate-partner ratios across offices changed during this period so that the most "leveraged" lawyers in 1992 were almost 50% more leveraged than the most "leveraged" lawyers in 1977. These facts suggest that working in hierarchical teams became cheaper in the law during this period.

We then analyze these changes in more depth. We propose a production function in which there are two inputs, skill and time, and a law office's output is the product of the value of partners' skill and the time that lawyers in the office spend directly in production.[4] We show that the coordination cost of hierarchical production is identified by the ratio between revenues per lawyer – the office's average product – and the marginal cost of an associate. In other words, the coordination cost of hierarchical production is the extent to which there are decreasing returns to the scale of a hierarchical team.[5] Applying ideas from assignment models and the hedonics literature, we estimate this marginal cost for each office, then use these estimates in specifications that uncover the coordination costs of hierarchical production. Our estimates indicate that coordination costs declined steadily between 1977 and 1992, such that hiring one's first associate leveraged a partner's skill by about 30% more in 1992 than 1977. We then use our estimates of coordination costs in counterfactual exercises that allow us to assess the extent to which increases in earnings inequality reflect lawyers' organizational responses to these changes. We find that most of the increase in inequality *among* top lawyers between 1977 and 1992 reflects increases in associate-partner ratios. In contrast, we find that most of the increase in inequality *between* top lawyers and other lawyers during this time reflects other factors that increased the market value of top lawyers' skill relative to that of other lawyers' skill, including skill-biased demand shifts. Changes in lawyers' hierarchical organization account for much of the increase in inequality within the upper tail, but little of the

[4] Unlike in Lucas (1978), Rosen (1982), Gabaix and Landier (2008) and Tervio (2008), the organization of production involves endogenous matching between managers and workers; better managers not only manage more efficiency units or larger size teams, but also match with highest skilled workers.

[5] An alternative interpretation of this ratio is that it reflects that partners' market power. In this highly fragmented industry this is unlikely; we nevertheless consider and test this alternative explanation and find that it is unlikely to account for the changes in this ratio that we uncover.

increase in inequality between lawyers in the upper tail and other lawyers. We then investigate why coordination costs changed during this time, and we provide some evidence that they relate to the diffusion of Lexis, a computer-aided legal research service; however, our data do not allow us to provide definitive evidence on precisely how information technology affected coordination costs in this industry during this time.[6]

Our work complements the literature on inequality (e.g., Katz and Murphy (1992), Gabaix and Landier (2008), Piketty (2014)) by introducing changes in coordination costs as an important factor in explaining changes in earnings inequality. Like Autor, Katz, and Kearney (2008), we find evidence of continual increases in earnings inequality among in the upper half of the earnings distribution that we study. We find in addition, however, that the particularly large increases among lawyers at the very top of the distribution are related to new organizational efficiencies (perhaps enabled by information technologies that we new at the time) that allowed the very top lawyers to exploit scale economies associated with their skill more easily.

This paper also is related to other recent work on the organization of legal services (for example, Oyer and Schaefer (2012, 2015)), and is part of a series of papers that we have written on hierarchies and organizational economics of legal services that use data from the Census of Services. The organizational analytics draw from Garicano (2000) and Garicano and Rossi-Hansberg (2006), which propose a theory of hierarchical production and embed it in an equilibrium model. Our empirical work is related to Garicano and Hubbard (2007), which tests whether associate-partner ratios increase as market size increases and lawyers field-specialize more, and Garicano and Hubbard (2012), which proposes a hierarchical production function, derives properties of the labor market equilibrium implied by this production function, and uses patterns in lawyers' earnings to test features of the organizational equilibrium. Finally, it is related to Garicano and Hubbard (forthcoming), which develops the empirical framework that we deploy in this paper and investigates how much hierarchical production – lawyers' ability to leverage their skill by working with associates

[6]Our data allows us to exploit the idea that decreases in coordination costs increase the returns to hierarchical production, which is related to Garicano's (2000) finding that reductions in either communication or learning costs lead to larger spans of control. But they do not allow us to exploit the idea that decreases in communication and learning costs should have different impacts on other organizational variables such as the number of hierarchical layers or the knowledge acquired at each layer.

– increased lawyers' productivity and enhanced earnings inequality across lawyers in 1992. This paper differs from our other work because it uses data from a span of fifteen years to examine the degree to which increases in earnings inequality and productivity are due to decreases in the organizational costs, and provides evidence on the source of these decreases. In other words, this paper examines *changes* in lawyers' earnings and organization, and provides evidence on the causes of these changes.

The rest of the paper is organized as follows. Section 2 documents some key facts and discusses their context. Section 3 develops our analytic framework. We propose an equilibrium model of knowledge-based hierarchies and describe how we use this model as the basis for our empirical specifications. In Section 4, we describe our data. We report and discuss our main results in Section 5. Section 6 concludes.

2 Earnings and Hierarchical Organization of U.S. Lawyers, 1977-1992

2.1 Two Stylized Facts

We begin by describing the main patterns concerning earnings inequality and hierarchical organization in the law during this period.

1. Earnings inequality increased steadily between 1977 and 1992; this increase was particularly large at the top of the earnings distribution. Table 1 presents our estimates of various quantiles of the earnings distribution among privately-practicing U.S. lawyers between 1977 and 1992. All figures are in 1992 dollars. These estimates use confidential data from the Census of Services; the way we construct these estimates differs somewhat by year, depending on the variables the Census collects. We discuss the data and how we construct these estimates in Section 4 below.

Earnings inequality among lawyers increased steadily during this time period, and this increase was particularly large when comparing lawyers in the upper tail relative to those at other quantiles. The ratio between the 95th percentile and median earnings increased from 3.5 in 1977 to 4.8 in 1992. In contrast, the ratio between 75th percentile and median earnings was roughly constant. Figure 1 graphically depicts earnings distributions for 1977 and 1992. Earnings were lower below the

80th percentile, and greater above the 80th percentile, in 1992 than in 1977.

The steadiness in the increase in earnings inequality is striking in light of large fluctuations in earnings *levels* over time. These fluctuations are correlated with the business cycle, and thus the overall demand for lawyers, though they undoubtedly reflect changes in the number and composition of lawyers as well. Median real earnings dropped by 20% between 1977 and 1982, and large decreases appear in the other quantiles as well. Lawyers' earnings then increased sharply between 1982 and 1987, with the median increasing by 20%, almost returning to the 1977 level. They then decreased slightly between 1987 and 1992. The contrast between the consistent increase in earnings inequality and the fluctuations of earnings levels during this period is interesting, because it suggests that increases in inequality reflect long-run phenomena that are to some extent distinct from factors that can vary from period to period. An explanation of increases in inequality that revolves only around changes in the overall demand for lawyers' services would have difficulty accommodating the fact that earnings inequality has increased not only during booms but during recessions as well: for example, not only between 1982 and 1987 but also between 1977 and 1982.

It is unlikely that changes in earnings inequality reflect changes in the distribution of demands across areas of the law. A well-known phenomena during this time is the "litigation explosion," which raises the issue of whether changes in the demand for litigation and the supply of litigators could explain these trends. However, as we will show in greater detail later in the paper, earnings inequality increased among lawyers in both litigation-intensive (e.g., negligence and insurance law) and non-litigation intensive fields. It also is unlikely that increases in earnings inequality reflect other well-known field compositional changes. For example, demand for merger and acquisition-related legal services was likely much higher in 1987 than in 1982 or 1992.[7] But as noted before, earnings inequality increased both leading up to and after this peak.

The earnings inequality patterns we find are consistent with well known findings over the same period throughout other occupations (see Katz and Murphy, 1992) and industries. Our work is the first one to be able to pair those findings with data on changes in firms' hierarchical structure and thus can provide direct evidence on

[7] This is reflected in changes in the field composition of lawyers as reported in our data: the share of lawyers that specialize in either banking or corporate law was 10.2% in 1982, 16.8% in 1987, then 13.2% in 1992.

the potential impact of the Lucas (1978) and Rosen (1982) type hypothesis that earnings inequality and spans of control are closely related.[8] We show next that the preliminary evidence is encouraging: a second broad trend in legal services is that lawyers' hierarchical organization has changed over time. Specifically, more lawyers work in hierarchical teams and hierarchical teams have more associates per partners. We state these two facts next.

2. Lawyers' hierarchical organization changed; a greater share of lawyers worked in hierarchical teams, and the distribution of associates across partners became more unequal. We classify lawyers into three categories: associates, unleveraged partners, and leveraged partners, where "unleveraged partners" are partners who work in offices with no associates and "leveraged partners" are partners who work in offices with at least one associate. Our data indicates that the share of lawyers who worked as associates increased from 29% in 1977 to 40% in 1992, and the share of leveraged partners remained constant at around 40%. Thus, the share of lawyers who worked in offices structured around hierarchical teams increased from 70% to around 80%. In contrast, the share of lawyers who worked as unleveraged partners, and thus in offices not structured around hierarchical teams, decreased from about 30% to 20%.

Table 2 provides evidence on the distribution of "leverage" across lawyers. "Leverage" equals zero for associates and partners at offices with no associates and equals the office's associate/partner ratio for partners at offices with at least one associate. This measure is designed to reflect how many lawyers work under a lawyer. This table shows that leverage has increased on average and has tended to become more unequal over time. The median leverage is zero throughout, while the 95th percentile increased from 1.17 to 1.67, or 43%. The steady increase in earnings inequality across lawyers, especially comparing lawyers at the top of the earnings distribution to other lawyers, coincides with an increase in the leverage of the most leveraged lawyers.

2.2 Potential Explanations

The joint increase in earnings inequality and leverage is particularly striking in light of large changes in the age distribution of lawyers during this time. One possible ex-

[8] In the conclusion we address the implications for the broader literature of our finding that, indeed, these two trends are connected.

planation for these trends would revolve around changes in lawyers' skill distribution: if the supply of younger, less experienced lawyers increased steadily relative to that of over older, more experienced lawyers, one would expect both increases in leverage and increases in earnings inequality simply because leverage has become cheaper over time. However, changes in the age distribution of lawyers suggest that the opposite is more likely to be the case. Table 3 indicates that the share of privately-practicing lawyers who are 35 or younger decreased by 25% (from 45% to 35%) between 1980 and 1990, then decreased by another 20-25% during the 1990s.[9] Earnings inequality and leverage increased between the late 1970s and early 1990s despite the fact that the number of young, inexperienced lawyers was declining relative to that of older, more experienced lawyers. It is thus difficult to explain changes in earnings inequality and leverage during this time with a theory that relies only on changes in the experience distribution of lawyers.

Two classes of explanations that can more easily reconcile these patterns are changes in the organizational cost of leverage and skill-biased changes in clients' demands. If the organizational costs of working with associates declined steadily over time, and the marginal benefits of hiring associates is greater for more skilled lawyers, one would expect leverage and earnings to increase disproportionately at the top of their respective distributions over time. This would be true even if the distribution of clients' demand for skill stayed constant. Alternatively, if clients' demand for the most skilled lawyers increased steadily during this time relative to that for less-skilled lawyers, one would expect steady increases in earnings inequality. One would also expect leverage to increase, even if the organizational costs of working with associates did not change.

An empirical goal of this paper is to shed light on these explanations. We will estimate changes in the organizational cost of leverage ("coordination costs"), and distinguish between changes in lawyers' earnings distribution that are directly associated with changes in leverage versus changes in the market value of individual lawyers' time. This exercise directly illuminates the first of these explanations; for example, we are able to provide evidence on how much less earnings inequality would

[9]These figures reflect a large, well-known demographic bulge among lawyers that is also manifested by time trends in the entry of new lawyers into the profession. New admissions to the bar increased by 50% from 20,510 to 30,707 between 1971 and 1973, reached 42,756 in 1979, then stabilized (Abel (1989), Table 21). Changes in the age distribution of lawyers since 1970 have reflected the entry and aging of these cohorts, which were far larger than those that preceded them.

have changed if leverage was constant during our sample period. It indirectly illuminates the second of these explanations, since changes in the market value of lawyers' time reflect not only any skill-biased changes in demand, but also changes in the distribution of lawyers' skills as well. One possibility with respect to the latter is that decreases in coordination costs could lead to a spreading out of the skill distribution by disproportionately increasing the returns to human capital investment for the most skilled lawyers.

3 Model

3.1 A Hierarchical Production Function

Following Garicano (2000), and Garicano and Hubbard (forthcoming), consider an environment where agents – here, lawyers – are endowed with one unit of time and unidimensional skill $z \sim g(z)$, $z \in [\underline{z}, \overline{z}]$, $\underline{z} > 0$. We measure this skill as the dollar value of output that a lawyer can produce when working on their own. We propose that hierarchical teams – working with associates – allows lawyers to apply their skill to other lawyers' time as well as their own. Specifically, we assume that the output of a hierarchical team with one lawyer of skill z_p and n lawyers of skill $z_a < z_p$ is $y = z_p f(n(z_a))$, where n is the number of associates, $f(n)$ is the effective time in production the $n+1$ lawyers spend, and $f(0) = 1$. We assume that lawyers' span of control is limited by the skill of those working under them; increasing a partner's span of control n requires them to delegate a larger share of their team's work to associates, and this in turn requires them to have more-skilled associates; drawing from results in Garicano (2000) we assume that $n(z_a)$ is an invertable function where $n'(z_a) > 0$.[10]

For empirical tractibility, we further specify $f(n) = (n+1)^\theta$, with $0 \leq \theta \leq 1$. If $\theta < 1$, then the effective time in production of the team is less than the lawyers' time endowment $n+1$; θ parameterizes the coordination cost associated with hierarchical production. Note that such costs do not exist if agents work on their own; if $n = 0$,

[10] Garicano (2000) derives this condition from first principles in a problem solving hierarchy.

$f(n(.)) = 1$ and $y = z_p$.[11] Our *hierarchical production function* is thus:

$$y = z_p(n(z_a) + 1)^\theta. \tag{1}$$

In contrast, the output of these $n + 1$ agents is $z_p + nz_a$ if they worked on their own. The benefit of hierarchical production is that the partner's knowledge is applied to other lawyers' time as well as their own, and the team's productivity per unit of time in production is higher than when they work on their own. The drawback is that lawyers spend a lower share of their time directly in production.

3.2 Partners' Earnings, Optimization, and θ

Consider a partner with skill z_p who, in equilibrium, chooses to work with n associates with skill z_a. This partner's earnings equal:

$$R(z_p, n) = \max_n z_p(n(z_a) + 1)^\theta - n(z_a)w\,(z_a) - c(n) \tag{2}$$

where $c(n)$ includes other costs such as overhead and the compensation of non-lawyers. Exploiting the invertibility of $n(z_a)$, we can write the first-order condition for this partner as:

$$\theta z_p(n + 1)^{\theta-1} = w(n) + w'\,(n)\,n + c'(n) \tag{3}$$

The left side of this equation is the marginal benefit of leverage; the right side is the marginal cost of leverage. This equation must hold for each leveraged partner in equilibrium. The marginal cost of leverage has three components. The first two reflect increased associate pay, and includes $w'\,(n)\,n$ as well as $w(n)$ because partners wishing to increase their leverage must not only hire more associates, but more skilled (and thus more highly paid) associates – from above, they will need to delegate tasks that they would otherwise handle themselves. The third term $c'(n)$ reflects incremental overhead and nonlawyer compensation.

Let $TR(z_p, n) = R(z_p, n)+n(z_a)w\,(z_a)+c(n) = z_p(n(z_a)+1)^\theta$ be the total revenues of this partner and his or her team of associates. Substituting the first order condition into the earnings function, one obtains:

[11] Although we label θ as "coordination costs," it includes any inefficiency that arises when individuals work in teams but not when they work on their own, including for example agency costs.

$$TR(z_p, n)/(n+1) = [w(n) + w'(n)\, n + c'(n)]/\theta \tag{4}$$

Solving for θ,

$$\theta = \frac{w(n) + w'(n)\, n + c'(n)}{TR(z_p, n)/(n+1)} = \frac{MC(n)}{AR(n)} \tag{5}$$

The coordination cost parameter θ is thus revealed by the ratio between the marginal cost of leverage and average revenues per lawyer, evaluated at partners' optimal choice of n. If these quantities are equal, this implies that hierarchical production is constant returns to scale in the sense that there are no additional coordination costs associated with working with larger teams with greater associate-partner ratios. If marginal cost is much lower than average revenues, in contrast, this implies that there are sharply diminishing returns to leverage: hierarchical production involves considerable coordination costs that reduce the time lawyers spend in production.

Our data allow us to calculate revenues per lawyer, $AR(n)$, for each law office in our sample. We also observe $w(n)$ and n, associate pay per associate and the number of associates, at each office. We do not observe $w'(n)$ or $c'(n)$, the marginal price of leverage or marginal nonlawyer and overhead costs. Obtaining estimates of θ thus requires us to derive estimates of these quantities at individual law offices; this will be the focus of empirical sections below.

3.3 Empirical Outputs

3.3.1 Deriving "Hierarchy-Free Earnings Distributions"

The earnings equation and total revenues identity above imply that:

$$z_p = \frac{TR(z_p, n)}{(n+1)^\theta}$$

and therefore:

$$\begin{aligned} R(z_p, 0) &= z_p - c(0) && (6) \\ &= \frac{TR(z_p, n)}{(n+1)^\theta} - c(0) && (7) \end{aligned}$$

We observe $TR(z_p, n)$ and n in the data. Therefore, estimates of θ and $c(0)$ – the nonlawyer and overhead costs of a office with no associates – allow us to estimate $R(z, 0)$ – how much partners would earn, if unleveraged – for leveraged partners at each office in our sample.

Below we use this as an input in the construction of "hierarchy-free" earnings distributions in the following way. Our estimate of "hierarchy free earnings" for a leveraged partner in office i equal $R(\widehat{z_{pi}}, 0) = TR_i/(n_i+1)^{\widehat{\theta}_i} - \widehat{c_i(0)}$ where $\widehat{\theta}_i$ and $\widehat{c_i(0)}$ are our estimates of coordination costs at office i and the nonlawyer and overhead costs of office i if it had no associates, respectively.[12] "Hierarchy-free earnings" for unleveraged partners are simply our estimates of their actual earnings. For associates, we assume that $R(\widehat{z_{pi}}, 0) = w_i$: their earnings if unleveraged equal what they earn as associates. Revealed preference arguments imply that associates' actual earnings should overstate their "hierarchy-free" earnings; in a model where individuals choose where to work to maximized their income, individuals who choose to be associates should earn more as associates than they would as unleveraged partners. Our estimates of "hierarchy-free earnings distributions" thus probably overstate lawyers' hierarchy-free earnings, especially below the median. This assumption will have a minimal effect on our main analysis, however, which focuses on quantiles at or above the median. It is important to include associates in the analysis of earnings distributions, but overstating their "hierarchy-free" earnings slightly will not affect our analysis as long as these individuals tend to be below the median in the "hierarchy-free" earnings distributions that we compute.

3.3.2 Lawyers' Productivity and Its Components

Along with examining the sources of increases in earnings inequality, we can also use our framework and estimates to investigate changes in lawyers' productivity between 1977-92, as measured by revenues per lawyer. Our analytic framework, and in particular the hierarchical production function that we propose, facilitates this analysis by positing that output is simply the product of skill and time: partner skill multiplied by the time lawyers in the office spend in production.

Dividing both sides of equation (1) by $n+1$, we obtain an expression for revenues

[12] We explain below our method for obtaining $\widehat{c(0)}$.

per lawyer:

$$y/(n+1) = z_p(n+1)^{\theta-1} = z_p s$$

where $s = (n+1)^{\theta-1}$, the share of lawyers' time that is spent directly in production. Office-level productivity increases therefore can either reflect increases in partner skill or increases in lawyers' time-efficiency.

Average revenues per lawyer across all offices is therefore:

$$\begin{aligned} \overline{y_i/(n_i+1)} &= \overline{z_{pi}s_i} \\ &= \overline{z_p}\ \overline{s} + cov(z_{pi}, s_i) \end{aligned}$$

where i indexes offices and the covariance and means are calculated using the number of lawyers in the office as weights. Our analytic framework and results imply that the covariance term should be negative: more skilled partners are more leveraged, but if $\theta < 1$ this lowers the share of time that lawyers spend directly in production. One can therefore decompose changes in average revenues per lawyer in the following way:

$$\Delta\overline{y_i/(n_i+1)} = \Delta\overline{z_p}\ \overline{s_t} + \Delta\overline{s}\ \overline{z_{p,t-1}} + \Delta cov(z_{pi}, s_i)$$

The first term is the change in the average value of skill that is applied to lawyers' time, holding lawyers' time efficiency constant. The second is the change in the share of lawyers' time spent in production, holding the average value of skill constant. The third is the change in the covariance between skill and time efficiency. The direct impact of increases in θ – that is, declines in coordination costs – would be to increase s, the share of time that lawyers spend directly in production. However, our framework indicates that lawyers are likely respond to declines in coordination costs by increasing n. The effect would lead $\overline{z_p}$, the average value of skill that is applied to lawyers' time, to increase and s to decrease. The extent to which declines in coordination costs are manifested in improvements in the utilization of time versus skill are thus an empirical question to which our framework and data provide evidence below. We use our estimates of z_p at each office and θ to obtain $\overline{z_p}$, $\overline{s}$, and $cov(z_{pi}, s_i)$ in each of our sample years, and examine how each of these terms change over time.

4 Data and Estimates

Our analysis uses confidential law-office-level data from the 1977, 1982, 1987, and 1992 Census of Services. These data include each office's revenues, employment, and payroll as reported to the Internal Revenue Service for tax purposes. They also include more detailed information collected by questions specifically asked to law offices. We observe the total number of lawyers, the number of associate lawyers, and the number of nonlawyers that work out of the office. We also observe "payroll by occupation" – total payroll to associate lawyers and to nonlawyers – and thus observe average associate pay and average nonlawyer pay at each office. We observe the share of lawyers that work primarily in each of 13 fields defined by the Census (e.g., corporate law, tax law, domestic law) and the share of lawyers who work in multiple fields ("general practitioners"). Finally, we observe the share of the office's revenues that come from clients who are individuals versus businesses or governments. These law-office-level data are collected from a large sample of law offices which includes nearly all law offices with at least 20 employees or that are part of multi-office firms, plus a sample of other offices. All estimates reported in this paper are computed using the Census' sampling weights. The set of law offices that receives a survey form for these data varies from year to year; therefore, our data are repeated cross-sections rather than a panel.

Our main analysis in each year uses only data from offices legally organized as partnerships or proprietorships, and not those legally organized as "Professional Service Organizations" (PSOs) such as Professional Corporations. The reason for this is that the Census asks respondents to classify lawyers according to how they are treated for tax purposes; all lawyers at firms organized as PSOs therefore are considered "associate lawyers," even though lawyers at such firms distinguish among themselves in the same way that lawyers at firms legally organized as partnerships do. The analytic framework we describe above requires data that distinguishes between partners and associates, and therefore cannot directly utilize the observations of offices legally organized as PSOs.[13]

[13] We do not believe that this leads to any significant selection issues. PSOs were introduced by states to allow the fringe benefits lawyers and other professionals pay themselves to have same tax advantages as those they pay employees. While firms' legal form of organization varies systematically across states (corresponding to differences in when different states began to allow PSOs), conditional on state, there is not a strong relationship between firms' LFO and observables such as office size and lawyers' fields. This is reflected in the fact that in 1992, firms organized as PSOs made up about 1/3 of the industry measured in terms of either lawyers, offices, and revenues. (Garicano and Hubbard (2007))

4.1 Estimating Partners' Earnings

The Census does not ask law firms to report partners' earnings. We therefore must estimate this variable. This is straightforward in 1977 and 1982 because the Census asks respondents to report their total expenses in these years, along with the variables described above. We estimate partners' earnings in each office in these years as just the difference between revenues and operating expenses, divided by the number of partners.[14] Estimating partners' earnings is less straightforward in 1987 and 1992 because the Census did not ask respondents to report operating expenses. Although we observe payroll, we do not observe fringe benefits or non-payroll-related operating expenses ("overhead"), the most important components of which for law offices include rental and lease payments, communication, office supplies, and "pass-through" expenses that are billed at cost to clients such as travel expenses or charges for non-lawyer experts such as engineers (e.g., for patent cases) or economists (e.g., for antitrust cases). For partnerships and proprietorships, the difference between revenues and payroll – which we can compute directly – equals the sum of partner earnings, fringe benefit expenses, and overhead.

We estimate partners' earnings in 1987 and 1992 using the same method as in Garicano and Hubbard (forthcoming). We exploit the fact that (a) for firms organized as PSOs, the difference between revenues and payroll equals the sum of fringe benefit expenses and overhead, since payroll includes the earnings of all lawyers (and nonlawyers), and (b) fringe benefits are consistently about 15% of payroll at law offices. Our estimate of overhead at offices organized as PSOs is therefore (revenues - 1.15*payroll). Using these offices, we regress our overhead estimate on characteristics of the office, including revenues, the number of people in the office, lawyers' fields, and local market size, allowing the relationships between overhead and revenues to be nonlinear and different across lawyers' fields, and allowing the relationship between overhead and the number of people in the office to differ with local market size (perhaps because office space is more expensive in larger markets). We then use the coefficient estimates from this regression to generate predicted values for overhead for each of our partnerships and proprietorships. Finally, we generate estimates of partner pay for each of our partnerships and proprietorships by subtracting the sum

[14] Capital expenditures, which are very small in this industry, are treated as part of partner earnings. Since partners are the residual claimants on law firms' assets, this treatment seems appropriate.

of estimated overhead and 1.15*payroll from the office's revenues, and dividing by the number of partners. This procedure produces estimates of partner pay analogous to those generated from the 1977 and 1982 data.

This procedure generates the earnings distributions we reported in Table 1 and discussed earlier. We have compared these distributions to those generated from other sources, in particular lawyer-level earnings data from the Census' Public Use Microdata Sample (PUMS). We report earnings distributions from the 1970, 1980, 1990, and 2000 PUMS in Table A1 in the Appendix. Although direct comparisons are impossible because the PUMS data come from different years than our data and because the PUMS data are top-coded, the distributions exhibit consistent patterns. In particular, the level and general time trend (in particular, low real earnings circa 1980-1982, higher real earnings before and after) in earnings are similar for the two series.

The structure of law offices' overhead expenses exhibits a few interesting trends. In Table 4, we report coefficient estimates from regressions that relate overhead to observables.[15] The 1987 and 1992 estimates use PSOs; we use these estimates to produce estimates of partner earnings at each of the offices in our main sample of partnerships and proprietorships. The 1977 and 1982 specifications use our main sample of partnerships and proprietorships (since we can estimate overhead directly for this sample for these years). The estimates indicate that while overhead is related to revenues in all years, the relationship between overhead and employment has tended to become stronger over time, especially for offices in very large cities and especially between 1987 and 1992. We suspect that this reflects, in part, changes in law offices' technology. As we discuss futher below, personal computers started to appear on lawyers' desks only in the late 1980s, and the early adopters of these and complementary hardware tended to be large, big-city law offices.

4.2 Estimating Marginal Costs

Our estimates of θ rely on estimates of $w'(n)$ and $c'(n)$ – the marginal price of leverage and marginal nonlawyer and overhead costs – as inputs.

[15] This summary table does not report all of the coefficients in these specifications, for example those on office's field shares and interactions between field shares and revenues. The full set of results for each year are available upon request from the authors.

4.2.1 The Marginal Price of Leverage

Our empirical specification of the relationship w and n aims to capture the relationship between associate pay and associate-partner ratios implied by our model – scaling up requires hiring not just more associates but more-highly-skilled associates – while accommodating the empirical fact that this relationship is not deterministic. We therefore specify average associate pay at office i, $w_i(n)$, as $w_i(n) = w(n)\xi_i$, where ξ_i is a mean one log-normally distributed random variable. We interpret ξ_i as a compensating differential that accounts for differences in working conditions at office i: this factor shifts up or down all potential associates' willingness to work at office i. The wage-leverage surface that partners at office i face equals a market wage-leverage surface $w(n)$ times an additional term that leads associate pay to be particularly high or low, conditional on the organization and skill of the lawyers at office i. Suppressing controls, we let $\ln w(n) = \beta_0 + \beta_1 n + \beta_2 n^2$, so that

$$\ln w_i(n) = \beta_0 + \beta_1 n + \beta_2 n^2 + \eta_i \tag{8}$$

The marginal wage $w_i'(n)$ that partners at office i confront is therefore $(\beta_1 n + \beta_2 n^2) w_i(n)$. We regress the log of associate earnings on a polynomial of n and use the coefficient estimates to construct an estimate of the marginal wage, $\widehat{w_i'(n)}$, for each office i.

We allow for the possibility that associate earnings are systematically higher in some markets than others and in some fields than others by including county fixed effects and the field shares of lawyers in office i as controls. We permit $w_i(n)$ to be determined by more-narrowly-defined labor markets by allowing the shape of $w(n)$ to differ for offices that serve litigation versus non-litigation-related demands and within the latter, that serve business versus individual demands. We have also explored the possibility that it varies across differently-sized geographic markets, but have not found evidence that this is the case. The specifications we report below therefore allow $w_i'(n)$ to vary across broadly-defined classes of demand, but not across geographic markets.[16]

As we discuss in Garicano and Hubbard (forthcoming), $\widehat{w_i'(n)}$ is a downward-biased estimate of the marginal price of leverage, because n will be negatively correlated with η_i. Partners at an office with a low value of η_i (or equivalently, ξ_i) will respond

[16] We have also included higher-order polynomial terms, but have found that this adds little explanatory value.

by hiring more associates than they otherwise would, which makes the empirical relationship between w and n to be less positively correlated than it otherwise would be. This, in turn leads our estimates of the marginal cost of leverage, and therefore θ, to be downward-biased and $R(z_p, 0)$ to be upward-biased. As we discuss in our other paper, we believe that this has a small effect on our estimates. There, we investigate the impact of assuming that the marginal price of leverage is two, four, and ten times what we estimate and show that this does not have a large impact on our estimates of θ. The reason for this is simple: other components of the marginal cost of leverage – such as the incremental associates' pay and benefits – apperar to be much larger that of the marginal price of leverage, so biased estimates of $\widehat{w_i'(n)}$ have little effect on the parameters of interest. They will have even less effect on the analysis in this paper, which revolves around changes over time, assuming this source of bias is relatively constant from year to year.[17]

Table 5 summarizes the coefficient estimates of equation (8); the specifications also include county fixed effects and "office class" dummies. The omitted field is "general practice." The patterns in the field controls are fairly consistent across years and show some expected patterns; for example, associate pay is relatively high at offices with a high share of corporate, tax law, or patent law specialists. Another notable pattern is that 1982 looks different than the other years for some specialized fields. Unlike other years, associate pay was not significantly higher at offices with high shares of banking, insurance, or negligence-defense specialists relative to those with high shares of general practitioners. This suggests that the returns to specialization were lower in this recessionary year than in other years, at least for some fields.

The coefficients of interest are those that relate associate earnings to associate-partner ratios; these are the polynomial coefficients at the top of the table. These coefficients are hard to interpret as presented; we therefore present additional evidence at the bottom of the table. There we report the difference between predicted percent difference of associate earnings at offices with associate-partner ratios of 1.5 and

[17] This is not the only effect that could lead to a downward-biased estimate of $w_i'(n)$. As we discuss in our previous work, a similar bias would exist if associates value working with more-skilled partners because it builds their human capital. If so, a partner who wants to hire slightly more knowledgeable associates has to compete with a slightly-more skilled partner to do so, and offer these associates a premium relative to the more-skilled partner. We believe that this has a minimal impact on the analysis in this paper for the same reasons we discuss above: accounting for it would have only a small effect on our estimates and even less on our inferences, which are largely based on changes over time.

0.5; the vast majority of lawyers work at offices with associate-partner ratios in this range. In general, the coefficient estimates imply that $w(n)$ differs across different classes of offices. The function is upward-sloping for all years for business non-litigation offices, and the predicted increase in associate earnings when moving from an associate-partner ratio of 0.5 to 1.5 is 4% in 1977 and 10-15% in the other years. This pattern is similar, but muted, for litigation offices; the predicted increase is 4-7% in three of the years and slightly less than zero in the fourth. In contrast, our estimates of $w(n)$ are different for individual, non-litigation offices – we find no evidence of an upward slope. The difference in $w(n)$ between this segment and the other segments may reflect that, from the perspective of partners in this segment of the industry, the quality and quantity of associates are more easily substitutable so that hiring more associates does not require them to hire more skilled associates.

4.2.2 Marginal Nonlawyer and Overhead Costs

We specify $c_i(n)$, nonlawyer and overhead costs (per partner) at office i, as:

$$\begin{aligned} c_i(n) &= (x_i l_i + oh_i)/p_i \\ &= x_i(1+n_i) + oh_i/p_i \end{aligned}$$

where x_i is nonlawyer pay per lawyer, l_i is the number of lawyers in office i, oh_i is overhead at office i, and p_i is the number of partners at office i. Under this specification, nonlawyer pay per lawyer is constant: hiring an additional associate implies a proportionate increase in the office's support staff. Thus:

$$c_i'(n) = x_i + oh_i'/p_i$$

From each partner in office i's perspective, an additional associate implies an increase in nonlawyer pay of x_i and an increase in overhead of oh_i'/p_i. x_i is observed in the data. We use the coefficient estimates on employment in the results reported in Table 4 to construct an estimate of oh_i'/p_i for each office.[18]

[18] We use this equation and the estimates of the overhead equation in Table 4 them as well to obtain an estimate $\widehat{c_i(0)}$ of the nonlawyer and overhead cost of office i if it had no associates, which we use in our estimates of hierarchy-free earnings distributions (see Section 3.3).

Finally, we note that our production function specification must account for the fact that the benefits of leverage from a partner's perspective are not simply incremental revenues, but rather incremental revenues, net of the overhead associated with these revenues. We therefore adjust revenues for each office downward by $(1 - \widehat{k_i})$, where $\widehat{k_i}$ is the estimated derivative of overhead with respect to revenues for office i implied by the estimates in Table 4. Thus our estimates of average revenues and marginal costs at each office i are:

$$\widehat{AR_i} = \frac{TR_i}{(n_i + 1)}(1 - \widehat{k_i}) \tag{9}$$

$$\widehat{MC_i} = \widehat{w_i'(n_i)}n_i + w_i + x_i + \widehat{oh_i'}/p_i \tag{10}$$

4.3 The Benefits and Costs of Leverage

Our framework gives rise to estimates of the average benefits and marginal costs of leverage in Table 6. This table depicts how, from the perspective of partners, the marginal benefits and marginal costs have evolved over time. On average, partners worked in offices where revenues per lawyer were $195,000 in 1977; this declined then increased during our sample period. The average benefit of leverage, which is this figure less the share of revenues that is overhead, exhibits a similar pattern. The average benefits of leverage for 1992 partners were about 30% greater than those of 1977 partners. The marginal cost of leverage, averaged across partners in each year, exhibits a somewhat different pattern. It decreased slightly between 1977 and 1982, then increased substantially between 1982 and 1992. The marginal cost of leverage for 1992 partners was about 50% greater than that of 1977 partners.

The right part of Table 6 depicts how the composition of marginal costs have evolved. Associate pay has fluctuated, but is a smaller share of the marginal cost of leverage over time, declining from 53% to 45%. Overhead, in contrast, increases both in its magnitude and its share of the marginal cost of leverage, rising from a negligible share in 1977 to 13% of the average partner's marginal costs in 1992. Our estimates of the marginal price of leverage suggest that it is a small, though increasing, component of the marginal cost of leverage for the average partner in each year. This low average masks considerable heterogeneity across offices, but cases where the marginal price of leverage exceeds $10,000 are rare simply because n is

low in this industry. While it is important to account for these other components, and our estimates of the marginal price of leverage are biased downward for reasons we discuss above, the payroll-related costs of an additional associate appear make up most of the marginal cost of leverage for most partners.

The ratio of our average estimates of the marginal cost of leverage and average benefits of leverage decline steadily from 0.58 in 1977 to 0.68 in 1992. This foreshadows our finding that the coordination costs are falling during our sample period.

4.4 The Coordination Costs of Hierarchies

Non-parametric estimates of the coordination costs of hierarchies at each office i can be obtained by simply taking the ratios between estimates of MC_i and AR_i: $\widehat{\theta}_i = \widehat{MC_i}/\widehat{AR_i}$ at each office. However, this method would produce estimates of θ_i that vary by an unrealisticly large amount across offices. Average revenues per lawyer, conditional on the number of associates per partner, vary widely across offices, and this nonparametric method would attribute all of this conditional variance to variance in coordination costs rather than other factors such as firm- or office-specific demand shocks. In fact, these other factors are likely important drivers of cross-office differences in revenues per lawyer.

We therefore respecify a partner's earnings in office i as:

$$\begin{aligned} R_i(z_{pi}, n) &= \widehat{z}_{pi}(n_i + 1)^{\theta} - w_i(n)n_i - c_i(n) \\ &= \varepsilon_i z_{pi}(n_i + 1)^{\theta} - w_i(n)n_i - c_i(n) \end{aligned} \tag{11}$$

This introduces a stochastic term, ε_i, to the term capturing law office i's revenues. We assume that this is a short-run demand shock that is realized after the partner chooses how many associates to hire; this reflects that the fact that clients' demands for legal services are uncertain, and this leads to variation in revenues conditional on the skills and size of the legal team. The timing of this shock implies that its realization affects partners' earnings but not the organizational equilibrium we depict above. We assume that ε_i is i.i.d., positive, and $E(\varepsilon_i) = 1$. Assuming that partners choose n to maximize expected earnings produces same the first order condition as before:

$$\theta z_{mi}(n_i + 1)^{\theta - 1} = w(n) + w'(n)\, n_i + c_i'(n) \tag{12}$$

Solving for z_{pi}, substituting the expression into (11), then rearranging terms and taking logs, we obtain:

$$\begin{aligned} \ln \frac{TR_i}{(n_i+1)} - \ln(w'(n)\, n_i + w_i + x_i + oh_i'/p_i) &= -\ln\theta + \ln\varepsilon_i \qquad (13) \\ \ln AR_i - \ln MC_i &= -\ln\theta + \ln\varepsilon_i \end{aligned}$$

Our empirical analogue, which uses estimates our office-level estimates of average revenues and marginal costs, is therefore:

$$\ln \widehat{AR_i} - \ln \widehat{MC_i} = -\ln\theta + \ln\varepsilon_i \qquad (14)$$

where $\widehat{MC_i}$ and $\widehat{AR_i}$ are defined above. We allow $-\ln\theta$, and therefore θ, to vary with the size of the office (as measured by the number of partners) and with the share of lawyers in 14 different fields; this allows for coordination costs to vary across offices along these dimensions.

Table 7 presents our estimates of equation (14), and the average predicted value of θ that these coefficient estimates imply. The omitted field is "general practitioner." From the bottom of the table, on average, θ steadily increased between 1977 to 1992 from 0.57 to 0.71. From the perspective of the average partner, hiring one's first associate increased the time that the (now two-person) team would spend in production by about one-half in 1977, but by about two-thirds in 1992. The real team size after hiring an associate would have increased from 1 to 2 individuals in both periods; the effective team size would have increased from 1 to $2^{.57} = 1.48$ individuals in 1977 and to $2^{.71} = 1.63$ in 1992, about 30% more.

4.5 "Hierarchy-Free" Earnings Distributions

We next use the method described in Section 3.4 to construct estimates of $R(\widehat{z_p}, 0)$, what "leveraged partners" would earn, if they were unleveraged, and use these estimates to construct "hierarchy free" earnings distributions. We then compare changes in this distribution to changes in lawyers' actual earnings distribution to infer the effect of changes in coordination costs on changes in earnings inequality. We emphasize that our analysis on this front is a partial equilibrium analysis, because this counterfactual holds constant the distribution of lawyers' skills as well as the match between clients and law firms. If lawyers, in fact, did not organize hierarchically, this would affect lawyers' investments in skills and the match between clients and lawyers.

Table 8 reports quantiles of the hierarchy-free earnings distributions in each of our years. This table is analogous to the earnings distributions we reported in Table 1, which we reproduce in the top panel of this table for comparison. The most important finding in this table is that inequality increases over time in the "hierarchy-free" earnings distribution, just like it does in the realized earnings distribution. The ratio between the 90th and 50th quantile increased from 2.4 to 2.8, and that between the 95th and 50th increased from 3.0 to 3.6 between 1977 and 1992. This finding indicates that increases in earnings inequality over time are not solely due to the degree to which lawyers are leveraged; even taking out the effect of increases in leverage, inequality increased substantially among lawyers above the median.

Before continuing, we note that we have characterized this result carefully. The results in Table 10 do *not* rule out the possibility that all of the increase in earnings inequality could be due to decreases in the coordination costs associated with hierarchical production. If increases in θ lead highly-skilled lawyers to accumulate more skill, this would be reflected by changes the hierarchy-free earnings distribution. The "pure leverage" effect to which we refer above is a lower bound of the impact of changes in θ on earnings inequality, because it does not include the effect of human capital investments that are responses to these changes.

Another finding in Table 8 echoes Garicano and Hubbard (forthcoming): hierarchical production amplifies earnings inequality. All of the earnings quantile ratios in the top panel are greater than those in the bottom panel, and the differences between the top and bottom panels are greater when the ratios involve higher quantiles. Our previous work showed this for 1992; here we show that similar conclusions hold for other years.

4.6 Organizational Changes and Increases in Earnings Inequality

Table 9 analyzes the extent to which increases in organizational leverage contributed to increases in earnings inequality between 1977 and 1992 through a decomposition of changes in the quantile ratios. The top panel uses law offices in all segments. The first column reports that the ratio between the 90th percentile and median earnings increased by 0.20 log points; in contrast, this ratio increased by 0.16 log points when using our estimates of the hierarchy free earnings distributions in these years. The

difference between the two, here called the "residual change in earnings inequality," depicts the change in earnings ratios that is attributable to changes in lawyers' leverage. The final row reports this as a share of the change in the earnings quantile ratio. From the table, we estimate that 17% of the change in the 90th/50th percentile ratio during this time is due to changes in lawyers' leverage. This figure is greater when examining ratios that focus more on the upper tail: we estimate that 38% of the increase in the 95th/50th percentile ratio, and 69% of the increase in the 95th/90th percentile ratio, is due to changes in lawyers' hierarchical organization.

Increases in organizational leverage thus explain the majority of the increase in earnings inequality among very top lawyers. They explain a substantial, but moderate amount of the increase in inequality between lawyers at the top of the distribution and the median lawyer. Most of the earnings inequality increase between top lawyers and the median lawyer is accounted for instead by differential changes in the market value of lawyers' time. Some of these differential changes may have organizational roots. Declines in the coordination costs of hierarchical production may have led the most skilled lawyers to increase their human capital disproportionately relative to other lawyers. These numbers are therefore likely to be a lower bound on the effect of declines in coordination costs on earnings inequality during this time.

The bottom panel reports a similar analysis, conducted separately for lawyers in "business, non-litigation," "litigation," and "individual, non-litigation" offices. The qualitative results for lawyers in "business, non-litigation" and "litigation" offices are similar to each other and to the results in the top panel: changes in leverage explain a large share of the increase in inequality among lawyers in the upper tail of the distribution, and a moderate share of the increase in inequality between these lawyers and the median lawyer. The effect of changes in leverage on earnings inequality among top lawyers is particularly pronounced among lawyers in "business, non-litigation" offices (e.g., offices that do transactional work for business clients but not litigation): over three-quarters of the change in the 95th/90th percentile earnings ratio is accounted for by changes in leverage, but none of the increase in the 90th/50th ratio. The results for lawyers in "individual, non-litigation" offices differ from those in other offices. Inequality increased substantially among lawyers in this segment during this time, especially comparing lawyers in the upper tail to those in the middle. But we find little evidence that this increase reflects changes in leverage: changes in the "estimated earnings, absent hierarchical production" ratios are similar in magnitude

to changes in the estimated earnings ratios.

4.7 Productivity Decompositions

Our final set of results in this section investigate changes in lawyers' productivity between 1977-92, as measured by revenues per lawyer, in light of the decline in coordination costs that took place during this time. Table 10 summarizes our analysis, which applies the equation:

$$\Delta\overline{y_i/(n_i+1)} = \Delta\overline{z_p}\ \overline{s_t} + \Delta\overline{s}\ \overline{z_{p,t-1}} + \Delta cov(z_{pi}, s_i)$$

Real revenues per lawyer increased by $46,000 between 1977 and 1992; this measure of productivity therefore increased by just over 25% during our sample period. The decomposition indicates that none of the productivity increase is accounted for by increases in lawyers' time efficiency. Although coordination costs decreased during this period, lawyers responded to this by increasing leverage in a way that left lawyers' average time efficiency unchanged. In contrast, all of the productivity increase is accounted for by increases in the average value of skill that is applied to lawyers' time. Even though the direct effect of reductions in coordination costs are to increase lawyers' time efficiency, lawyers' aggregate response to these reductions ultimately exploited the input that is a source of increasing returns rather than the input that is not; skill rather than time.

5 Why Did Coordination Costs Change During this Period?

5.1 Technological Change In Law Offices, 1977-1992

Three new technologies had an important effect on how lawyers generated output during this time: computer-aided legal research systems, word processors, and internal email systems.

The commercialization and diffusion of computer-aided legal research systems such as Lexis and Westlaw lowered lawyers' cost of retrieving information. These services were first offered in the mid-1970s. By the late 1970s many of the largest firms subscribed to at least one of these services, which were usually accessed through one or more dedicated terminals in the firm's office. The cost of these services at

the time was very high (over $100/hour plus the price of leasing terminals) and the coverage of the databases was limited, so very few small and medium-sized firms chose to subscribe themselves, although many lawyers at such firms had access through publically accessible law libraries. Decreases in the price of both the hardware and these services and increases in their coverage led these services to become common in all but the very smallest offices by the early 1990s, and they are currently available as web-based applications.[19] These services fundamentally changed how lawyers conducted research. Before these services, lawyers depended on paper trails and the memories of their colleagues to find the pertinent information they needed for their work.

Document production changed during this time as well. At the start of the period, practically all documents were typed by hand, often in duplicate, and the physical copies were stored in lawyers' case files. This process changed, first with the development of faster, cheaper photocopiers, then with the diffusion of word processing machines starting in the early 1980s. These machines, which were highly specialized computers, allowed lawyers (or, more precisely, their secretaries) to revise documents without having to retype them entirely and to retain electronic copies of any documents that they produced. The ability to revise documents without having to retype them entirely was valuable not just because it saved the time of retyping documents, but also because it reduced the time spent checking documents since one could focus attention on parts that had changed. The ability to maintain electronic copies was extremely valuable to lawyers because it allowed them to easily reuse text. Most lawyers had files of forms that they used to construct standard documents, but until documents were stored electronically, reusing text from previously-developed documents required them to retrieve the hard copies and retype the relevant text into the new document. PC-based word processing applications gradually replaced specialized word processing machines throughout the 1980s. These offered similar functionality, but were far cheaper, and extended these capabilities to smaller law offices. The change in computing platform from specialized machines to PCs did not immediately change how documents were produced in most cases; PCs at first simply

[19] Although Federal law databases were available on these services in the mid-1970s, state law databases were added to these services gradually. Below we will describe how we exploit cross-state differences in the availability of Lexis state law databases to examine whether the coordination cost decreases we uncover are related to the diffusion of these services.

replaced specialized word processing machines on secretaries' desks.[20] By the early 1990s, word processing applications had been adopted at most law firms, even small ones, though they were not necessarily used directly by the lawyers themselves.

Finally, the way lawyers communicated with each other and with clients changed as well. The most important change in intra-office communication was the diffusion of electronic mail, which occurred late in our sample period and primarily in the largest offices. Personal computers became common on lawyers' desks, first at large firms, in the late 1980s and early 1990s. Adoption of PCs by lawyers themselves generally coincided with the adoption of local area networks which linked these machines together with each other and printers, and which supported intra-office electronic mail.[21] Email not only provided a new way that lawyers could communicate with each other, but also allowed them to more easily share and edit electronic versions of documents. External communication changed throughout our sample period; fax machines became common in law offices during the 1980s, and teleconferencing and videoconferencing became more affordable throughout this period. Lawyers' use of email for external communication was uncommon until the mid-1990s commercialization of the internet, however.

Thus, technological change fundamentally altered how lawyers accomplished three important tasks during this period. Each of these changes had their greatest initial impact on large firms first before diffusing to smaller ones, but they took place at different points in time. Information retrieval improved starting in the late 1970s, particularly for lawyers in states where on-line databases included state law as well as Federal law. Document production changed starting in the early 1980s, and intra-office communication costs decreased starting in the late 1980s.

All of these changes decrease coordination costs. The impact of email and other means of electronic communication on coordination costs is straightforward. More subtly, the diffusion of computer-aided legal research decreased coordination costs by reducing the degree to which associates relied on partners' guidance to find relevant material; the results of search queries provide associates guidance that sometimes sub-

[20] A 1985 Survey by Hildebrandt, Inc. reports that most large firms had one or more PCs, but the majority of these were used by secretaries and administrators.

[21] Staudt and Shiels (1994) provide evidence that by 1993, most lawyers in large firms had personal computers on or near their desks, and the vast majority of large law firms had installed local area networks. The diffusion of networked PCs was very rapid; in the mid-1980s, these were extremely rare.

stitutes for partners' expertise. Finally, the adoption of word processing applications diminished coordination costs by making it less costly for teams of lawyers to edit and unify text that was drafted by different individuals into a single document. A broad consequence of these changes is that partners could delegate work to associates more efficiently than they could in the past, allowing for an increase in the leverage of partner talent.

5.2 Evidence

Our estimates above indicate that coordination costs associated with hierarchical production declined steadily during this time. This implies that the overall decline cannot be solely attributed to technological changes that took place only in some of these subperiods. In particular, this pattern cannot be solely due to the diffusion of personal computers within law firms, which was important only in the final subperiod in our sample, 1987-1992. This pattern instead is consistent with the hypothesis that the steady diffusion of a series of new applications lowered coordination costs during this period, starting with computer-aided legal research in the late 1970s.

We further investigate whether the decreases in coordination costs we uncover above are related to the diffusion of computer-aided legal research by exploiting the fact that state materials were added to Lexis libraries gradually, and some states' materials were added earlier than others. Lexis was thus more valuable for lawyers in some states than others during certain periods. We therefore investigate whether patterns in coordination costs are correlated with the timing of the availability of state materials: did θ decrease earlier in states where state materials were available earlier? In particular, we examine whether θ was systematically lower in 1982, but not in 1977 or 1987, in states where materials were available early than late.

We obtained data on the timing of Lexis availability by examining documents from the files of Robert Asman, President of the Ohio State Bar Association Automated Research.[22] A series of documents from the mid-1970s-early 1980s, including contracts and promotional materials, allow us to observe what was available on Lexis at different points in time. The state materials on Lexis during this period typically included the decisions of the states' Supreme Court and important Courts of Appeals.

[22] These files are maintained in the Case Western University Law Library; thanks to Kathleen Carrick for providing us access to them.

Lexis would typically try to make available these decisions for at least the previous 15-20 years (going back to somewhere in the 1950s or 1960s); once this was achieved, it would move on to other states. Lexis generally added larger states earlier, as potential demand was greater in these states.

We were able to obtain availability at several points in time; we count a state as having availability if state Supreme Court decisions are available for at least the previous ten years. By June 1974, materials were available for Missouri, Ohio, and New York. By November 1976, they were available for eight more states: California, Delaware, Florida, Illinois, Kansas, Massachusetts, Pennsylvania, and Texas. We will refer to these 11 states as the "early" states and the rest as the "late" states.[23] Eleven more states were available by August 1979; all 50 states were available by 1982.

The top panel of Table 11 provides some initial results from this exercise. The variable "early Lexis state" equals one if the law office is located in an early state and zero if it is located in a late state. The coefficient on this variable is negative and significant in each of our sample years; however, there is no evidence that it is particularly large in 1982 relative to the surrounding years. These regressions thus provide no support for the proposition that declines in coordination costs are related to the availability of Lexis materials.

The bottom panel contains some more detailed results that distinguish between large and small law offices; although Lexis tried to market its service to small law offices (through the availability of public terminals priced on a per use basis), it is clear that most adoption of the service was by larger law offices. We therefore create a dummy that equals one if the office has at least 10 partners and zero otherwise, and include interactions between this variable and the "early" dummy to investigate whether there is a difference in θ between large law offices in early and late states in 1982 but not before or after. Table 9 provides evidence that this is indeed the case. The coefficient on the "early Lexis state*at least 10 partners" interaction is negative and significant in 1982, but close to zero and not statistically significant in 1977 or 1987. Looking across large law offices, coordination costs declined in early states relative to late states between 1977 and 1982; late states then caught up between 1982 and 1987. There is thus some evidence that some of the decreases in coordination

[23] We experimented with dividing states into four categories rather than two, and found that results were similar for the two "early" categories and for the two "late" ones; we therefore combined them.

costs in Table 7 are related to the diffusion of computer-aided legal research.

While this pattern is interesting, it is important to recognize that the evidence that it provides is not conclusive. The "early" states tend to be states that contain the cities with the most lawyers in the country: New York City, Los Angeles, Chicago, etc. Absent detailed firm- or office-level data on adoption, it is unlikely that we can provide evidence against alternative hypotheses in which other factors lowered coordination costs for large law offices in states with large cities in 1982 but not before or after.[24] We see the results in Table 9 as suggestive of connections between the availability of new information technology and coordination costs (and therefore to increases in lawyers' earnings inequality), but more detailed data are necessary to establish these connections definitively.

6 Conclusion

Labor economists have long been concerned with the mechanisms behind the increases in earnings inequality since the late 1970s.[25] The literature has concluded that the phenomenon is primarily the consequence of changes in the demand for skill rather than changes in the supply of skill. It has also tentatively concluded that technological changes, rather than trade, are the likely culprits. More recently, some authors have argued that scale effects along the lines of those examined in Rosen (1981, 1982) have disproportionately affected earnings at the very top of the distribution by allowing individuals to exploit better increasing returns associated with their skill.[26]

In this paper we analyze data from U.S. lawyers between 1977-1992 and provide evidence on how changes in the ability of individuals to exploit increasing returns associated with their skill contributed to increases in earnings inequality in this industry during this time. We find that the coordination costs associated with hierarchical production diminished significantly during this period, and that increases in associate-partner ratios during this time account for about two-thirds of the in-

[24] We have, however, examined whether this pattern is merely a big city effect by investigating whether it holds when dummying out offices in New York, Los Angeles, Chicago, Dallas, Houston, and San Francisco. The pattern persists even when doing so.

[25] See notably Katz and Murphy (1992).

[26] Garicano and Rossi-Hasberg (2006) show that improvements in communication technology expand effective team size and increase the reach of hierarchy; Gabaix and Landier (2008) show that changes in firm size (as given by market capitalization) can account for most of the recent expansion of executive pay among very large firms.

crease in earnings inequality among very top lawyers, but a much smaller share of the increase in earnings inequality between top lawyers and other lawyers. Preliminary evidence indicates that these changes in organizational costs may be related to availability of computer-aided legal research services such as Lexis. However, more detailed data are necessary to establish this firmly and to investigate the particular paths through which declines in various classes of information costs have affected organization and inequality in this industry.

We see this paper as contributing to the understanding of the organizational underpinnings of changes in labor market outcomes. Our evidence highlights that changes in external and internal labor markets are closely related; understanding changes in what have traditionally been considered external labor market outcomes is likely to require studying how the demand and organization of skill and time changes inside firms. While law offices are an unusually clean laboratory, given offices' small size and comparable organizational structures, future studies in other industries with more organizationally complex firms should allow for further insights, in particular by allowing for an analysis of changes in the number of hierarchical layers in firms, which we could not measure in our data as most law firms (and our data) distinguish only between partners and associates.

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Table 1
Estimated Earnings Distribution Across Privately-Practicing Lawyers, 1977-1992

	Earnings Quantiles ('000s of 1992 Dollars)							Ratios of Quantiles		
	5th	10th	25th	50th	75th	90th	95th	75th/50th	90th/50th	95th/50th
1977	21	31	50	81	147	222	282	1.8	2.7	3.5
1982	15	24	40	66	114	185	242	1.7	2.8	3.7
1987	14	26	49	80	136	237	336	1.7	3.0	4.2
1992	3	20	47	77	137	257	373	1.8	3.3	4.8

Table 2
Estimated Leverage Distribution Across Privately-Practicing Lawyers, 1977-1992

	Leverage Quantiles									
	50th	55th	60th	65th	70th	75th	80th	85th	90th	95th
1977	0	0	0.13	0.25	0.33	0.50	0.57	0.73	1.00	1.17
1982	0	0	0	0.20	0.33	0.48	0.58	0.78	1.00	1.39
1987	0	0	0.14	0.33	0.50	0.63	0.83	1.00	1.25	1.67
1992	0	0	0	0.20	0.42	0.61	0.80	1.00	1.25	1.67

Leverage equals zero for associates and for partners at offices with no associates, and is the office's associate/ partner ratio at offices with at least one associate.

Table 3
Age Distribution of Full-Time Privately-Practicing Lawyers

Year	Shares by Age Bracket		
	35 or younger	36-50	51 or older
1970	30%	40%	30%
1980	45%	36%	19%
1990	35%	49%	16%
2000	27%	47%	26%

Source: PUMS 1% State Sample (Form 1, Form 2), 1970; PUMS 5% State Sample, 1980, 1990, 2000
Lawyers, at law offices, >39 hrs/week, >45 weeks/year, in labor force, age 25-70.

Table 4
Overhead, Employment, and Revenues

Offices That Are Legally Organized As Partnerships or Proprietorships for 1977 and 1982, As PSOs for 1987 and 1992.

Dependent Variable: (Expenses - 1.15*Payroll) for 1977, 1982; (Revenues - 1.15*Payroll) for 1987, 1992.

	1977	1982	1987	1992
C	**4.237**	0.960	**22.672**	**28.508**
	(0.928)	(1.211)	**(3.795)**	**(2.508)**
Employment	0.407	0.014	0.475	**2.864**
	(0.368)	(0.605)	(0.802)	**(0.603)**
Market Size*Employment Interactions				
20K-100K*Employment	**-0.958**	-0.740	-0.098	0.796
	(0.442)	(0.679)	(0.876)	(0.662)
100K-200K*Employment	-0.532	1.429	0.483	0.984
	(0.516)	(0.773)	(0.923)	(0.701)
200K-400K*Employment	-0.236	-0.333	0.551	**2.139**
	(0.456)	(0.736)	(0.866)	**(0.647)**
400K-1M*Employment	**0.903**	-0.352	**2.433**	**2.279**
	(0.451)	(0.766)	**(0.858)**	**(0.657)**
More than 1M*Employment	**2.616**	1.473	**4.856**	**13.896**
	(0.539)	(0.936)	**(1.008)**	**(0.735)**
Revenues Quadratic				
Revenues	**0.219**	**0.262**	**0.279**	**0.213**
	(0.004)	**(0.007)**	**(0.009)**	**(0.007)**
Revenues^2	**-9.16E-06**	-4.81E-06	-5.88E-06	**-7.61E-06**
	(1.77E-06)	(2.75E-06)	(3.39E-06)	**(1.80E-06)**
Market Size Dummies				
20K-100K	**2.195**	**5.734**	-2.707	-1.586
	(1.116)	**(1.439)**	(4.365)	(3.023)
100K-200K	**3.927**	**5.640**	-0.043	4.089
	(1.364)	**(1.739)**	(4.605)	(3.319)
200K-400K	**6.557**	**5.276**	-2.364	**11.098**
	(1.158)	**(1.589)**	(4.255)	**(2.809)**
400K-1M	**5.709**	**11.055**	**-9.841**	**7.873**
	(1.114)	**(1.554)**	**(4.034)**	**(2.756)**
More than 1M	**9.865**	**11.131**	**-15.302**	**-20.181**
	(1.308)	**(1.980)**	**(4.273)**	**(3.032)**
N	12043	4883	10647	10438
R-Squared	0.59	0.59	0.53	0.70

Specification also includes the (uninteracted) field shares of lawyers in the office, and interactions between the field shares and the revenues quadratic. Omitted field category is "share(general practitioner)."
Market size dummies are defined in terms of total 1992 employment in the county in which the office is located.
Employment is the total number of individuals (lawyers and non-lawyers) working in the office, minus 2.
Bold indicates rejection of the hypothesis b=0 using a one-tailed t-test of size 0.05.

Table 5
Wage-Leverage Regression Estimates, 1977-1992
Partnerships and Proprietorships With At Least One Associate

	1977	1982	1987	1992
Coefficient Estimates				
Associates/Partner -- "Business, Non-Litigation Offices"	0.203	**0.177**	**0.200**	**0.146**
	(0.042)	**(0.053)**	**(0.058)**	**(0.049)**
(Associates/Partner)**2 -- "Business, Non-Litigation Offices"	0.008	**-0.035**	-0.029	-0.021
	(0.012)	**(0.016)**	(0.016)	(0.013)
Associates/Partner -- "Litigation Offices"	0.085	-0.116	0.067	0.029
	(0.057)	(0.062)	(0.054)	(0.043)
(Associates/Partner)**2 -- "Litigation Offices"	-0.008	**0.048**	-0.007	0.007
	(0.016)	**(0.017)**	(0.014)	(0.010)
Associates/Partner -- "Individual, Non-Litigation Offices"	-0.059	-0.104	**-0.215**	0.002
	(0.058)	(0.065)	**(0.080)**	(0.060)
(Associates/Partner)**2 -- "Individual, Non-Litigation Offices"	0.020	**0.044**	**0.053**	-0.026
	(0.018)	**(0.018)**	**(0.025)**	(0.016)
Share(Banking Law Specialist)	**0.381**	-0.020	**0.234**	**0.193**
	(0.067)	(0.078)	**(0.072)**	**(0.062)**
Share(Corporate Law Specialist)	**0.387**	**0.318**	**0.579**	**0.675**
	(0.051)	**(0.061)**	**(0.061)**	**(0.058)**
Share(Insurance Law Specialist)	**0.192**	-0.036	**0.226**	**0.232**
	(0.062)	(0.070)	**(0.066)**	**(0.046)**
Share(Negligence-Defense Specialist)	**0.182**	0.030	**0.245**	**0.263**
	(0.056)	(0.067)	**(0.061)**	**(0.048)**
Share(Patent Law Specialist)	**0.206**	**0.219**	**0.404**	**0.413**
	(0.047)	**(0.051)**	**(0.066)**	**(0.055)**
Share(Government Law Specialist)		0.037	0.250	**0.548**
		(0.099)	(0.129)	**(0.070)**
Share(Environmental Law Specialist)				**0.517**
				(0.104)
Share(Real Estate Law Specialist)	0.088	**0.159**	**0.148**	**0.375**
	(0.053)	**(0.065)**	**(0.051)**	**(0.049)**
Share(Tax Law Specialist)	**0.379**	**0.489**	**0.368**	**0.603**
	(0.076)	**(0.104)**	**(0.109)**	**(0.107)**
Share(Criminal Law Specialist)	-0.017	-0.169	-0.062	**-0.265**
	(0.080)	(0.106)	(0.093)	**(0.057)**
Share(Domestic Law Specialist)	**-0.258**	-0.020	**-0.217**	0.082
	(0.083)	(0.105)	**(0.078)**	(0.072)
Share(Negligence-Plaintiff Specialist)	0.087	0.094	-0.055	**0.163**
	(0.060)	(0.074)	(0.064)	**(0.048)**
Share(Probate Law Specialist)	**0.157**	-0.019	**0.389**	**0.319**
	(0.064)	(0.085)	**(0.100)**	**(0.085)**
Share(Other Specialist)	**0.275**	**0.160**	**0.181**	**0.252**
	(0.032)	**(0.035)**	**(0.037)**	**(0.029)**
R-Squared	0.39	0.50	0.48	0.61
N	7560	3058	4835	5319
Estimated percent change in earnings from moving from ap=0.5 to ap=1.5: exp[w(1.5)]/exp[w(0.5)]				
Business, Non-Litigation Offices	4%	11%	15%	11%
Litigation Offices	7%	-2%	5%	4%
Individual, Non-Litigation Offices	-1%	-1%	-10%	-5%

Table 6
Mean Real Revenues Per Lawyer and the Estimated Marginal Cost of Leverage, 1977-1992

Partnerships and Proprietorships With At Least One Associate

					Components of Estimated Marginal Cost				
Year	Revenues/ Lawyer	Overhead Share of Revs.	Estimated Avg. Benefits	Estimated MC	Associate Pay	Nonlawyer Pay	Benefits	Overhead	Marginal Price of Leverage
	TR/(n+1)	*K*	*TR/(n+1)*(1-K)*	*MC*	*w*	*x*	*0.15*(w+x)*	*oh*'/p*	*w'n*
Means									
1977	195	0.20	156	91	48	28	11	2	2
1982	180	0.25	136	86	45	27	11	1	2
1987	235	0.24	181	119	57	38	14	6	4
1992	247	0.18	204	139	62	39	15	18	5
Means, Relative to Mean Estimated MC									
1977	2.15		1.71	1.00	0.53	0.31	0.12	0.02	0.02
1982	2.10		1.58	1.00	0.52	0.32	0.12	0.01	0.02
1987	1.97		1.52	1.00	0.48	0.32	0.12	0.05	0.03
1992	1.78		1.47	1.00	0.45	0.28	0.11	0.13	0.04

All dollar figures in thousands of 1992 dollars.

Table 7
Production Function Estimates, 1977-1992
Partnerships and Proprietorships With At Least One Associate

	1977	1982	1987	1992
Coefficient Estimates				
Constant	**0.603**	**0.478**	**0.463**	**0.336**
	(0.007)	**(0.011)**	**(0.012)**	**(0.010)**
Number of Partners	**-0.0052**	**-0.0051**	**-0.0034**	**0.0013**
	(0.0006)	**(0.001)**	**(0.001)**	**(0.0004)**
Number of Partners**2	-5.90E-05	**4.82E-05**	**4.04E-05**	-9.30E-07
	(8.40E-06)	**(7.34E-06)**	**(5.23E-06)**	(2.82E-06)
Share(Banking Law Specialist)	**-0.226**	0.054	**-0.281**	-0.005
	(0.039)	(0.055)	**(0.046)**	(0.037)
Share(Corporate Law Specialist)	-0.034	-0.024	**-0.120**	**-0.201**
	(0.025)	(0.037)	**(0.033)**	**(0.029)**
Share(Insurance Law Specialist)	**-0.071**	-0.013	-0.058	**-0.077**
	(0.028)	(0.034)	(0.032)	**(0.021)**
Share(Negligence-Defense Specialist)	**-0.029**	**0.170**	**0.080**	**0.066**
	(0.022)	**(0.029)**	**(0.028)**	**(0.021)**
Share(Patent Law Specialist)	0.023	0.030	-0.071	**-0.075**
	(0.023)	(0.031)	(0.038)	**(0.029)**
Share(Government Law Specialist)			-0.101	0.038
			(0.065)	(0.044)
Share(Environmental Law Specialist)				**0.144**
				(0.068)
Share(Real Estate Law Specialist)	-0.038	**-0.108**	-0.001	**-0.141**
	(0.034)	**(0.046)**	(0.036)	**(0.035)**
Share(Tax Law Specialist)	**0.123**	0.062	-0.032	0.060
	(0.042)	(0.077)	(0.072)	(0.063)
Share(Criminal Law Specialist)	-0.058	0.073	**0.176**	0.075
	(0.054)	(0.094)	**(0.073)**	(0.046)
Share(Domestic Law Specialist)	**-0.105**	-0.022	-0.109	**0.139**
	(0.056)	(0.083)	(0.063)	**(0.053)**
Share(Negligence-Plaintiff Specialist)	0.045	**0.237**	**0.253**	**0.366**
	(0.031)	**(0.047)**	**(0.036)**	**(0.026)**
Share(Probate Law Specialist)	-0.028	0.007	-0.134	**-0.119**
	(0.040)	(0.066)	(0.068)	**(0.057)**
Share(Other Specialist)	-0.014	**0.069**	**0.025**	0.007
	(0.017)	**(0.023)**	**(0.022)**	(0.017)
R-Squared	0.03	0.04	0.05	0.07
N	7560	3058	4835	5319
Average Predicted Value for Theta	0.57	0.63	0.66	0.71

The dependent variable in the production function is ln(revenues/lawyer*(1-K))-ln(MC), where K is the coefficient on revenues in the overhead regression for the office, and MC is the estimated marginal cost of leverage for the office. The coefficients reported here correspond to -ln(theta) in the text.
The 0.343 coefficient estimate in 1992 for the constant implies an estimate of theta of 0.710 for an office of general practitioners (the omitted category).

Bold indicates rejection of the hypothesis b=0 using a one-tailed t-test of size 0.05.

Table 8
Earnings Distribution Across Privately-Practicing Lawyers, 1977-1992

	Earnings Quantiles ('000s of 1992 Dollars)							Ratios of Quantiles		
	5th	10th	25th	50th	75th	90th	95th	75th/50th	90th/50th	95th/50th
Estimated Earnings Distribution										
1977	21	31	50	81	147	222	282	1.8	2.7	3.5
1982	15	24	40	66	114	185	242	1.7	2.8	3.7
1987	14	26	49	80	136	237	336	1.7	3.0	4.2
1992	3	20	47	77	137	257	373	1.8	3.3	4.8
Estimated Earnings Distribution, Absent Hierarchical Production										
1977	23	32	51	81	136	196	241	1.7	2.4	3.0
1982	17	26	41	66	105	158	195	1.6	2.4	3.0
1987	15	27	48	77	126	203	263	1.6	2.7	3.4
1992	5	21	46	78	131	222	284	1.7	2.8	3.6

All dollar amounts in thousands of 1992 dollars.

Table 9
Changes in Logged Earnings Quantile Ratios, Privately-Practicing Lawyers, 1977-1992

	Change In Logged Quantile Ratios, 1977-1992		
	ln(90th/50th)	ln(95th/50th)	ln(95th/90th)
All Offices			
Estimated Earnings	0.20	0.33	0.13
Estimated Earnings, Absent Hierarchical Production	0.16	0.21	0.04
Residual Change in Earnings Inequality	0.03	0.13	0.09
Residual Change as Percent of Estimated Earnings Change	17%	38%	69%
By Office Class			
Estimated Earnings			
Business, Non-Litigation	0.11	0.23	0.12
Litigation	0.31	0.46	0.15
Individual, Non-Litigation	0.48	0.54	0.06
Estimated Earnings, Absent Hierarchical Production			
Business, Non-Litigation	0.11	0.14	0.02
Litigation	0.25	0.31	0.07
Individual, Non-Litigation	0.41	0.54	0.13
Residual Change in Earnings Inequality			
Business, Non-Litigation	0.00	0.09	0.09
Litigation	0.07	0.15	0.08
Individual, Non-Litigation	0.07	0.00	-0.07
Residual Change as Percent of Estimated Earnings Change			
Business, Non-Litigation	0%	41%	80%
Litigation	21%	32%	55%
Individual, Non-Litigation	14%	0%	-117%

Residual Change in Earnings Inequality is the difference between the figures in the "estimated earnings" panel and the "estimated earnings, absent hierarchical production" panel. This is a measure of the degree to which changes in leverage have affected earnings inequality.

Table 10
Decomposition of Productivity Changes

Revenues Per Lawyer and Its Components

Year	$\overline{y_i/(n_i+1)}$	$\overline{z_m}$	$\overline{s}$	$cov(z_{mi}, s_i)$
1977	182	222	0.86	-9
1982	167	205	0.86	-9
1987	225	285	0.83	-13
1992	227	280	0.86	-12

Decomposition of Changes in Revenues Per Lawyer

	$\Delta\overline{y_i/(n_i+1)}$	$\Delta\overline{z_m}\ \overline{s_t}$	$\Delta\overline{s}\ \overline{z_{m,t-1}}$	$\Delta cov(z_{mi}, s_i)$
1977-1992	46	49	0	-3

All dollar amounts are in thousands of 1992 dollars.

Table 11
Production Function Estimates, 1977-1992 -- Lexis Specifications

Partnerships and Proprietorships With At Least One Associate

	1977	1982	1987	1992
Coefficient Estimates				
Constant	**0.616**	**0.499**	**0.474**	**0.368**
	(0.007)	**(0.011)**	**(0.013)**	**(0.011)**
Early Lexis State	**-0.036**	**-0.052**	**-0.029**	**-0.076**
	(0.007)	**(0.010)**	**(0.001)**	**(0.008)**
Constant	**0.601**	**0.468**	**0.459**	**0.369**
	(0.007)	**(0.011)**	**(0.013)**	**(0.011)**
Early Lexis State	**-0.036**	**-0.028**	**-0.025**	**-0.071**
	(0.008)	**(0.013)**	**(0.013)**	**(0.011)**
Early Lexis State*Office Has >=10 Partners	0.006	**-0.068**	0.007	0.003
	(0.015)	**(0.023)**	(0.020)	(0.015)
Office Has >=10 Partners	**-0.076**	-0.017	-0.027	**0.041**
	(0.011)	(0.018)	(0.016)	**(0.012)**
N	7560	3058	4835	5319

The dependent variable in the production function is ln(revenues/lawyer*(1-K))-ln(MC), where K is the coefficient on revenues in the overhead regression for the office, and MC is the estimated marginal cost of leverage for the office.
Specifications also include the lawyer specialization shares as controls, like in Table 7.
The top specification includes the level and square of the number of partners; the bottom does not.
Bold indicates rejection of the hypothesis b=0 using a one-tailed t-test of size 0.05.

Table A1
Earnings Distribution of Privately-Practicing Lawyers

	Earnings Quantiles ('000s of 1992 Dollars)									Top Coded
	10th	20th	30th	40th	50th	60th	70th	80th	90th	Above…
1969	31	40	50	60	75	88	105	134	184	$ 191,150
1979	23	34	42	50	59	73	91	116	*	$ 144,975
1989	29	40	51	61	74	88	*	*	*	$ 101,790
1999	27	39	50	61	72	84	105	*	*	$ 106,092

Asterisk indicates top-coded value.

Source: PUMS 1% State Sample (Form 1, Form 2), 1970; PUMS 5% State Sample, 1980, 1990, 2000.
Lawyers, at law offices, >39 hrs/week, >45 weeks/year, in labor force, age 25-70.

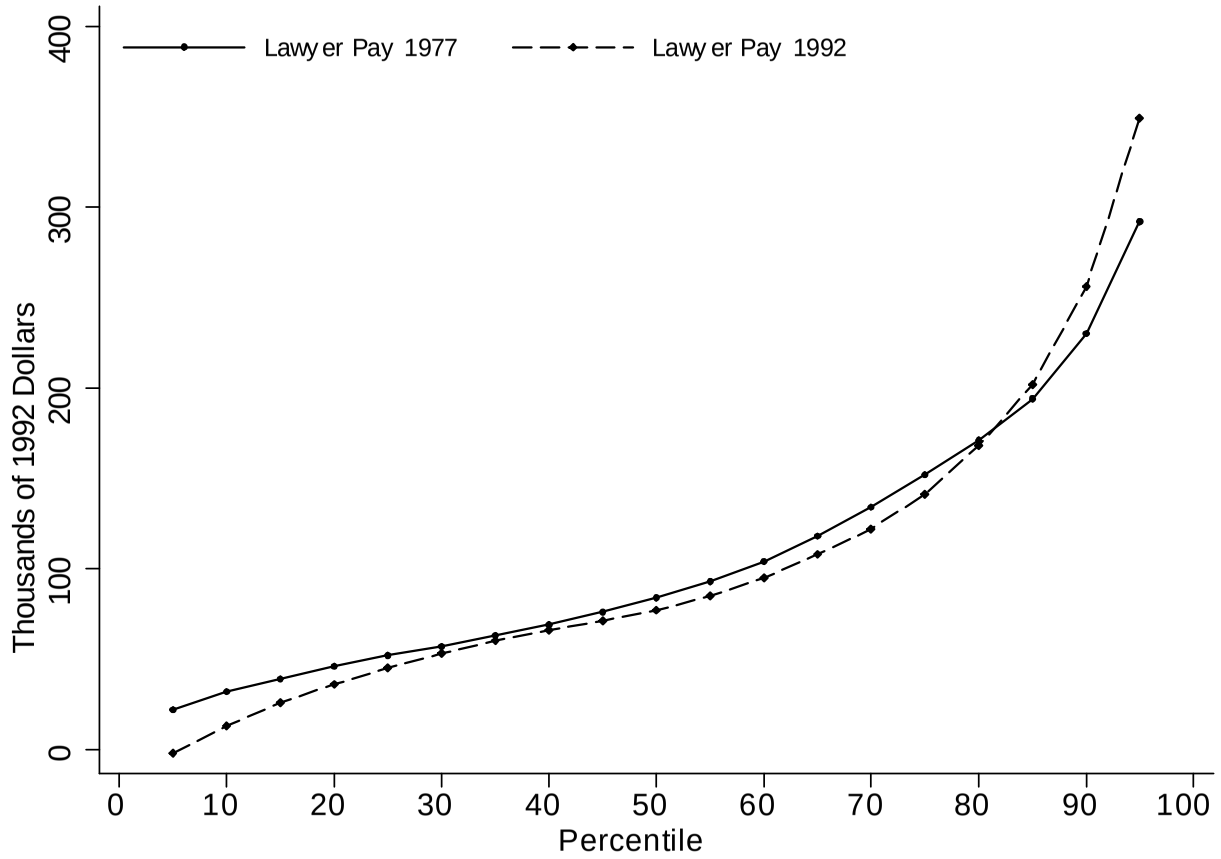

Figure 1. The Distribution of Lawyers' Earnings in 1977 and 1992. This Figure reports 20 quantiles of our estimated distribution of lawyers' earnings in 1977 and 1992. Earnings declined slightly below the 80th percentile, and increased above the 80th percentile.