My presentation will cover the main themes from a series of papers that I have co-written with Luis Garicano on the organization of the legal services industry in the U.S. We use this industry as a laboratory for examining issues that arise in the organization of knowledge-intensive production. The rest of the document contains the slides that I will use in the presentation.

Our work on specialization and law firms’ field boundaries, summarized here on pages 14-25, draws from "Specialization, Firms, and Markets: The Division of Labor Within and Between Law Firms."

Our work on hierarchies, summarized here on pages 26-36, draws from “Managerial Leverage Is Limited by the Extent of the Market.” (forthcoming, Journal of Law and Economics)

Our work on the interaction of lawyers’ human capital at its implications, summarized here on pages 37-53, draws from “Learning About the Nature of Production from Equilibrium Assignment Patterns.”

All of these papers are available from my research web site, which is:

www.kellogg.northwestern.edu/faculty/hubbard/htm/research/.
The Organization of Specialization: Knowledge Based Production

Luis Garicano
Thomas N. Hubbard
Two Themes of Our Research Agenda

I. Organizational Problems in Exploiting Individuals’ Returns to Specialization

Fundamental Aspects of Knowledge-Based Production

1. Specialization Is Valuable

   The cost of acquiring knowledge is independent of its subsequent use.

2. Diagnosis Is Non-Trivial

   Knowledge is not only necessary to solve problems, but also sometimes to diagnose them.

Combined, this means that demands need not match themselves to the individuals who have a comparative advantage in addressing them. Knowledge may be underexploited as a consequence.

How does the organization of knowledge-intensive production reflect/respond to this problem?

II. The Interaction of Individuals’ Human Capital in Knowledge-Based Production

How do these organizational responses affect the interaction between individuals’ human capital?

How does this affect where heterogeneous individuals work, their organizational position, their earnings, etc.?
I. Organizational Problems Associated With Exploiting Lawyers’ Returns to Specialization

Some Central Facts

- The organization of legal services changes as lawyers field-specialize more.

  Firms’ field boundaries narrow.
  Associate-partner ratios increase, though only within segments serving business clients.
  Non-lawyer/lawyer ratios do not change.

- Law firms’ field boundaries produce industry segmentation along the lines of transactional versus litigation, which as at least as important as individual v. business.

Implications

- Law firms’ field boundaries are shaped by the need to provide lawyers incentives to share information about economic opportunities.

- An important role that hierarchies play in legal services is in allowing experts to specialize in problems they have a comparative advantage in solving.

- Specialization affects firms’ boundaries and hierarchies by making these issues more salient.

- A common theme: organizational structure responds to the problem of matching individuals to the tasks that they have a comparative advantage in addressing.
II. The Interaction of Lawyers’ Human Capital in the Production of Legal Services

Some Central Facts

• Partner earnings, associate earnings, and associate-partner ratios covary positively, not only across but within local markets.

• In general, partners earn more than associates, even when comparing partners at firms with very low associate-partner ratios with associates at firms with very high associate-partner ratios.

• There is a correspondence between lawyers’ economy-wide rank in the earnings distribution and the size of the market in which they work, but this correspondence is not monotonic. For example, lawyers in the first and seventh earnings decile are overrepresented in small markets, and lawyers in the sixth and tenth earnings decile are overrepresented in large markets.

Implications

• Skills of different lawyers are neither strict complements nor substitutes in the production of legal services.

• Skill complementarities arise, in part, precisely because it is possible to organize production hierarchically. This aspect of production profoundly affects many aspects of the industry, including where lawyers work, their position, how much they earn, and so on.
Preliminaries I: Data


• County-level data from 1992 County Business Patterns.
  • Employment, distribution of employment across major industries, distribution of establishment size by industry.

• County-level data from 1993 County and City Data Book.
  • County-level demographic data.
### Legal Services

(Form CB-8100)

**Item 10. Personnel and Payroll, by Occupation**

Include personnel who perform a variety of functions (secretaries, etc.) on the one line which best describes the primary nature of their work.

**Line a(1) - Lawyers who are members of a professional service corporation should be included here.**

**Line b - Only proprietors and partners not considered employees of the firm for Federal tax purposes should be included here.**

**Occurrence (include proprietors and partners on line b only)**

<table>
<thead>
<tr>
<th>Occupation (include proprietors and partners on line b only)</th>
<th>Personnel for pay period including March 12, 1992 (number)</th>
<th>Annual payroll</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Type of employee</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1) Associate lawyers (employees of firm)</td>
<td>565</td>
<td>570</td>
</tr>
<tr>
<td>(2) Paraprofessionals (law clerks, legal assistants, investigators, etc.)</td>
<td>566</td>
<td>571</td>
</tr>
<tr>
<td>(3) Managers and other nonlegal professional staff</td>
<td>567</td>
<td>572</td>
</tr>
<tr>
<td>(4) All other (stenographers, bookkeepers, etc.)</td>
<td>568</td>
<td>573</td>
</tr>
<tr>
<td>(5) TOTAL (Sum of lines a(1) through a(4) above should equal entries in items 6a and 7)</td>
<td>569</td>
<td>574</td>
</tr>
<tr>
<td>b. Active proprietors or partners at this location (unincorporated operations only)</td>
<td>450</td>
<td></td>
</tr>
</tbody>
</table>

For law firms operating at more than one location, report proprietors or partners at the location where they spend most of their working time. (If this establishment is a member of a group practice, include only proprietors or partners whose practice is covered by this EIN number.)

**Item 11. Nature of Lawyers' Practice**

Include each individual lawyer reported in items 10a(1) and 10b (associate lawyers plus proprietors and partners at this location) on the one line which best describes the lawyer's primary field of specialization. Lawyers who are not primarily engaged in a single specialized field should be included on line b.

<table>
<thead>
<tr>
<th>Primary fields of practice</th>
<th>Number of lawyers</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Specialized fields</td>
<td></td>
</tr>
<tr>
<td>(1) Banking and commercial law</td>
<td>575</td>
</tr>
<tr>
<td>(2) Corporate law</td>
<td>576</td>
</tr>
<tr>
<td>(3) Criminal law</td>
<td>577</td>
</tr>
<tr>
<td>(4) Domestic relations</td>
<td>518</td>
</tr>
<tr>
<td>(5) Environmental law</td>
<td>519</td>
</tr>
<tr>
<td>(6) Governmental law</td>
<td>580</td>
</tr>
<tr>
<td>(7) Insurance law</td>
<td>581</td>
</tr>
<tr>
<td>(8) Negligence - defendant</td>
<td>582</td>
</tr>
<tr>
<td>(9) Negligence - plaintiff</td>
<td>543</td>
</tr>
<tr>
<td>(10) Patent, trademark, and copyright law</td>
<td>564</td>
</tr>
<tr>
<td>(11) Real estate</td>
<td>565</td>
</tr>
<tr>
<td>(12) Tax law</td>
<td>586</td>
</tr>
<tr>
<td>(13) Wills, estate planning, and probate</td>
<td>587</td>
</tr>
<tr>
<td>(14) Other specialized field - Specify</td>
<td>588</td>
</tr>
<tr>
<td>b. General practice</td>
<td>589</td>
</tr>
<tr>
<td>c. TOTAL (Sum of above lines should equal the sum of items 10a(1) and 10b)</td>
<td>591</td>
</tr>
</tbody>
</table>
Preliminaries II: Classifying Fields in Contractual Time and by the Source of Demand

Terms discussed; Contract proposed

Agreement; Contract takes force

Parties take actions; Uncertainty resolved

Dispute resolution; Litigation

Ex Ante Services

Ex Post Services

Businesses: banking, corporate, environmental, governmental, patent, real estate, tax.

Individuals: probate

Businesses: insurance, negligence-defense

Individuals: negligence-plaintiff, criminal, domestic
### Shares of Lawyers in Specialized Fields, Offices, and Firms

<table>
<thead>
<tr>
<th>Ex Ante Business Field</th>
<th>Share of Lawyers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banking</td>
<td>0.047</td>
</tr>
<tr>
<td>Corporate</td>
<td>0.083</td>
</tr>
<tr>
<td>Environmental</td>
<td>0.016</td>
</tr>
<tr>
<td>Governmental</td>
<td>0.015</td>
</tr>
<tr>
<td>Patent</td>
<td>0.020</td>
</tr>
<tr>
<td>Real Estate</td>
<td>0.062</td>
</tr>
<tr>
<td>Tax</td>
<td>0.028</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ex Post Business Field</th>
<th>Share of Lawyers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insurance</td>
<td>0.061</td>
</tr>
<tr>
<td>Negligence-Defendant</td>
<td>0.066</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other Specialized Field</th>
<th>Share of Lawyers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.155</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Individual Field</th>
<th>Share of Lawyers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criminal</td>
<td>0.024</td>
</tr>
<tr>
<td>Domestic Relations</td>
<td>0.026</td>
</tr>
<tr>
<td>Negligence-Plaintiff</td>
<td>0.074</td>
</tr>
<tr>
<td>Probate</td>
<td>0.035</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>General Practice</th>
<th>Share of Lawyers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.289</td>
</tr>
</tbody>
</table>

All shares computed using Census-provided sampling weights.
Preliminaries III: Does the Distribution of Demands Vary With Market Size?

*Dependent Variable: Percentage of Law Office’s Revenues That Come From Clients Who Are Individuals.*

<table>
<thead>
<tr>
<th>Employment Range</th>
<th>Small Market Subsample</th>
<th>Full Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>Standard Error</td>
</tr>
<tr>
<td>Employment 20K-100K</td>
<td>-9.77</td>
<td>1.88</td>
</tr>
<tr>
<td></td>
<td>-2.59</td>
<td>2.02</td>
</tr>
<tr>
<td>Employment 100K-200K</td>
<td>-13.14</td>
<td>2.27</td>
</tr>
<tr>
<td></td>
<td>-1.05</td>
<td>3.31</td>
</tr>
<tr>
<td>Employment 200K-400K</td>
<td>-17.99</td>
<td>9.33</td>
</tr>
<tr>
<td></td>
<td>0.45</td>
<td>8.27</td>
</tr>
<tr>
<td>Employment 400K-1M</td>
<td>-36.19</td>
<td>3.09</td>
</tr>
<tr>
<td></td>
<td>(3.09)</td>
<td>(4.11)</td>
</tr>
<tr>
<td>Employment &gt; 1M</td>
<td>-43.74</td>
<td>2.76</td>
</tr>
<tr>
<td></td>
<td>(2.76)</td>
<td>(4.31)</td>
</tr>
<tr>
<td>ln(employment)</td>
<td>-1.57</td>
<td>1.07</td>
</tr>
<tr>
<td></td>
<td>(1.07)</td>
<td>(0.82)</td>
</tr>
</tbody>
</table>

C

Includes Controls? | N | Y | Y | N | Y | Y

N | 5780 | 24984

Small market subsample includes law offices in non-MSAs and in single-county MSAs with less than 225,000 employment.
Question 1. Do Lawyers Specialize More In Larger Markets?

A Simple Model (Murphy (1986), Garicano and Hubbard (forthcoming)).

- Stage 1: N Lawyers choose the breadth (field A, B, or both) and depth of their knowledge.
- Stage 2: Demand realized. N Demanders each learn whether their demand is for A or B.
- Stage 3: Markets clear, production takes place.

The Trade-Off:

Specialists earn less than generalists if demand when their field is low (excess supply in that field). But earn more when demand in their field is not low (their depth makes them more productive).

Equilibrium Specialization:

In equilibrium, the expected earnings of specialists are equal that of generalists.

Market Size and Specialization:

Start from an equilibrium level of specialization. As N increases, aggregate uncertainty about the share of demands in fields A and B decreases. Expected earnings of specialists increases: the probability that there is excess supply in A decreases. Generalists become specialists until the point that expected earnings are once again equal.
In eqm $N_i$ satisfies: $w_i(N_i \mid N) = \Pr(\tilde{N}_i > N_i \mid N) q_{\tilde{N}} - c(q_{\tilde{N}}) (1 - q_{\tilde{N}}) - c(q_{\tilde{N}}) q_{\tilde{N}} = w_o$
## Market Size and Lawyer Specialization

### Small Market Subsample

Regression coefficients on ln(county employment), using the share of specialized lawyers as the dependent variable.

<table>
<thead>
<tr>
<th>Share Any</th>
<th>Share Specialized Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.136</td>
<td>(0.012)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Share Any</th>
<th>Share Ex Ante Bus Field</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Share Banking</td>
</tr>
<tr>
<td>0.029</td>
<td>0.001</td>
</tr>
<tr>
<td>(0.007)</td>
<td>(0.003)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Share Any</th>
<th>Share Ex Post Bus Field</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Share Insurance</td>
</tr>
<tr>
<td>0.027</td>
<td>0.022</td>
</tr>
<tr>
<td>(0.007)</td>
<td>(0.004)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Share Any</th>
<th>Share Individual Field</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Share Criminal</td>
</tr>
<tr>
<td>0.047</td>
<td>0.009</td>
</tr>
<tr>
<td>(0.009)</td>
<td>(0.003)</td>
</tr>
</tbody>
</table>
Summary of Results on Lawyer Specialization and Market Size

• Holding constant the distribution of demands, the share of lawyers that field-specialize increases with market size.

  o This is true across classes of fields (ex ante v. ex post, business v. individual).

• Doubling county employment is associated with a 9.5 percentage point increase in the predicted share of specialists.

• This confirms our intuition, going back to Adam Smith….

  o …though there is surprisingly little systematic empirical evidence on this point.

• …and sets up our main analysis, which has to do with the implications of specialization on organization.
Question 2. What Determines Law Firms’ Field Boundaries?

• Do law firms’ field boundaries narrow as market size increases and lawyers specialize?
  o If so, this indicates that firms’ boundaries are not merely shaped by clients’ demands, but also whether firms or markets best mediate relationships between individual lawyers.
  o An implication of Coase (1937): firms’ scope should narrow as individuals specialize more.

• Which lawyers work disproportionately with each other in the same firm?
  o Evidence on the benefits and costs of transacting “within a firm.”
  o Law firms’ boundaries reflect the scope of revenue sharing arrangements.
  o Propositions concern benefits and costs of such arrangements.
    • Risk-sharing, knowledge-sharing, monitoring.
Do Law Firms’ Field Boundaries Narrow as Market Size Increases and Lawyers Specialize?

Market Size Increases

Firms’ boundaries do not change

Firms’ boundaries narrow
Do Law Firms’ Field Boundaries Narrow as Market Size Increases and Lawyers Specialize?

Market Size Increases

- Share of lawyers in field-specialized firms constant
- Share of lawyers in field-specialized firms increases
Specialization Increases, Mediated by Firms

Specialization Increases, Mediated by Markets
Empirical Specification

\[ s_k = X_j \beta_1 + \varepsilon_{1k} \]

\[ s_k^{sf} = X_j \beta_2 + \varepsilon_{2k} \]

\( s_k \) = the share of lawyers in office \( k \) that are field-specialized.

\( s_k^{sf} \) = the share of lawyers in office \( k \) that are in a field-specialized firm.
Do Law Firms’ Field Boundaries Narrow as Market Size Increases and Lawyers Specialize?

Market Size Increases

1 - \( \frac{\beta_2}{\beta_1} \)

\( \frac{\beta_2}{\beta_1} \)
## Market Size, Lawyer, and Law Firm Specialization

### Small Market Subsample

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Share Any Specialized Field</th>
<th>Share Ex Ante Business Field</th>
<th>Share Ex Post Business Field</th>
<th>Share Individual Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(county employment)</td>
<td>0.136 (0.012)</td>
<td>0.029 (0.007)</td>
<td>0.027 (0.007)</td>
<td>0.047 (0.009)</td>
</tr>
</tbody>
</table>

### Market Size and Individual Specialization Regressions (Beta1)

### Market Size and Law Office Specialization Regressions (Beta2)

<table>
<thead>
<tr>
<th>ln(county employment)</th>
<th>0.066 (0.011)</th>
<th>0.004 (0.003)</th>
<th>0.011 (0.003)</th>
<th>0.031 (0.008)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beta2/Beta1</td>
<td>0.49</td>
<td>0.14</td>
<td>0.41</td>
<td>0.66</td>
</tr>
</tbody>
</table>

N = 6032

Controls include share of employment in 7 major sectors, average establishment size within each of these sectors, and a state capital dummy.

Small market subsample includes law offices in non-MSAs and in single-county MSAs with less than 225,000 employment. Standard errors are clustered at the county level, and are reported in parentheses.

Bold indicates statistically significantly different from zero, using a two-sided t-test of size 0.05.
Market Size and Law Firm Specialization

• In general, firms’ field boundaries narrow as market size increases and lawyers specialize.
  
  o Firms’ field boundaries do not merely reflect the distribution of clients’ demands.
  o They also reflect whether firms or markets best mediate relationships among lawyers.

• This pattern varies across classes of fields.
  
  o No evidence of this for ex ante business fields such as corporate and tax law.
  o Evidence exists for ex post business fields (e.g., insurance law) and individual fields.

• In small markets, one lawyer might cover corporate, tax, and insurance law. Hence this lawyer’s firm covers (at least) these three fields.

• In larger markets, different lawyers cover these fields. Once this happens, some fields remain with the same firm and some are spun off. Here, corporate and tax remain in the same firm, but insurance is spun off.
What Determines Law Firms’ Field Boundaries?
Some Theories on the Benefits and Costs of Revenue-Sharing Arrangements

• **Risk Sharing.** Revenue-sharing arrangements help shield lawyers from risk associated with field-specific demand shocks (Gilson and Mnookin (1985)).
  
  o Are lawyers with positively (negatively) correlated demands disproportionately unlikely (likely) to work with one another in the same firm?

• **Referrals (Knowledge-sharing about opportunities).** Revenue-sharing arrangements strengthen lawyers incentives to share knowledge about opportunities with one another (Garicano and Santos (2004)).
  
  o Are lawyers in fields where cross-field referrals are more valuable more likely to work with one another in the same firm?
  o Cross-field referrals tend to be more valuable for ex ante than ex post demands, because it is relatively easy for clients to judge the field scope of their demand at that point in time.

• **Monitoring.** Revenue-sharing arrangements weaken individual lawyers’ incentives; thus the costs of transacting “within a firm” should be lower when there are strong cognitive connections between fields.
  
  o Are lawyers in fields with strong cognitive connections more likely to work with one another in the same firm?
## Normalized Composition of Law Firms

By Specialty of the Lawyer

<table>
<thead>
<tr>
<th>Specialty of the Lawyer</th>
<th>Banking</th>
<th>Corporate</th>
<th>Governmental</th>
<th>Environmental</th>
<th>Tax</th>
<th>Real Estate</th>
<th>Patent</th>
<th>Insurance</th>
<th>Neg-Def</th>
<th>Criminal</th>
<th>Domestic</th>
<th>Neg-Pla</th>
<th>Probate</th>
<th>Other</th>
<th>Gen Prac</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banking</td>
<td>7.52</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Corporate</td>
<td>1.27</td>
<td>4.42</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government</td>
<td>1.06</td>
<td>1.26</td>
<td></td>
<td>24.28</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Environmental</td>
<td>1.34</td>
<td>1.50</td>
<td>2.36</td>
<td>13.61</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>Tax</td>
<td>1.18</td>
<td>1.84</td>
<td>1.13</td>
<td>1.39</td>
<td>10.90</td>
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<tr>
<td>Real Estate</td>
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<td>0.85</td>
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<td>6.79</td>
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</tr>
<tr>
<td>Patent</td>
<td>0.35</td>
<td>0.63</td>
<td>0.42</td>
<td>0.62</td>
<td>0.53</td>
<td>0.25</td>
<td>39.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insurance</td>
<td>0.61</td>
<td>0.50</td>
<td>0.56</td>
<td>0.99</td>
<td>0.37</td>
<td>0.35</td>
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<td>11.75</td>
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<td></td>
<td></td>
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<tr>
<td>Neg-Def</td>
<td>0.73</td>
<td>0.65</td>
<td>0.71</td>
<td>1.04</td>
<td>0.60</td>
<td>0.54</td>
<td>0.17</td>
<td>0.58</td>
<td>9.83</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Criminal</td>
<td>0.33</td>
<td>0.48</td>
<td>0.47</td>
<td>0.44</td>
<td>0.41</td>
<td>0.49</td>
<td>0.07</td>
<td>0.19</td>
<td>0.19</td>
<td>26.97</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Domestic</td>
<td>0.61</td>
<td>0.49</td>
<td>0.80</td>
<td>0.47</td>
<td>0.40</td>
<td>0.74</td>
<td>0.07</td>
<td>0.30</td>
<td>0.33</td>
<td>1.61</td>
<td>20.80</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neg-Pla</td>
<td>0.64</td>
<td>0.31</td>
<td>0.37</td>
<td>0.26</td>
<td>0.22</td>
<td>0.60</td>
<td>0.05</td>
<td>0.14</td>
<td>0.37</td>
<td>0.84</td>
<td>0.78</td>
<td>10.03</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probate</td>
<td>0.97</td>
<td>1.12</td>
<td>0.81</td>
<td>0.86</td>
<td>1.62</td>
<td>1.27</td>
<td>0.22</td>
<td>0.52</td>
<td>0.64</td>
<td>0.59</td>
<td>1.10</td>
<td>0.43</td>
<td>11.31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0.65</td>
<td>1.05</td>
<td>0.73</td>
<td>1.02</td>
<td>0.89</td>
<td>0.68</td>
<td>0.31</td>
<td>0.23</td>
<td>0.26</td>
<td>0.28</td>
<td>0.38</td>
<td>0.18</td>
<td>0.53</td>
<td>4.20</td>
<td></td>
</tr>
<tr>
<td>Gen Prac</td>
<td>0.30</td>
<td>0.25</td>
<td>0.29</td>
<td>0.31</td>
<td>0.27</td>
<td>0.25</td>
<td>0.09</td>
<td>0.12</td>
<td>0.15</td>
<td>0.16</td>
<td>0.29</td>
<td>0.13</td>
<td>0.29</td>
<td>0.18</td>
<td>2.95</td>
</tr>
</tbody>
</table>

Diagonal

<table>
<thead>
<tr>
<th>Specialty of the Lawyer</th>
<th>Banking</th>
<th>Corporate</th>
<th>Governmental</th>
<th>Environmental</th>
<th>Tax</th>
<th>Real Estate</th>
<th>Patent</th>
<th>Insurance</th>
<th>Neg-Def</th>
<th>Criminal</th>
<th>Domestic</th>
<th>Neg-Pla</th>
<th>Probate</th>
<th>Other</th>
<th>Gen Prac</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banking</td>
<td>4.47</td>
<td>3.48</td>
<td>13.93</td>
<td>10.38</td>
<td>3.73</td>
<td>2.63</td>
<td>32.62</td>
<td>9.95</td>
<td>8.23</td>
<td>6.43</td>
<td>5.95</td>
<td>4.50</td>
<td>3.02</td>
<td>2.83</td>
<td>1.38</td>
</tr>
<tr>
<td>(colleagues only)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bold indicates values greater than 1.00.
Main Patterns

- Ex ante specialists tend to work at the same firm with one another, but most other pairs of specialists tend not to.
  - This extends across the business/individual split. Probate lawyers work disproportionately at the same firm as ex ante business specialists.
- The main exception to this is that patent lawyers, ex ante business specialists, work in field-specialized firms.
- Lawyers in the same field are disproportionately likely to work at the same firm with one another.
What Determines Law Firms’ Field Boundaries?

- **Risk Sharing.**
  - Little evidence in favor. In fact, lawyers in fields with positively correlated demands (banking, corporate, real estate) are disproportionately **likely** to work with one another in the same firm.

- **Referrals (Knowledge-sharing about opportunities).**
  - In favor. Cross-field patterns correspond to clients’ ability to self-refer.
    - Lawyers in ex ante fields are disproportionately likely to work with one another in the same firm.
    - The main exception, patent law, is explained easily in this light.
  - Against. Within-field result.
    - Lawyers in the same field are disproportionately likely to work with one another.
    - Explanations: partners and associates, subspecialization by partners.

- **Monitoring.**
  - In favor. Within-field result.
  - Against. Cross-field results. Ex ante business fields are found in the same firm, regardless of the strength of the fields’ cognitive connections.
Question 3. What Determines Law Firms’ Hierarchies?

- Why do individuals (sometimes) organize into hierarchies?
- What determines hierarchies’ shape?
Basic Facts About Legal Services Hierarchies
United States, 1992

Panel A: Distribution of Law Offices and Associates by Number of Associates in the Office (percent)

<table>
<thead>
<tr>
<th>Number of Associates</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>&gt;5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution of Law Offices</td>
<td>72.7</td>
<td>11.2</td>
<td>5.4</td>
<td>2.8</td>
<td>1.4</td>
<td>1.6</td>
<td>4.9</td>
</tr>
<tr>
<td>Distribution of Associates</td>
<td>8.4</td>
<td>8.0</td>
<td>6.4</td>
<td>4.2</td>
<td>6.1</td>
<td>66.9</td>
<td></td>
</tr>
</tbody>
</table>

Panel B: Distribution of Law Offices and Share of Lawyers Who Are Specialists, by Associate/Partner Ratio (percent)

<table>
<thead>
<tr>
<th>Associate/Partner Ratio</th>
<th>0</th>
<th>0-0.5</th>
<th>0.5-1.0</th>
<th>1.0-1.5</th>
<th>1.5-2.0</th>
<th>2.0+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distribution of Law Offices</td>
<td>72.7</td>
<td>7.4</td>
<td>11.6</td>
<td>2.2</td>
<td>3.6</td>
<td>2.5</td>
</tr>
<tr>
<td>Share of Lawyers Who Are Specialists</td>
<td>44.8</td>
<td>68.7</td>
<td>76.7</td>
<td>86.0</td>
<td>77.8</td>
<td>86.5</td>
</tr>
</tbody>
</table>

Panel C: Distribution of Leverage Across Lawyers (percent)

<table>
<thead>
<tr>
<th>Leverage</th>
<th>0</th>
<th>0-0.5</th>
<th>0.5-1.0</th>
<th>1.0-1.5</th>
<th>1.5-2.0</th>
<th>2.0+</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Lawyers</td>
<td>40.0</td>
<td>26.4</td>
<td>9.1</td>
<td>12.7</td>
<td>5.7</td>
<td>3.7</td>
</tr>
<tr>
<td>Lawyers Serving Business Clients</td>
<td>48.4</td>
<td>11.0</td>
<td>9.3</td>
<td>15.1</td>
<td>8.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Lawyers Serving Individual Clients</td>
<td>25.2</td>
<td>53.5</td>
<td>8.8</td>
<td>8.4</td>
<td>1.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>
Remarks About These Facts

• Theories that emphasize…
  o Monitoring/coordination of team production.
  o Tournaments among lower-tier individuals.
  o Partners as specialized rainmakers.

• …would have a hard time accommodating these industry-wide patterns.

• …though they certainly may capture phenomena in particular firms or segments.

• Theories that emphasize hierarchies’ role in exploiting specialized human capital can accommodate these easily, and have additional testable implications.
Theory: A Model of Hierarchy in a World With One Field

Supply

Demand

N agents, each with one unit of time for handling problems

N demanders, each with a set of problems requiring one unit of time to handle
Autarky

Supply

Demand

Working Alone: \( y = pq - c(q) \)
Production in Knowledge-Based Hierarchies

\[ MC(q) \]

\[ MB \]

\[ MB' \]

Solved

Handled by Top

Handled by Bottom
Knowledge-Based Hierarchies

- **Main Idea.** Organizing hierarchically exploits expert knowledge, by shielding experts from problems they do not have a comparative advantage in addressing.

- **Proposition.** Individuals should be more likely to work in hierarchies, and worker-manager ratios should be higher, in larger markets.
  - Individuals should be more likely to organize hierarchically, and have higher worker-manager ratios, when the marginal benefits of depth are higher.
  - The marginal benefits of depth are higher for specialists than generalists.
    - In equilibrium, field A specialists are more likely to work in field A than a generalist who has expertise in both field A and B.
    - Individuals should be more likely to work in hierarchies, and worker-manager ratios should be higher, when they are field-specialized then not.
    - A greater share of individuals field-specialize in larger markets.

- **Exceptions.** Constraints on the division of labor. Fields with low returns to depth.
Figure 1
Specialization and Hierarchy

generalist, hierarchy

specialist, hierarchy

generalist, non-hierarchy

specialist, non-hierarchy

\( \ln(\text{county employment}) \)
Figure 2
Partners and Associates

ln(county employment)
Hierarchies: Additional Results

• These patterns only appear when looking at offices serving business, not individuals.
  
  o It does not appear in segments where we think that the returns to depth are relatively low.

• This is true holding constant firm size.
  
  o N-lawyer firms in small markets are organized differently than n-lawyer firms in large markets, and this corresponds to differences in the degree to which lawyers in these firms field-specialize.

• An analogous pattern does not appear when looking at the hierarchical margin between lawyers and non-lawyers.
  
  o It appears at a margin where the division of labor is unconstrained, not one where it is (legally) constrained.
Figure 3
The Distribution of Leverage
Business Segment Lawyers

Leverage

associate, hierarchy

partner, non-hierarchy

partner, hierarchy

percentile in leverage distribution

Arrows indicate how the distribution changes as local market size increases.
I. Organizational Problems Associated With Exploiting Lawyers’ Returns to Specialization

Some Central Facts

- The organization of legal services changes as lawyers field-specialize more.
  
  Firms’ field boundaries narrow.
  Associate-partner ratios increase, though only within segments serving business clients.
  Non-lawyer/lawyer ratios do not change.

- Law firms’ field boundaries produce industry segmentation along the lines of transactional versus litigation, which as at least as important as individual v. business.

Implications

- Law firms’ field boundaries are shaped by the need to provide lawyers incentives to share information about economic opportunities.

- An important role that hierarchies play in legal services is in allowing experts to specialize in problems they have a comparative advantage in solving.

- Specialization affects firms’ boundaries and hierarchies by making these issues more salient.

- A common theme: organizational structure responds to the problem of matching individuals to the tasks that they have a comparative advantage in addressing.
Question 4. How Does Lawyers’ Human Capital Interact in the Production of Legal Services?

Idea: Equilibrium assignment connects earnings and organizational patterns to production functions.

Industry-wide earnings patterns contain a wealth of information that can allow researchers to better understand the nature of production in an industry, and in turn why an industry is organized as it is.
Equilibrium Assignment with Classes of Non-Hierarchical Production Functions


Example: \( f(z_1, z_2) = z_1z_2 \)

- Positive assortative matching.
- Self-matching in equilibrium.
- Stratification by firm.

2. Submodular, symmetric skill sensitivity. (Grossman and Maggi (2000))

Example: \( f(z_1, z_2) = 1-(1-z_1)(1-z_2) \)

- Negative assortative matching.
- Cross-matching in equilibrium.

3. Supermodular, asymmetric skill sensitivity. (Kremer and Maskin (1997))

Example: \( f(z_1, z_2) = z_1^{\gamma}z_2^{1-\gamma}, \gamma > 1/2 \)

- Positive assortative matching.
- Cross-matching in equilibrium is possible…
- …as is stratification by occupation.

\[ y = g(z)n \]

\( z = \text{managerial human capital} \)
\( n = \text{resources assigned to the manager} \)

“Span of control”; number of workers, efficiency units of labor, units of physical capital

Span limited implicitly or explicitly by manager’s time constraints.

- In equilibrium, more skilled managers are assigned more resources.
“Hierarchical Production Functions”: Properties

The general form:

\[ y = g(z_h) t = z_h t \]

\( z_h = \) skill of the most skilled member in the group
\( t = \) time to which this skill is applied

Specific cases:

Autarky: \( y(z_h,t) = z \)

(Two-level) Hierarchy: \( y(z_h,t) = z_h n(z_l); n' > 0 \)

\( n = \) number of workers
\( z_l = \) skill of the less-skilled member in the group

- Inputs are human capital and time, which are complements.
- We assume \( n' > 0 \). This implies more skilled workers enable more workers per manager. (perhaps because they require less managerial time per worker)

Important characteristics of this production function:

- \( z_h \) and \( z_l \) are complements.
- Production is asymmetrically sensitive to \( z_h \) and \( z_h \)
- Scale of operations effects associated with human capital.
“Hierarchical Production Functions”: Equilibrium Assignment

Autarky: \( y(z_h, t) = z \)
Hierarchy: \( y(z_h, t) = z_h n(z_i); n' > 0 \)

- **Positive Sorting**
  - More highly skilled managers work with more highly skilled workers.
  - Follows directly from complementarities between manager and worker skill.

- **Scale of Operations Effects**
  - More highly skilled managers work in groups with more workers/manager.
  - More highly skilled workers work in groups with more workers/manager.
  - Follows from \( n' > 0 \) plus positive sorting.

- **Equilibrium assignment must involve cross-matching; self-matching is not an equilibrium outcome**
  - \( (n+1) \) equally-skilled individuals produce more under autarky than if they worked together in a hierarchy.

- **Strict stratification by occupation**…
  - …the least skilled manager is more skilled than the most skilled worker…
  - …obtains in equilibrium in contexts where production involves matching problems to individuals and solving problems, as in Garciano-Rossi-Hansberg (2005).
An Outline of the Evidence

1. Regressions of associate pay on (estimated) partner pay.

   *Lawyers’ equilibrium assignment to each other.*

2. Regressions of partner, associate pay on associate/partner ratio.

3. Stratification tests.

   *Lawyers’ equilibrium assignment to organizational positions.*

4. Analysis of the pay distribution and how it varies with market size.

   *Lawyers’ equilibrium assignment to markets.*
**Table 5**

**Regressions of Associate Pay on Partner Pay**

*Partnerships and Proprietorships with at Least One Associate*

Dependent Variable: $\ln(\text{associate pay})$

---

**Panel A: Business and Individual Client Offices (N=5365)**

<table>
<thead>
<tr>
<th>ln(partner pay)</th>
<th>0.349</th>
<th>0.256</th>
<th>0.190</th>
<th>0.176</th>
<th>0.173</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.008)</td>
<td>(0.009)</td>
<td>(0.008)</td>
<td>(0.008)</td>
<td>(0.008)</td>
<td></td>
</tr>
</tbody>
</table>

R-squared 0.24 0.37 0.48 0.65 0.67

**Panel B: Business Client Offices (N=3480)**

<table>
<thead>
<tr>
<th>ln(partner pay)</th>
<th>0.308</th>
<th>0.235</th>
<th>0.162</th>
<th>0.141</th>
<th>0.138</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.009)</td>
<td>(0.009)</td>
<td>(0.009)</td>
<td>(0.009)</td>
<td>(0.009)</td>
<td></td>
</tr>
</tbody>
</table>

R-squared 0.25 0.33 0.48 0.64 0.66

**Panel C: Individual Client Offices (N=1885)**

<table>
<thead>
<tr>
<th>ln(partner pay)</th>
<th>0.331</th>
<th>0.252</th>
<th>0.214</th>
<th>0.189</th>
<th>0.196</th>
</tr>
</thead>
<tbody>
<tr>
<td>(0.015)</td>
<td>(0.016)</td>
<td>(0.016)</td>
<td>(0.017)</td>
<td>(0.016)</td>
<td></td>
</tr>
</tbody>
</table>

R-squared 0.21 0.31 0.37 0.70 0.72

Controls

- None
- Specialty Shares
- Specialty Shares, Market Size Dummies
- Specialty Shares, County Dummies
- Specialty Shares, County Dummies, Partners, Partners**2, Partners**3

Bold indicates rejection of the hypothesis $b=0$ using a one-tailed t-test of size 0.05.
Table 7
Regressions of Partner Pay and Associate Pay on Associates/Partner
Partnerships and Proprietorships with at Least One Associate

**Panel A: Dependent Variable: ln(partner pay), N=5365**

<table>
<thead>
<tr>
<th>ln(associates/partner)</th>
<th>0.375</th>
<th>0.312</th>
<th>0.264</th>
<th>0.285</th>
<th>0.283</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.011)</td>
<td>(0.012)</td>
<td>(0.014)</td>
<td>(0.014)</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.15</td>
<td>0.30</td>
<td>0.33</td>
<td>0.50</td>
<td>0.51</td>
</tr>
</tbody>
</table>

**Panel B: Dependent Variable: ln(associate pay), N=5475**

<table>
<thead>
<tr>
<th>ln(associates/partner)</th>
<th>0.190</th>
<th>0.156</th>
<th>0.087</th>
<th>0.055</th>
<th>0.103</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(0.009)</td>
<td>(0.008)</td>
<td>(0.008)</td>
<td>(0.008)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.07</td>
<td>0.30</td>
<td>0.43</td>
<td>0.59</td>
<td>0.62</td>
</tr>
</tbody>
</table>

Controls  
None  
Specialty Shares  
Specialty Shares, Market Size Dummies  
Specialty Shares, County Dummies  
Specialty Shares, County Dummies, Partners, Partners**2, Partners**3

Associate pay is associate payroll within the office divided by the number of associates.
Partner pay is (revenues - payroll - overhead) divided by the number of partners, where overhead equals 0.43*revenues.
The number of observations differs between the two panels because ln(partner pay) is undefined when partner pay is negative.

Bold indicates rejection of the hypothesis b=0 using a one-tailed t-test of size 0.05.
Fitting Models for Vuong Tests

“Occupational Stratification” Specification

\[ w_i = a_i + e_i, \ e_i \sim \text{logistic}(0, s) \]

\[ \text{Prob(lawyer i is in A1)} = 1 - \Phi(\frac{w_i - a_1}{s}) \]
\[ \text{Prob(lawyer i is in “position j”)} = \Phi(\frac{w_i - a_{j-1}}{s}) - \Phi(\frac{w_i - a_j}{s}), \ j=2,\ldots,7 \]
\[ \text{Prob(lawyer i is in P4)} = \Phi(\frac{w_i - a_7}{s}) \]

This is an ordered logit model. We allow the parameters \(a_j\) to vary with the field shares of lawyer i’s office and with market size. We constrain \(a_{j+1} > a_j\).

We fit this specification, and other specifications where the ordering is different, and use Vuong’s (1989) non-nested hypothesis test to assess which fits the data best.
### Table 8

**Vuong Tests of Occupational Stratification**

*Lawyers in Partnerships and Proprietorships With at Least One Associate*

<table>
<thead>
<tr>
<th>Ordering</th>
<th>-LogL Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 A2 A3 A4 P1 P2 P3 P4</td>
<td>17936</td>
</tr>
<tr>
<td>A1 A2 A3 P1 A4 P2 P3 P4</td>
<td>18142 7.25</td>
</tr>
<tr>
<td>A1 P1 A2 P2 A3 P3 A4 P4</td>
<td>19823 15.03</td>
</tr>
</tbody>
</table>

This table reports Vuong test statistics when comparing the occupational stratification specification in the first row to alternative specifications. The null is that the specifications fit the data equally well. Under the null, this statistic is distributed N(0,1). See Vuong (1989) for details.

The specifications are ordered logits, where lawyers are classified according to their occupational position and the associate/partner ratio in their office. The categories A1-A4 correspond to associates in offices where this ratio is less than 0.5, at least 0.5 but less than 1.0, at least 1.0 but less than 2.0, and greater than 2.0, respectively. The categories P1-P4 correspond to partners classified analogously.

The ordered logits predict lawyers' classification as a function of their earnings. All specifications allow threshold "alphas" to vary with specialty shares and county employment size dummies (see text for how these are defined).

The unit of observation is at the occupation*office level (partners or associates at a given office). N=10,950, which reflects that there are two observations for each of the 5475 partnerships and proprietorships with at least one associate in our data.
## Table 9
### Vuong Tests of Occupational Stratification

*Lawyers in Partnerships or Proprietorships*

<table>
<thead>
<tr>
<th>Ordering</th>
<th>Vuong Test LogL Statistic</th>
<th>Vuong Test LogL Statistic</th>
<th>Vuong Test LogL Statistic</th>
<th>Vuong Test LogL Statistic</th>
<th>Vuong Test LogL Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 A2 A3 A4 P0 P1 P2 P3 P4</td>
<td>24580</td>
<td>15110</td>
<td>8842</td>
<td>6104</td>
<td>2057</td>
</tr>
<tr>
<td>A1 A2 A3 P0 A4 P1 P2 P3 P4</td>
<td>24501</td>
<td>-2.08</td>
<td>15154</td>
<td>1.73</td>
<td>8769</td>
</tr>
<tr>
<td>A1 A2 P0 A3 A4 P1 P2 P3 P4</td>
<td>24256</td>
<td>-3.01</td>
<td>15206</td>
<td>2.59</td>
<td>8620</td>
</tr>
<tr>
<td>A1 P0 A2 A3 A4 P1 P2 P3 P4</td>
<td>24263</td>
<td>-2.09</td>
<td>15305</td>
<td>3.63</td>
<td>8584</td>
</tr>
<tr>
<td>P0 A1 A2 A3 A4 P1 P2 P3 P4</td>
<td>24414</td>
<td>-1.04</td>
<td>15492</td>
<td>5.98</td>
<td>8565</td>
</tr>
</tbody>
</table>

**Sample:**
- Offices: All
- Counties: All
  - Employment: < 400K, > 400K
  - Business Client: All, Individual Client

This table reports Vuong test statistics when comparing the occupational stratification specification in the first row to alternative specifications. The null is that the specifications fit the data equally well. Under the null, this statistic is distributed N(0,1). See Vuong (1989) for details.

The specifications are ordered logits, where lawyers are classified according to their occupational position and the associate/partner ratio in their office. The categories A1-A4 correspond to associates in offices where this ratio is less than 0.5, at least 0.5 but less than 1.0, at least 1.0 but less than 2.0, and greater than 2.0, respectively. The categories P1-P4 correspond to partners classified analogously. P0 is partners at offices without associates.

The ordered logits predict lawyers' classification as a function of their earnings. All specifications allow threshold "alphas" to vary with specialty shares and county employment size dummies (see text for how these are defined).

The unit of observation is at the occupation*office level (partners or associates at a given office). N=14,918, which reflects that there are two observations for each of the 5475 partnerships and proprietorships with at least one associate in our data plus 3,968 offices with partners but not associates.

Individual client offices are offices where at least 50% of revenues come from individuals. All other offices are business offices. Approximately 40 counties had >400K employment as of 1992; counties with approximately 400K employees include Hillsborough County, FL (Tampa) and Orange County, FL (Orlando).
Earnings Distributions and Local Market Size

How does the assignment of individuals to markets reflect the equilibrium assignment of individuals to each other?

One possibility: Rosen (1981). Superstar effects lead skill and market size to be positively associated throughout their respective domains.

But under cross-matching...those who work disproportionately in large markets should include not just experts, but also those whose comparative advantage is working with experts – and these other individuals are somewhere in the middle of the skill distribution.

As skill increases, an individual’s comparative advantage changes:

- worker under relatively low-skilled manager, small market
- worker under relatively high-skilled manager, large market
- relatively low-skilled manager, small market
- relatively high-skilled manager, large market

One would not expect these conditional density functions to be monotonic.

- In this simple example they would be bimodal.
The Distribution of Lawyers Across Earnings Deciles by Market Size Category

Although higher-earning lawyers tend to work in larger markets, earnings and market size do not appear to be positively associated throughout their domains.

Instead, the distributions tend to be bimodal, with both modes increasing as one moves from smaller to larger local markets.

Mean earnings by earnings decile:

1\textsuperscript{st}: 14,263  
2\textsuperscript{nd}: 33,057  
3\textsuperscript{rd}: 46,069  
4\textsuperscript{th}: 57,553  
5\textsuperscript{th}: 68,142  
6\textsuperscript{th}: 78,741  
7\textsuperscript{th}: 91,908  
8\textsuperscript{th}: 111,594  
9\textsuperscript{th}: 144,278  
10\textsuperscript{th}: 293,814
II. The Interaction of Lawyers’ Human Capital in the Production of Legal Services

Some Central Facts

- Partner earnings, associate earnings, and associate-partner ratios covary positively, not only across but within local markets.

- Except in the very largest local markets, partners earn more than associates, even when comparing partners at firms with very low associate-partner ratios with associates at firms with very high associate-partner ratios.

- There is a correspondence between lawyers’ economy-wide rank in the earnings distribution and the size of the market in which they work, but this correspondence is not monotonic. For example, lawyers in the first and seventh earnings decile are overrepresented in small markets, and lawyers in the sixth and tenth earnings decile are overrepresented in large markets.

Implications

- Skills of different lawyers are neither strict complements nor substitutes in the production of legal services.

- Skill complementarities arise, in part, precisely because it is possible to organize production hierarchically. This aspect of production profoundly affects many aspects of the industry, including where lawyers work, their position, how much they earn, and so on.