Institutions, Norms, Collective Bargaining and Worker Productivity

David Autor
MIT and NBER

14.662 – Graduate Labor Economics
Spring 2017
Labor Market Institutions

• Neoclassical conception of labor market
  • Frictionless Walrasian spot market

• In reality, large number of institutions that shape...
  1. Supply and demand for labor
  2. Contracts that can or cannot be struck
  3. Wage setting: Wage floors, overtime rules, rents, comparisons and morale
  4. Non-wage attributes of job: Fringe benefits, safety, flexibility, status, autonomy, authority vs. submission
  5. Norms of behavior: Discrimination, gender preference, racism, tolerance/ intolerance
Taxonomy of Institutions

1. Contracting and collective bargaining environment
2. Labor standards and regulations
3. Social norms
4. Competitive environment
1. **Contracting and collective bargaining environment**
   - What is default contracting regime, e.g., Employment at Will, Master and Servant?
   - Do workers have a right to collectively bargain? Do firms?
   - Does a legal authority oversee union activity and elections? Is there an arbitration regime?
   - What can and cannot be bargained over (rents, quasi-rents; wages, employment levels, job security)?

2. **Labor standards and regulations**

3. **Social norms**

4. **Competitive environment**
Taxonomy of Institutions

1. Contracting and collective bargaining environment
2. Labor standards and regulations
   - Occupational licensing and certification
   - Safety regulations
   - Minimum wages
   - Benefit mandates
   - Overtime laws, limits on hours per day/week
   - Unemployment, injury compensation, and disability insurance
   - Dismissal and severance pay
3. Social norms
4. Competitive environment
1. Contracting and collective bargaining environment
2. Labor standards and regulations
3. Social norms
   • Fairness and reciprocity
   • Tolerance for or aversion to inequality
   • Discrimination, preference, intolerance
   • Identification with profession, firm, mission
4. Competitive environment
1. Contracting and collective bargaining environment
2. Labor standards and regulations
3. Social norms
4. Competitive environment
   • Market power
   • Presence of rents and quasi-rents
   • Degree of national and international competition
1. Labor coercion and contracting
   - Master and Servant
   - Employment at Will, Right to Work, Yertle the Turtle

2. What do unions do?
   - Efficient bargaining
   - Holdup
   - Voice
   - Inefficient bargaining

3. Firms effects and outsourcing
   - Firm effects, worker effects, and sorting
   - Outsourcing and ‘rent sharing’

4. Competitive environment
   - ‘Superstar’ firms
Coercive Contract Enforcement: Law and the Labor Market in Nineteenth Century Industrial Britain

Suresh Naidu and Noam Yuchtman

AER, 2013
“The majority of labor transactions throughout much of history and a significant fraction of such transactions in many developing countries today are “coercive,” in the sense that force or the threat of force plays a central role in convincing workers to accept employment or its terms.”
When does coercion occur?

1. Evsy Domar, 1970
   - Slavery or serfdom should be more likely when labor is scarce so that (shadow) wages are high

2. “Neo-Malthusian” theory of feudal decline (Habakkuk, 1958)
   - Labor coercion started to decline when labor became scarcer following the Black Death and other demographic shocks that reduced population and raised wages
   - Coercion more likely when labor is abundant?
Principle-agent model

- Worker’s outside option is $\tilde{\mu} \geq 0$
- Convey cost of effort function (satisfying inada conditions)

Employer has three instruments

1. Wage conditional on success of project: $w^x > 0$
2. Punishment conditional on failure of project $p^y \geq 0$
3. ‘Guns’ if contract not accepted $-g < 0$. Convex cost of ‘guns,’ satisfying inada conditions
Employer has three instruments:

1. Wage conditional on success of project: $w^x > 0$
2. Punishment conditional on failure of project $p^y \geq 0$
3. ‘Guns’ if contract not accepted $-g < 0$. Convex cost of ‘guns,’ satisfying inada conditions

Standard P-A constraints

1. Participation: Agent prefers contract to outside option
2. IC: Contract yields a stipulated level of effort (a function of $w^x, p^y, g$)
Standard P-A constraints

1. Participation: Agent prefers contract to outside option
   - Coercion used to ‘persuade’ worker to accept contract by reducing outside option $\tilde{\mu} - g$
   - Worker’s alternative is to accept is to escape to seek better option. But pays $g$ (whipping, etc)

2. IC: Contract yields a stipulated level of effort, a function of $w^x$, $p^y$, $g$, and bargaining weight (Coasian)
   - To induce higher worker effort, firm can raise $w^x$, lower $p^y$, and increase $g$
   - But $p^y \geq 0$: ‘Limited liability’
   - Thus, increase $g$ to get more effort
   - Effort and coercion are complements
Intuition

- Once contract accepted, employer wants worker to exert effort to increase odds of success of project
- Effort costly for agent, so need a higher wage to induce more effort
- By reducing outside option, coercion reduces the contingent wage needed to satisfy IR constraint
- Coercion and effort are complements
General equilibrium interactions

1. When labor is scarce, output is lower so prices are higher
2. Higher value of output, raises value of effort
3. But this raises the employer’s value of coercion (to reduce wage payments through use of force)
4. Thus, *tight labor markets can increase coercion*
“I attribute the increase [in prosecutions] to the present prosperous state of trade... [A worker] wanted to change his employer, but could not do so. The paucity of hands has increased the value of labor, and the workmen can get in many instances more advantageous terms by leaving their present employ, but those [yearly] contracts [in pottery] prevent their leaving.”

*Report of the Select Committee on Master and Servant (House of Commons 1866, pp. 60–61)*

(Supports the Domar view)
General equilibrium interactions

• When labor is scarce, output is lower so prices are higher
• Higher value of output, raises value of effort
• But this raises the employer’s value of coercion (to reduce wage payments through use of force)
• Thus, tight labor markets can increase coercion
• **But if tight labor markets raise the outside option fast enough, this will reduce coercion**
1. **Domar point: Procyclical coercion**
   - General (market) equilibrium interactions working through the price of output lead to a positive relationship between labor scarcity and coercion

2. **Malthusian point: Procyclical outside option**
   - If the outside option increases fast enough, this reduces effort and therefore coercion
   - Can lead to countercyclical coercion
1. **Coercion is statically inefficient**
   - Coercion forcibly transfers worker utility to employer
   - Coercion not a ‘conservative commodity'
   - *Possible for coerced workers to have high expected wages and still be worse off than ‘free’ workers*
   - Why? Their effort is inefficiently (endogenously) high due to reduced outside option

2. **Coercion is dynamically inefficient**
   - Investing in employer-specific skills would *raise workers’ marginal product of effort* (efficient)
   - But this will induce more coercion – holdup
   - Coercion therefore reduces incentives for specific skills accumulation – dynamic inefficiency
What about coercion in Naidu-Yuchtman?

In Naidu-Yuchtman, coercion is one component of efficient contracting

- Coercion reduces commitment problems in insurance contracts

- Why different from Acemoglu-Wolitzky?
  - In N-Y, coercion only applied when worker breaks contract.
  - In A-W, coercion used to persuade worker to accept contract (“an offer you can’t refuse”)
  - Fundamentally, these are different mechanisms
• 1823 United Kingdom: Master and Servant Act
  • Allowed British employers to “have their workmen sent to the house of correction and held at hard labor for up to three months for breaches of their labor agreements”
  • Criminally (as opposed to civilly) prosecute and severely punish employees for breach of contract.

• >10K Master-Servant prosecutions annually 1858-75
  • More prosecutions for M/S than for petty larceny
  • Modal case: employee ‘absconding’ from employer
  • Masters won ~70% of cases against servants
  • Imprisonment and whipping: ~10% of prosecutions
Unemployment and Master and Servant Prosecutions per 1,000 pop per Year, 1858 – 1875

Panel C. Unemployment and prosecutions per capita per year

Graph showing the relationship between unemployment and prosecutions per 1,000 population per year from 1858 to 1875. The graph includes two lines: one for mean prosecutions and another for unemployment. The x-axis represents the years from 1858 to 1875, and the y-axis represents the number of prosecutions per 1,000 population and the unemployment rate. The data is from Naidu and Yuchtman 2013.
We find that all of the coefficients maintain their sign, and all are statistically significant, suggesting that each industry shock is independently affecting prosecutions. A joint test of the three labor demand shocks is significant well below 1 percent.

We next, in column 5, allow for year-specific effects of each county's initial population density, initial fraction of the population working in manufacturing, and initial fraction of the population that is urban, and we allow Wales to experience different year-specific shocks. Again, the labor demand shocks are associated with a significant increase in prosecutions for each industry and the joint test of the demand shocks' significance is highly significant. In column 6, we include linear, county-specific time trends. All of the demand shocks remain highly significant.

The coefficients in column 6 indicate that a 25 percent increase in coal, iron, or textile prices (approximately one standard deviation for all the industries' prices in our sample) is predicted to increase Master and Servant prosecutions by around 10.

In a specification we omit for brevity, we also allow for district-specific trends in prosecutions, and the labor demand shocks remain positive and highly significant, individually and jointly.
Table 2—Reduced Form Sectoral Shocks on Master and Servant Prosecutions

<table>
<thead>
<tr>
<th></th>
<th>OLS</th>
<th>2SLS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Fraction textiles 1851 ×</td>
<td>210.9***</td>
<td>159.3***</td>
</tr>
<tr>
<td>log(cotton price ratio)</td>
<td>(42.39)</td>
<td>(42.02)</td>
</tr>
<tr>
<td>Iron county ×</td>
<td>76.03***</td>
<td>51.98**</td>
</tr>
<tr>
<td>log(iron price)</td>
<td>(22.90)</td>
<td>(19.48)</td>
</tr>
<tr>
<td>Coal county ×</td>
<td></td>
<td>68.32***</td>
</tr>
<tr>
<td>log(coal price)</td>
<td>(15.90)</td>
<td>(10.11)</td>
</tr>
<tr>
<td>log(population)</td>
<td>145.5***</td>
<td>124.8***</td>
</tr>
<tr>
<td></td>
<td>(50.52)</td>
<td>(42.20)</td>
</tr>
<tr>
<td>F-statistic p-value on</td>
<td></td>
<td></td>
</tr>
<tr>
<td>joint significance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>District FE</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Year FE</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Time-varying controls</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>County-specific trends</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Observations</td>
<td>3,942</td>
<td>3,942</td>
</tr>
</tbody>
</table>

Notes: Dependent variable is absolute number of master and servant prosecutions. Standard errors, clustered on county, included in parentheses. Time varying controls are year specific effects of 1851 income, 1851 population density, 1851 proportion urban, and a Wales dummy. Columns 1 through 6 are estimated using OLS; columns 7 and 8 use 2SLS, where distance to Lancashire is used as an instrument for employment share in textiles and iron ore production is used as an instrument for pig iron production. First stage results from columns 7 and 8 are presented in the online Appendix.
Wages Rise in High Prosecution Counties Following 1875 Repeal of Master and Servant

Figure 5. Wages in High Prosecution Counties Relative to Low Prosecution Counties, Before and After Repeal of Penal Sanctions

Notes: Wages in high prosecution counties, relative to low prosecution counties, before and after repeal of penal sanctions. Figure plots coefficients and their 95 percent confidence intervals (dotted lines) from a regression of wages at the county-year level on interactions between the log of a county's average Master and Servant prosecutions per capita over the 1858–1875 period and dummy variables for five-year time periods. The coefficients from these interactions are plotted. Control variables in the regression are year and county fixed effects, county-specific recession effects, controls for county characteristics (population, population density, proportion of population that is urban, and income all interpolated between census years), year-specific controls for initial county characteristics (population density, income, proportion urban, and a Wales dummy), membership in the Amalgamated Society of Engineers, measured at the county-year level, and one-year lagged wage.

Naidu and Yuchtman 2013
Wages Rise in High Prosecution Counties Following 1875 Repeal of Master and Servant (1851 – 1905 data)

Table 5—Effect of Repeal on Wage Levels, by Average Prosecutions

<table>
<thead>
<tr>
<th></th>
<th>OLS</th>
<th>Arellano-Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Post-1875 × log (average prosecutions)</strong></td>
<td>0.0206*** (0.0082)</td>
<td>0.0133** (0.0053)</td>
</tr>
<tr>
<td>Population density</td>
<td>−0.0570 (0.0583)</td>
<td>−0.0455* (0.0274)</td>
</tr>
<tr>
<td>Proportion urban</td>
<td>−0.0488 (0.0461)</td>
<td>0.0010 (0.0047)</td>
</tr>
<tr>
<td>log (income)</td>
<td>0.0291 (0.0312)</td>
<td>0.0194 (0.0136)</td>
</tr>
<tr>
<td>log (population)</td>
<td>0.1050*** (0.0279)</td>
<td>0.0511 (0.0343)</td>
</tr>
<tr>
<td>Union membership</td>
<td>0.170 (0.1080)</td>
<td>0.0437 (0.0500)</td>
</tr>
<tr>
<td>Lagged log (wage)</td>
<td>0.861*** (0.0198)</td>
<td>0.813*** (0.0207)</td>
</tr>
</tbody>
</table>

Time-varying controls: No, Yes
Labor market controls: No, Yes
Post-1875 × county controls: No, Yes
County-specific recession effect: No, Yes
Observations: 2,860, 2,860, 2,392, 2,808, 2,392, 1,685, 2,392, 2,392

Notes: *Significant at the 10% level.
**Significant at the 5% level.
***Significant at the 1% level.

Including a lagged dependent variable can induce the well-known Nickell bias, which our model suggests could operate via long-term contracts. The coefﬁcients of interest.

The coefﬁcients of column 1, but includes a lag of the log wage, in order to control for potentially persistent features of past wages, is clustered by county, except in the average prosecutions (0.83), where robust GMM standard errors are reported. All coefficients of column 1, but includes a lag of the log wage, in order to control for potentially persistent features of past wages, is clustered by county, except in the average prosecutions (0.83), where robust GMM standard errors are reported.
Wages Rise in High Prosecution Counties Following 1875 Repeal of Master and Servant

Table 6—Wage Responses to Labor Demand Shocks, Pre- and Post-Repeal of Penal Sanctions

<table>
<thead>
<tr>
<th></th>
<th>Pre-repeal</th>
<th></th>
<th></th>
<th></th>
<th>Post-repeal</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
<td>(7)</td>
</tr>
<tr>
<td>Fraction textiles 1851 × log (cotton price ratio)</td>
<td>−0.0071 (0.109)</td>
<td>−0.0017 (0.107)</td>
<td>0.278*** (0.0951)</td>
<td>0.102 (0.0925)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron county × log (iron price)</td>
<td>−0.0028 (0.0214)</td>
<td>−0.0081 (0.0215)</td>
<td>0.175*** (0.0633)</td>
<td>0.126** (0.0494)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coal county × log (coal price)</td>
<td>0.0149 (0.0205)</td>
<td>0.0167 (0.0203)</td>
<td>0.101*** (0.0176)</td>
<td>0.105*** (0.0196)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron county × log (steel price)</td>
<td>0.0517 (0.0368)</td>
<td>0.0520 (0.0356)</td>
<td>0.0459 (0.0349)</td>
<td>0.0460 (0.0349)</td>
<td>0.124*** (0.0409)</td>
<td>0.118*** (0.0380)</td>
<td>0.102*** (0.0342)</td>
</tr>
<tr>
<td>Notes: Bessemer diffusion</td>
<td>−0.168** (0.0638)</td>
<td>−0.158** (0.0619)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F-statistic p-value on joint significance</td>
<td>0.852</td>
<td></td>
<td></td>
<td></td>
<td>0.000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

District FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes
Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes
Time-varying controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes
Observations | 1,300 | 1,300 | 1,300 | 1,300 | 1,560 | 1,560 | 1,560 | 1,560 | 1,560

Naidu and Yuchtman 2013
1. **Domar point: Procyclical coercion**
   - General (market) equilibrium interactions working through the price of output lead to a positive relationship between labor scarcity and coercion
   - *This is seen while M&S in effect*

2. **Malthusian point: Procyclical outside option**
   - If the outside option increases fast enough, this reduces effort and therefore collusion
   - Can lead to countercyclical coercion
   - *Once M&S rescinded, we see wages (and hence outside option) rising with labor market tightness*
   - *Breaks link between tightness and coercion*
1. Labor coercion and contracting
   - Master and Servant
   - Employment at Will, Right to Work, Yertle the Turtle

2. What do unions do?
   - Efficient bargaining
   - Holdup
   - Voice
   - Inefficient bargaining

3. Firms effects and outsourcing
   - Firm effects, worker effects, and sorting
   - Outsourcing and ‘rent sharing’

4. Competitive environment
   - ‘Superstar’ firms
Employment-at-will doctrine famously articulated by the Tennessee Supreme Court in 1884

- “Men must be left, without interference to buy and sell where they please, and to discharge or retain employees at will for good cause or for no cause, or even for bad cause without thereby being guilty of an unlawful act per se”

(Payne v. Western & Atlantic Railroad, Tennessee 1884)
Employment at Will

Texas Supreme Court 1985

• “Absolute employment-at-will is a relic of early industrial times, conjuring up visions of the sweatshops described by Charles Dickens and his contemporaries. The doctrine belongs in a museum, not in our law.”

(Sabine Pilot Service, Inc. v. Hauck, Texas 1985)
A landmark decision in the recent erosion of employment at will is the 1980 case of 
*Toussaint v. Blue Cross & Blue Shield*, in which the Michigan Supreme Court held that 
an employer's indirect statements about the manner in which termination decisions are 
made can imply legally binding employment contracts.

In *Toussaint*, the plaintiff successfully sued for breach of contract by citing an internal personnel policy handbook indicating that it was Blue Cross's policy to terminate employees only for just cause. Although Toussaint was unaware of the handbook when hired, the court held that the handbook implied a binding contract. Courts in 23 other states issued similar decisions over the next 5 years. An equally influential 1981 California case, *Pugh v. See's Candies*, further expanded the implied contract notion by finding that workers are entitled to ongoing employment even in the absence of written or indirect statements if contractual rights are implied via the context of the employment relationship.

This context may include, for example, longevity of service, a history of promotion or salary increases, general company policies as exemplified.

Full citations for precedent setting cases cited in the text are given in table A1.

*Fig. 1.*—Count of states recognizing exceptions to the employment-at-will doctrine, 1958–97.
Right to Work Laws: Prohibit union security agreements, or agreements between labor unions and employers, that govern the extent to which an established union can require employees' membership, payment of union dues, or fees as a condition of employment, either before or after hiring.
On the far-away island of Sala-ma-Sond, Yertle the Turtle was king of the pond.

A nice little pond. It was clean. It was neat.

The water was warm. There was plenty to eat.

The turtles had everything turtles might need.

And they were all happy. Quite happy indeed.
They were... until Yertle, the king of them all,
Decided the kingdom he ruled was too small.
“I'm ruler,” said Yertle, “of all that I see.
But I don't see enough. That's the trouble with me.
With this stone for a throne, I look down on my pond
But I cannot look down on the places beyond.”
So Yertle, the Turtle King, lifted his hand
And Yertle, the Turtle King, gave a command.
He ordered nine turtles to swim to his stone
And, using these turtles, he built a new throne.
He made each turtle stand on another one's back
And he piled them all up in a nine-turtle stack.
Labor Coercion

All mine!" Yertle cried. "Oh, the things I now rule! I'm the king of a cow! And I'm the king of a mule! I'm the king of a house! And, what's more, beyond that I'm the king of a blueberry bush and a cat! I'm Yertle the Turtle! Oh, marvelous me! For I am the ruler of all that I see!"
“Your Majesty, please... I don't like to complain,
But down here below, we are feeling great pain.
I know, up on top you are seeing great sights,
But down here at the bottom we, too, should have rights.
We turtles can't stand it. Our shells will all crack!
Besides, we need food. We are starving!” groaned Mack.
“You hush up your mouth!” howled the mighty King Yertle. “You've no right to talk to the world's highest turtle. I rule from the clouds! Over land! Over sea! There's nothing, no, NOTHING, that's higher than me!”
But, as Yertle, the Turtle King, lifted his hand
And started to order and give the command,
That plain little turtle below in the stack,
That plain little turtle whose name was just Mack,
Decided he'd taken enough. And he had.
And that plain little lad got a bit mad.
And that plain little Mack did a plain little thing. He burped!
And his burp shook the throne of the king!
Outline

1. Labor coercion and contracting

2. What do unions do?
   - Efficient bargaining
   - Holdup
   - Voice
   - Inefficient bargaining

3. Firms effects and outsourcing
   - Firm effects, worker effects, and sorting
   - Outsourcing and ‘rent sharing’

4. Competitive environment
   - ‘Superstar’ firms
What Do Unions Do?

1. **Efficient bargaining view**
   - No necessary reduction in profits
   - Higher employment (and lower wages) than in free market equilibrium

2. **Rent extraction (holdup) view**

3. **‘Voice’ view**

4. **Inefficient bargaining view**
Labor Demand and Isoprofit Curves

This defines the firm's labour demand curve; for any \( w \) chosen by the union, the employment level \( L \) that the firm will select is defined by (1). A sketch of this result can be seen in Figure 1 below.

Figure 1: Labour Demand Curve

Defining the objective function of the union is, as Dunlop noted, rather more difficult. The most general way to proceed is simply to assume that the union has some utility function \( U(w, L) \) (with \( U_w > 0 \)) over the contract wage and the level of employment; McDonald & Solow again set up union preferences by assuming that union members are identical, and that union utility can be expressed as the expected utility of an individual member given the probability of unemployment. Under this assumption, we can write

\[
U(w, L) = N \left[ L \left( u(w) \right) + (w - L) u(w) \right],
\]

where \( N \) represents the membership of the union, \( u(\cdot) \) is a standard concave income utility function, and \( w \) represents the generic unemployment alternative, including unemployment benefits and utility from leisure. Since \( N \) and \( w \) are, we presume, fixed for the purpose of union wage setting, we can redefine \( U(w, L) = L \left[ u(w) \right] \). The union will select \( w \) to maximize \( U \) (however \( U \) is defined); this is equivalent to choosing \( w \) and \( L \) subject to \( R_L = w \):

\[
\max_{w,L} U(w, L) \quad \text{s.t.} \quad R_L = w.
\]

This is slightly different from the notation used by McDonald & Solow; in their initial model, they separate unemployment income from disutility of work, although they later recombine them.
Tangency of Union Indifference Curves to Labor Demand Curve

\[ L = U(w, L) + R_L w \]

\[ U_L + U_w R_L = 0 \]

Therefore:

\[ U_L U_w = R_L \]

This result means that the union will choose the point where the firm's labor demand curve is tangent to one of their indifference curves in \((w, L)\) space, as at point A in Figure 2.

Figure 2: Tangency of Labor Demand Curve and Union Indifference Curve

The Monopoly Union model has proven to be very popular as a description of union wage and employment outcomes, partly because the underlying game structure seems to correspond with reality; most collective bargaining processes typically do provide employers considerable discretion over the quantity of employment. However, the outcome of the...
This was first noted, in the context of labour markets, by (Leontief 1946), and developed further by (Fellner 1947), before being given a more thorough algebraic and graphical treatment by (McDonald and Solow 1981).

Figures 1 and 2 are combined in Figure 3, allowing us to see this inefficiency graphically; the result is a region of wage-employment combinations, labelled B, in which at least one of the firm and union can be made better off than at point A without making the other worse off. Graphically, this arises because, as Figure 1 demonstrates, the labour demand curve is defined as the locus of points at which the firm’s isoprofit curve is horizontal; meanwhile, the union’s indifference curve is always downward-sloping (as long as the union prefers higher employment at a given wage). Pareto efficiency requires tangency of the firm’s isoprofit curve and the union’s indifference curve, which can never occur along the labour demand curve.

As a result, an alternative model has been developed, in which the firm and union bargain to an allocation that is Pareto efficient; the rationale for such a model is that economic agents in a one-on-one negotiation would not leave unexploited gains from trade on the table.

As will be noted later, a median-voter model can result in indifference curves which are horizontal over some range, presenting the possibility that Pareto efficiency could coincide with the labour demand curve.

(Pencavel 1991) argues that “most economists . . . are inclined to the view that union-management bar-
The most popular of which is the asymmetric Nash bargaining solution. The Efficient Bargaining model draws its appeal from the fact that, unlike the Monopoly Union model, it does not imply a situation of unexploited gains from trade in a bilateral negotiation. However, the main criticism of the Efficient Bargaining model is that its fundamental structure does not appear to correspond to reality as strongly as the Monopoly Union model does; we generally do not observe firms and unions negotiating directly over the quantity of employment as well as wages (this criticism motivates the analysis of a hybrid model, that of (Kuhn 1988), in Section 3.3). On the other hand, collective bargaining does often cover issues which may proxy for employment, such as crew size, manning rules, and seniority wage structures.

The MU and EB models represent the two most popular alternative economic representations of the wage-employment outcome of collective bargaining, and deciding between

\[ (u_u) \longleftrightarrow (\varphi_\varphi) \]

Models using the two-stage collective bargaining structure proposed by (Manning 1987) generally make use of an asymmetric Nash bargain over each of wage and employment. (McDonald and Solow 1981), meanwhile, suggest a number of other possible methods of determining the equilibrium, including the existence of a dominant union or dominant firm, or some historically-determined “fair shares” division of surplus.

(Johnson 1990) and (Oswald 1993) both discuss the occurrence of such procedures in reality. However, as will be discussed later, several authors have cast doubt on the idea that bargaining over such measures can actually approximate an efficient outcome.

Perhaps the third most popular representation is the median-voter model, which will be discussed briefly.
Efficient Union Bargaining over Wages and Employment

Firm solves

\[
\max_{\{L, w\}} \quad p(s(L)) f(L) - wL
\]

s.t. \( u(w, L) \geq \bar{w} \)

union utility

\[ f_n \]

FOCs:

\[-L + \lambda u_w(\cdot) = 0\]

\[
\frac{L}{u_w(\cdot)} = \lambda = \frac{w - R}{u_L(\cdot)}
\]

\[
\frac{w - R}{L} = \frac{u_L(\cdot)}{u_w(\cdot)} \quad \text{along contract curve.}
\]

\[ p'(s(L)) s'(L) f(L) + p(s(L)) f'(L) - w + \lambda u_L(\cdot) = 0 \]

\[ = \frac{1}{\delta L} p s(L) \in R(L) \]
Now suppose \( V(w,L) = (w-w^0)L \).

Eqbm condn is \( \frac{w-R}{L} = \frac{w-w^0}{L} \iff R(L) = w_0 \).

So L along the contract curve depends on outside option \( w_0 \) but NOT \( w \) itself.
“Finally, the empirical results suggest that employment outcomes in union contracts are determined on a conventional downward-sloping demand schedule, taking the prevailing contract wage as given. There is no indication that employment is related to outside wages in a manner consistent with a simple model of efficient contracting.”
Table 4—Estimated Employment Determination Equations

<table>
<thead>
<tr>
<th></th>
<th>OLS (1)</th>
<th>OLS (2)</th>
<th>IV(^a) (3)</th>
<th>IV(^a) (4)</th>
<th>IV(^b) (5)</th>
<th>IV(^b) (6)</th>
<th>IV(^b) (7)</th>
<th>IV(^b) (8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Year Effects</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>2. Real Industry Input Price</td>
<td>0.22</td>
<td>0.16</td>
<td>0.20</td>
<td>0.16</td>
<td>0.19</td>
<td>0.16</td>
<td>0.19</td>
<td>0.15</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.08)</td>
<td>(0.06)</td>
<td>(0.08)</td>
<td>(0.06)</td>
<td>(0.08)</td>
<td>(0.06)</td>
<td>(0.08)</td>
</tr>
<tr>
<td>3. Real Industry Output</td>
<td>0.20</td>
<td>0.29</td>
<td>0.22</td>
<td>0.28</td>
<td>0.23</td>
<td>0.28</td>
<td>0.23</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
<td>(0.09)</td>
<td>(0.07)</td>
<td>(0.09)</td>
<td>(0.07)</td>
<td>(0.09)</td>
<td>(0.07)</td>
<td>(0.09)</td>
</tr>
<tr>
<td>4. Real Industry Output (Previous Year)</td>
<td>0.17</td>
<td>0.10</td>
<td>0.15</td>
<td>0.11</td>
<td>0.14</td>
<td>0.11</td>
<td>0.14</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td>(0.06)</td>
<td>(0.07)</td>
<td>(0.07)</td>
<td>(0.07)</td>
<td>(0.06)</td>
<td>(0.07)</td>
<td>(0.07)</td>
<td>(0.07)</td>
</tr>
<tr>
<td>5. Real Wage at End of Contract</td>
<td>-0.15</td>
<td>-0.02</td>
<td>-0.28</td>
<td>-0.45</td>
<td>-0.39</td>
<td>-0.51</td>
<td>-0.42</td>
<td>-0.40</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
<td>(0.10)</td>
<td>(0.17)</td>
<td>(0.35)</td>
<td>(0.12)</td>
<td>(0.29)</td>
<td>(0.17)</td>
<td>(0.42)</td>
</tr>
<tr>
<td>6. Unexpected Inflation During Contract</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-0.03</td>
<td>0.10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Standard Error</td>
<td>0.196</td>
<td>0.194</td>
<td>0.196</td>
<td>0.195</td>
<td>0.196</td>
<td>0.196</td>
<td>0.196</td>
<td>0.195</td>
</tr>
<tr>
<td>8. Test for Exclusion of Year Effects ((p)-Value)</td>
<td>-</td>
<td>0.003</td>
<td>-</td>
<td>0.006</td>
<td>-</td>
<td>0.004</td>
<td>-</td>
<td>0.004</td>
</tr>
<tr>
<td>9. Overidentification Test(^c)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0.76</td>
<td>0.97</td>
<td>0.74</td>
<td>0.96</td>
</tr>
</tbody>
</table>

Note: Standard errors in parentheses. Sample size is 1293. All regressions include a (first-differenced) linear trend. The mean and standard deviation of the dependent variable are \(-0.017\) and 0.201. Standard errors are corrected for first-order moving average error component and heteroskedasticity.

\(a\) Instrumental variable for real wage at end of contract is the unanticipated change in real wages during the contract.

\(b\) Instrumental variables for real wage at end of the contract include 18 year effects, the real wage in manufacturing at the start of the contract, and the unanticipated change in real wages during the contract.

\(c\) Probability value of test for orthogonality of residuals and instruments. The test statistic is distributed as chi-squared with 19 degrees of freedom in all cases.
What Do Unions Do?

1. Efficient bargaining view
2. Rent extraction (holdup) view
   - Grout ‘84 ECMA insight: Bargaining over sunk costs
   - See Los Angeles port workers
     - International Long-shore and Warehouse Union represents 20,000 dockworkers
     - Current contract pays $26 to $41 an hour, with full healthcare for members + copious overtime
3. ‘Voice’ view
4. Inefficient bargaining view
What Do Unions Do?

1. Efficient bargaining view

2. Rent extraction (holdup) view
   - Grout '84 ECMA insight: Bargaining over sunk costs
   - See Los Angeles port workers
     - International Long-shore and Warehouse Union represents 20,000 dockworkers
     - Current contract pays $26 to $41 an hour, with full healthcare for members + copious overtime

3. ‘Voice’ view

4. Inefficient bargaining view
What Do Unions Do?

1. Efficient bargaining view
2. Rent extraction (holdup) view
3. ‘Voice’ view
   - Freeman and Medoff, 1984, *What do Unions Do?*
4. Inefficient bargaining view
What Do Unions Do?

1. Efficient bargaining view
2. Rent extraction (holdup) view
3. ‘Voice’ view
4. Inefficient bargaining view
   - “The best of all monopoly profits is a quiet life.” J. R. Hicks, *Econometrica*, 1935
   - Harvey Leibenstein: “Allocative Efficiency vs. X-Efficiency” AER ‘66
   - Carmichael-MacLeod, 2000
   - Schmitz, 1995
What Determines Productivity?
Lessons from the Dramatic Recovery of the U.S. and Canadian Iron Ore Industries Following Their Early 1980s Crisis

James A. Schmitz Jr.
Journal of Political Economy, 2005
Context: Great Lakes Iron Ore

• **1880 – 1980**
  • Minnesota mines, plus a few others in the Great Lakes region, were sole suppliers of iron ore to the Great Lakes region steel market
  • Why? Low transport costs from ore mines to Great Lakes steel producers
  • Outside producers were uncompetitive in region

• **Early 1980s**
  • Brazilian ore producers began offering iron ore to Chicago at prices substantially below prices of local iron ore
  • Minnesota mines challenged in their only market
  • Canadian producers faced similar existential threat
Pig Iron Production by Region, 1950 – 1996

Fig. 1.—Pig iron production by various regions, 1950–96

Schmitz 2005
Context: Great Lakes Iron Ore

Industry response

1. Labor productivity doubled in a few years
2. Materials productivity increased by > 50%
3. Capital productivity increased as well
4. Potential foreign competition was pushed out of the Great Lakes region

How did this occur – i.e., what the heck happened?
Fig. 2.—Production and labor productivity: Minnesota pellet industry
Decomposition of Labor Productivity Growth in Minnesota Pellet Industry: Within/Between Mines

<table>
<thead>
<tr>
<th>Growth between 1980 and</th>
<th>Overall Industry Growth (1)</th>
<th>Share of Industry Growth Due to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Within Mines (2)</td>
<td>Between Mines (3)</td>
</tr>
<tr>
<td>1981</td>
<td>10.20</td>
<td>105</td>
</tr>
<tr>
<td>1982</td>
<td>0</td>
<td>...</td>
</tr>
<tr>
<td>1983</td>
<td>13.60</td>
<td>79</td>
</tr>
<tr>
<td>1984</td>
<td>55.10</td>
<td>93</td>
</tr>
<tr>
<td>1985</td>
<td>67.90</td>
<td>97</td>
</tr>
<tr>
<td>1986</td>
<td>77.50</td>
<td>87</td>
</tr>
<tr>
<td>1987</td>
<td>121.50</td>
<td>77</td>
</tr>
<tr>
<td>1988</td>
<td>108.80</td>
<td>76</td>
</tr>
<tr>
<td>1989</td>
<td>101.80</td>
<td>73</td>
</tr>
<tr>
<td>1990</td>
<td>100.90</td>
<td>95</td>
</tr>
<tr>
<td>1991</td>
<td>87.20</td>
<td>96</td>
</tr>
<tr>
<td>1992</td>
<td>91.70</td>
<td>92</td>
</tr>
<tr>
<td>1993</td>
<td>104.40</td>
<td>108</td>
</tr>
<tr>
<td>1994</td>
<td>113.70</td>
<td>106</td>
</tr>
<tr>
<td>1995</td>
<td>119.90</td>
<td>101</td>
</tr>
</tbody>
</table>

Note.—All figures are percentages. Ellipses in place of a figure mean that it is not defined (growth was zero between 1980 and 1982). Weights are the mine’s share of industry hours.
## TABLE 1
**Total Factor Productivity: Canadian Iron Ore Industry**

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Factor Productivity</th>
<th>Calculated from</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>$Y_t/N_t$</td>
</tr>
<tr>
<td>1981</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>1982</td>
<td>.91</td>
<td>.94</td>
</tr>
<tr>
<td>1983</td>
<td>.86</td>
<td>.97</td>
</tr>
<tr>
<td>1984</td>
<td>.91</td>
<td>1.09</td>
</tr>
<tr>
<td>1985</td>
<td>1.00</td>
<td>1.19</td>
</tr>
<tr>
<td>1986</td>
<td>1.33</td>
<td>1.61</td>
</tr>
<tr>
<td>1987</td>
<td>1.34</td>
<td>1.64</td>
</tr>
<tr>
<td>1988</td>
<td>1.46</td>
<td>1.78</td>
</tr>
<tr>
<td>1989</td>
<td>1.48</td>
<td>1.79</td>
</tr>
<tr>
<td>1990</td>
<td>1.36</td>
<td>1.57</td>
</tr>
<tr>
<td>1991</td>
<td>1.40</td>
<td>1.64</td>
</tr>
<tr>
<td>1992</td>
<td>1.41</td>
<td>1.58</td>
</tr>
<tr>
<td>1993</td>
<td>1.50</td>
<td>1.59</td>
</tr>
<tr>
<td>1994</td>
<td>1.54</td>
<td>1.75</td>
</tr>
<tr>
<td>1995</td>
<td>1.51</td>
<td>1.64</td>
</tr>
</tbody>
</table>
Fig. 6.—Total factor productivity (and quantities used in its calculation): Canadian iron ore industry

Schmitz 2005
Sources of Labor Productivity Growth

Pre-crisis

1. Machine operators (production workers) *barred* from setting up their own machines, picking up small supplies and parts incidental to the job

2. *Not* allowed to maintain their machines: tightening nuts and bolts; replacing fuses, wiper blades, tires, bulbs, batteries, and fluids; or jump-starting vehicles

3. *Could not* make repairs or assist repair workers

Post-crisis

- Number of distinct “repair job” categories fell from upper 20s to the low single digits
- About 2 of every 5 repair jobs *redundant*
Total Hours and Repair Hours as a Percentage of Total Hours @ Minntac/USX Mine, 1968 – 1995

Fig. 10.—Total hours and repair hours as a percentage of total hours: Minntac/USX pellet mine

Schmitz 2005
Sources of Labor Productivity Growth

Before crisis

• Changes in work shifts occurred “at the dry,” i.e., at a fixed point in the mine
• Machines stood idle during travel to and back from “the dry” — approximately 15 – 30 minutes of eight-hour shift

After crisis

• Shift changes were done “eyeball-to-eyeball” — that is, at the equipment
Schmitz’s View

• “I have shown that increases in competition (or decreases in tariffs) led to surges in TFP through changes in restrictive work practices.

• “This naturally leads to the question, Why were restrictive work practices not changed before the crisis in iron ore?

• “Let me start with a straw man. This straw man says that these work practices were part of a rent package received by workers.
• “But this view is vastly incomplete... If it was idle time workers wanted, why structure work practices so that machinery sat idle as well?

• “With machinery idle, capital productivity and materials productivity suffer. Work practices clearly led to money being flushed down the toilet.

• “Hence, there are other reasons these work practices were not changed before the crisis.”
Schmitz’s View

What are these reasons?

1. X-Efficiency/Hicks
2. Disagreements about how to divide generated rents
3. Commitment problems (Carmichael-MacLeod ‘00)
1. Labor coercion and contracting
2. What do unions do?
3. Firms effects and outsourcing
   • Firm effects, worker effects, and sorting
   • Outsourcing and ‘rent sharing’
4. Competitive environment
   • ‘Superstar’ firms
Workplace Heterogeneity and the Rise of West German Wage Inequality

Card, Heining and Kline
QJE 2013
**Evolution of Wage Inequality in West Germany, 1990 – 2008**

Indexed Wage Growth of the 15th, 50th, 85th Percentiles, West Germany, 1990–2008

*Notes:* Calculations based on SIAB Sample for West German Full-Time Workers between 20 and 60 years of age. The figure shows the indexed (log) real wage growth of the 15th, 50th, and 85th percentiles of the wage distribution, with 1990 as the base year. Nominal wages are deflated using the consumer price index (1995 = 100) provided by the German Federal Statistical Office.
Wage Inequality: German Males, 1985 - 2009

Figure 1a: Trends in Percentiles of Real Log Daily Wage
West German Men Relative to 1996 Base

Note: figure shows percentiles of log real daily wage for full time male workers on their main job, deviated from value of same percentile in 1996 and multiplied by 100.
Residual MSE of Earnings Conditional on Many Covs

Figure 4: Residual Standard Deviations from Alternative Wage Models

Notes: See note to Figure 3b. Figure shows measures of dispersion in residual real daily wage for full time male workers. Residual wage is residual from linear regression model. "Mincer" refers to model with dummies for education categories and cubic in experience, fit separately in each year. Other models add additional controls as indicated.

Card, Heining, Kline 2013
Figure 5: Sorting Across Establishments of Workers in Different Education and Occupation Groups

Notes: figure shows two measures of sorting of full time male workers across establishments. See text for definitions of indices.
Estimating Abowd-Kramarz-Margolis Wage Model

- Basic model for $y_{it} = \ln w_{it}$

$$y_{it} = \alpha_i + \psi_{J(i,t)} + X'_{it}\beta + \eta_{i,J(i,t)} + \zeta_{it} + \varepsilon_{it}$$

- Where
  - $\alpha_i$ is time-invariant worker effect
  - $\psi_{J(i,t)}$ is proportional pay premium for firm $J$ where worker $i$ is employed in year $t$
  - $X'_{it}$ worker covariates
  - $\eta_{i,J(i,t)}$ match specific effect
  - $\zeta_{it}$ individual drift term (with unit root)
  - $\varepsilon_{it}$ iid error term
Estimating Abowd-Kramarz-Margolis Wage Model

- Basic model for $y_{it} = \ln w_{it}$
  $$y_{it} = \alpha_i + \psi_{J(i,t)} + X_{it}'\beta + r_{it}$$
  $$r_{it} = \eta_{i,J(i,t)} + \zeta_{it} + \varepsilon_{it}$$

- Rewrite in matrix notation
  $$y_{it} = Da + F\psi + X\beta + r = Z'\xi + r$$

- Where
  $$Z \equiv [D, F, X]$$
  $$\xi = [\alpha', \psi', \beta']$$
  $$\xi = (Z'Z)^{-1}Z'y$$

- Consistency of OLS requires
  $$E[D'r] = E[F'r] = E[X'r] = 0$$
Consistency of OLS requires

\[ E[D'r] = 0, E[F'r] = 0, E[X'r] = 0 \]

Maintained assumption that person fixed effects orthogonal to error terms \( E[D'r] = 0 \)

Key concern for ID

Is the composite error term orthogonal to the matrix of establishment identifiers?
Is composite error term orthogonal to estab FE’s?

- **Sufficient condition:** Job mobility patterns are independent of \((\eta, \zeta, \varepsilon)\), *exogenous mobility assumption*

- Can be written as
  \[
P[J(i, t) = j | r] = P[J(i, t) = j] = G_{jt}(\alpha_i, \psi_1, ..., \psi_J) \quad \forall \ i, t
  \]

- Where \(G_{jt}(\alpha_i, \psi_1, ..., \psi_J)\) is a deterministic mobility function whose elements sum to 1

- This function says that mobility independent of \(r_{it}\) conditional on person and firm FE’s
Estimating Abowd-Kramarz-Margolis Wage Model

\[ P[J(i, t) = j| r] = P[J(i, t) = j] = G_{jt}(\alpha_i, \psi_1, ..., \psi_J) \forall i, t \]

- Where \( G_{jt}(\alpha_i, \psi_1, ..., \psi_J) \) is a deterministic mobility function whose elements sum to 1
- This function says that mobility independent of \( r_{it} \) conditional on person and firm FE’s

What does **not** violate this assumption:

1. Systematic mobility based on \( \alpha_i, \psi_1, ..., \psi_J \), workers generally moving from low- to high-wage estabs
2. Higher or lower turnover by worker skill
3. Sorting: high-wage workers move to high FE estabs
4. Matching on non-wage attributes
Consistency of OLS requires

\[ E[D'r] = 0, \quad E[F'r] = 0, \quad E[X'r] = 0 \]

1. Possible that workers are sorting on idiosyncratic match specific component, \( \eta_{i,j} \)
   
   • Implies that wage gains from ‘upward’ moves not symmetric with wage losses from ‘downward’ moves
   
   • Comparative advantage would generate this pattern
   
   • Also implies that a saturated model will perform much better than FE model
No Evidence that Wage Changes are Asymmetric for Upward vs. Downward Worker Moves

Figure 9a: Mean Wages of Movers, Classified by Quartile of Establishment Effects for Origin and Destination Firms, Interval 4

Mean Log Wage of Movers

- 4 to 4
- 4 to 3
- 4 to 2
- 4 to 1
- 1 to 4
- 1 to 3
- 1 to 2
- 1 to 1

Time (0=first year on new job)

Notes: figure shows mean wages of male workers observed in 2002-2009 who change jobs in 2004-2007, and held the preceding job for 2 or more years, and the new job for 2 or more years. "Job" refers to main job in year, excluding part time jobs. Each job is classified into quartiles based on estimated establishment effect from AKM model presented in Table 3.
Figure 7: Relative Explanatory Power of AKM Model in Different Periods

Notes: figure shows standard deviation of log real wages for full time male workers in indicated interval, along with root-mean-squared error (RMSE) from AKM specification and alternative model with unrestricted match effects. See notes to Table 3 for description of models.
Comparing Residuals Within Deciles of Person and Establishment FE’s

Figure 8b: Mean Residual by Person/Establishment Deciles, Interval 4

Notes: figure shows mean residuals from estimated AKM model with cells defined by decile of estimated establishment effect, interacted with decile of estimated person effect. See Table 3 for summary of model parameters.
Consistency of OLS requires

\[ E[D'r] = 0, E[F'r] = 0, E[X'r] = 0 \]

1. Possible that workers are sorting on idiosyncratic match specific component, \( \eta_{i,j} \)

2. Possible that ‘drift’ component of wage changes \( \zeta_{it} \) correlated with mobility

- Workers who turn out to be more productive than expected will experience rising wages at their initial employer, and will also be more likely to move higher-wage establishments (and v.v. for workers moving in opposite direction)
- Implies pre-trends
No Evidence of Pre-Trends in Wages for Movers

Figure 6b: Mean Wages of Job Changers, Classified by Quartile of Mean Wage of Co-Workers at Origin and Destination Establishment, Interval 4

Notes: figure shows mean wages of male workers observed in 2002-2009 who change jobs in 2004-2007 and held the preceding job for 2 or more years, and the new job for 2 or more years. "Job" refers to establishment with most earnings in year, excluding part time work. Each job is classified into quartiles based on mean wage of co-workers (quartiles are based on all full time workers in the same year).
Estimating Abowd-Kramarz-Margolis Wage Model

- Consistency of OLS requires

\[ E[D'r] = 0, E[F'r] = 0, E[X'r] = 0 \]

1. Possible that workers are sorting on idiosyncratic match specific component, \( \eta_{i,j} \)

2. Possible that ‘drift’ component of wage changes \( \zeta_{it} \) correlated with mobility

3. Possible that mobility induced by shocks to establishment effects
   - May induce bias where receiving firms’ FE’s look ‘better’ than they are
   - Again suggests that mobility related to transitory wage patterns
No Evidence of Pre-Trends in Wages for Movers

Figure 6b: Mean Wages of Job Changers, Classified by Quartile of Mean Wage of Co-Workers at Origin and Destination Establishment, Interval 4

Notes: figure shows mean wages of male workers observed in 2002-2009 who change jobs in 2004-2007 and held the preceding job for 2 or more years, and the new job for 2 or more years. "Job" refers to establishment with most earnings in year, excluding part time work. Each job is classified into quartiles based on mean wage of co-workers (quartiles are based on all full time workers in the same year).
Figure 11: Decomposition of Variance of Log Wages

Notes: figure shows terms in decomposition of observed variance of log wages for full time male workers, based on estimated AKM models shown in Table 3. See text for decomposition formula.
Joint Distribution of Person and Establishment Effects: Period 1

Figure 10a: Joint Distribution of Person and Establishment Effects, Interval 1

Note: figure shows joint distribution of estimated person and establishment effects from AKM model. See Table 3 for summary of model parameters.
Note: figure shows joint distribution of estimated person and establishment effects from AKM model. See Table 3 for summary of model parameters.
### TABLE IV

**Decomposition of the Rise in Wage Inequality**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1) Var. component</td>
<td>(2) Share of total</td>
</tr>
<tr>
<td>Total variance of log wages</td>
<td>0.137</td>
<td>100.0</td>
</tr>
<tr>
<td>Components of variance:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variance of person effect</td>
<td>0.084</td>
<td>61.3</td>
</tr>
<tr>
<td>Variance of establ. effect</td>
<td>0.025</td>
<td>18.5</td>
</tr>
<tr>
<td>Variance of Xb</td>
<td>0.015</td>
<td>10.7</td>
</tr>
<tr>
<td>Variance of residual</td>
<td>0.011</td>
<td>8.2</td>
</tr>
<tr>
<td>2cov(person, establ.)</td>
<td>0.003</td>
<td>2.3</td>
</tr>
<tr>
<td>2cov(Xb, person + establ.)</td>
<td>−0.001</td>
<td>−1.0</td>
</tr>
</tbody>
</table>

*Notes: See notes to Table II for sample composition. Calculations based on estimated AKM models summarized in Table III. Entry in column (5) is change in variance component from interval 1 to interval 4. Entry in column (6) is ratio of the change in the variance component to the total change in variance of wages reported in first row of table (as a percentage).*

*Counterfactual 1 computes the counterfactual rise in variance assuming the correlation between the person and establishment effects remains at its interval 1 value—that is, imposing the restriction that Cov₄(person, establ.) = r¹Var₄(person)¹/² x Var₄(establ.)¹/² where the subscript 4 refers to the interval 4 value of the statistic and r¹ is the correlation between the person and establishment effects in interval 1. Counterfactual 2 assumes that the variance of establishment effects remains at its interval 1 level. Counterfactual 3 imposes both restrictions.*

---

*Card, Heining, Kline 2013*
### TABLE IV

**Decomposition of the Rise in Wage Inequality**

| Change from interval 1 to 4 |  
|----------------------------|-------------------------------|
|                            | (5) Var. component | (6) Share of total |
| Total variance of log wages | 0.112 | 100 |
| Components of variance:    |                  |                      |
| Variance of person effect  | 0.043 | 39 |
| Variance of establ. effect | 0.027 | 25 |
| Variance of Xb             | −0.008 | −7 |
| Variance of residual       | 0.003 | 3 |
| 2cov(person, establ.)      | 0.038 | 34 |
| 2cov(Xb, person + establ.) | 0.007 | 7 |

**Counterfactuals for variance of log wages***

<table>
<thead>
<tr>
<th>Countersfactual</th>
<th>(5) Var. component</th>
<th>(6) Share of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No rise in correl. of person/estab. effects</td>
<td>0.077</td>
<td>69</td>
</tr>
<tr>
<td>2. No rise in var. of estab. effect</td>
<td>0.072</td>
<td>64</td>
</tr>
<tr>
<td>3. Both 1 and 2</td>
<td>0.047</td>
<td>42</td>
</tr>
</tbody>
</table>

*Counterfactual 1 computes the counterfactual rise in variance assuming the correlation between the person and establishment effects remains at its interval 1 value—that is, imposing the restriction that \( \text{Cov}(\text{person}, \text{establ.}) = \frac{1}{2} \text{Var}(\text{I}^4_{\text{person}}) \text{Var}(\text{I}^4_{\text{establ.}}) \). Counterfactual 2 assumes that the variance of establishment effects remains at its interval 1 level. Counterfactual 3 imposes both restrictions. Notes: See notes to Table II for sample composition. Calculations based on estimated AKM models summarized in Table III. Entry in column (5) is change in variance component from interval 1 to interval 4. Entry in column (6) is ratio of the change in the variance component to the total change in variance of wages reported in first row of table.
Mundlak Decomposition of Return to Education

Figure 13: Mundlak Decomposition of Return to Education

- OLS return (left scale)
- Within-establishment return (left scale)
- Return to coworker schooling (left scale)
- Education sorting index (right scale)

Note: figure shows components of decomposition of conventional (OLS) return to education in each year. The OLS return (plotted with red squares) is the sum of the within-establishment return (plotted with blue circles) and the product of the return to co-worker schooling (plotted with yellow triangles) and the education sorting index (plotted with pale green diamonds). See text for formula, first derived by Mundlak (1978). OLS return is coefficient on years of schooling in regression model for log real daily wages that also controls for cubic in experience.
What Are We Feeling That Would Be Better Expressed In German?

1. Dread of something inevitable yet benign
   Fuerchten unbawendbarfreundlich

2. The wish to see all suffer for the crimes of one
   Schadenallemeinverbrechen

3. Laughter at something one knows in one's soul is not funny
   Lachen auf komisch sind nicht Spaß

4. Für die Stichprobenverteilungsfunktion von $Z_1^*, ..., Z_n^*$ verwenden wir die folgende Notation

$$\hat{F}^*(z) = n^{-1} \sum_{i=1}^{n} 1 \{ Z_i^* \leq z \}.$$
1. Labor coercion and contracting
2. What do unions do?
3. Firms effects and outsourcing
   - Firm effects, worker effects, and sorting
   - Outsourcing and ‘rent sharing’
4. Competitive environment
   - ‘Superstar’ firms

Goldschmidt and Schmieder
QJE forthcoming
Where Did All of The Food, Cleaning, Security and Logistics Workers Go?

Figure I: Share of Firms with any Food/Cleaning/Security/Logistics workers, by Industry

(a) Retail

(b) Manufacturing

(c) Finance

(d) Hospitals

Notes: The Figure shows the fraction of West German establishments with at least 100 workers in 4 major industries (retail, manufacturing, finance and hospitals), who are employing at least 1 worker in the respective occupations (food, cleaning, security, driver or warehouse worker). The data covers 1975 to 2008 and in each year is based on the employee composition on June 30th.
Growing Employment in Temp Agencies, Cleaning, Security, Logistics, and and Business Service Firms

Figure II: Share of Workers employed by Business Service Firms and Temp Agencies over time

(a) Worker in all Occupations

Notes: The top figure shows the share of all fulltime workers in West Germany from 1975 to 2008 who are working in either a cleaning, security or logistics business service firm or for a temp agency. The bottom figure shows the share of workers in food, cleaning, security or logistics occupations who are employed in business service firms or temp agencies. For food occupations the time series in the bottom figure starts in 1999, since earlier industry codes did not differentiate between restaurants and food business services industries, such as canteens and catering. We also exclude food workers employed in the restaurant, hotel and air travel industries.
Large Share of FCSL Workers Now Employed in Temp Agencies and Business Services

Figure II: Share of Workers employed by Business Service Firms and Temp Agencies over time

Notes: The top figure shows the share of all fulltime workers in West Germany from 1975 to 2008 who are working in either a cleaning, security or logistics business service firm or for a temp agency. The bottom figure shows the share of workers in food, cleaning, security or logistics occupations who are employed in business service firms or temp agencies. For food occupations the time series in the bottom figure starts in 1999, since earlier industry codes did not differentiate between restaurants and food business services industries, such as canteens and catering. We also exclude food workers employed in the restaurant, hotel and air travel industries.

(b) Workers in Food / Cleaning / Security / Logistics Occupations
Establishments with On-Site Outsourcing Events

On-site outsourcing events are defined as groups of workers leaving large establishments and moving to business service firms.

(a) Number of Outsourcing Establishments in East and West Germany

Notes: The figure shows the number of on-site outsourcing events in Germany by year, where on-site outsourcing events are defined as groups of workers leaving large establishments and moving to business service firms. The top figure breaks this up by East and West Germany, while the bottom breaks it up by outsourcing type. Only the bottom figure includes outsourcing to temp agencies.

Goldschmidt and Schmieder 2015
Establishments with On-Site Outsourcing Events

On-site outsourcing events are defined as groups of workers leaving large establishments and moving to business service firms. The figure shows the number of on-site outsourcing events in Germany by year, where on-site outsourcing events are defined as groups of workers leaving large establishments and moving to business service firms. The top figure breaks this up by East and West Germany, while the bottom breaks it up by outsourcing type. Only the bottom figure includes outsourcing to temp agencies.

(b) Number of Outsourcing Establishments by Type of Outsourcing
Event Studies of Outsourced Workers versus Matched Comparison Groups

Figure IV: Employment Outcomes of Outsourced and Non-Outsourced Workers Before and After On-site Outsourcing

(a) Log Daily Wage

(b) Log Daily Wage - Balanced Panel

(c) Days Worked Per Year

(d) Probability of working at outsourced job

Notes: The figures follow two groups of workers: the first is a group of workers who are outsourced between year $t=-1$ and $t=0$ (the first year at the new establishment), while the second group is a control group of non-outsourced workers. The control group was chosen by finding workers employed in the same industry and occupation with similar tenure and establishment size in the year prior to outsourcing, and have similar wages 2 and 3 years prior to outsourcing as the outsourced workers. The figures show average characteristics of the workers in the two groups before and after the outsourcing event. Panel (a), (c) and (d) show data from the unbalanced panels of workers in the outsourced and control group. Panel (b) restricts the data to a balanced panel of individuals observed in each year from 5 years before to 10 years after the outsourcing event.
Log Wage Regression Estimates: Outsourced Workers versus Matched Comparison Groups

Figure V: Regression Estimates of the Effect of On-site Outsourcing on Log Daily Wages

- .15
- .1
- .05

Worker level estimate

(a) All worker observations before and after outsourcing

(b) Sample restricted to observations remaining at the same job

(c) Alternative matching variables

(d) Comparison to workers within outsourcing establishments

Notes: The figures show regression estimates of the effects of being outsourced between t=-1 and t=0 (the first year at the new establishment) on log wages before and after the outsourcing event (see equation 2). The omitted category is year -1. The bands are 95 percent confidence intervals (SE clustered on the level of the outsourcing establishment). The regressions control for individual fixed effects and year dummies. The figures follow two groups of workers: the first is a group of workers who are outsourced between year t=-1 and t=0, while the second group is a control group of non-outsourced workers. Panel (a) shows results irrespective of whether they move to other establishments in later years. Panel (b) restricts the sample to workers who are at the outsourced job, i.e. at the same establishment as in time t=-1 in all years before outsourcing, and in the same establishment as in time t=1 in all years after outsourcing. Panel (c) shows results for the same restriction as (b) but alternative establishment level control variables in the matching algorithm and Panel (d) uses a control group of workers at the outsourcing establishment who are not outsourced.
(b) Sample restricted to observations remaining at the same job
Establishment Characteristics of Outsourced and Non-Outsourced Jobs Before and After Outsourcing

Figure 7: Establishment Characteristics of Outsourced and Non-outsourced Jobs before and after Outsourcing

(a) Size of Employer (Establishment)
(b) Average Log Wage of Coworkers

Notes: Sample restricted to workers who are at the same establishment as in time t=-1 in all years before outsourcing, and in the same establishment as in time t=1 in all years after outsourcing. The figures follow two group of workers: the first is a group of workers who are outsourced between year t=-1 and t=0, while the second group is a control group of non-outsourced workers. The figures show average characteristics of the establishments where the workers in the two groups are working before and after the outsourcing event. The AKM effect is the estimated establishment fixed effect from a wage regression including a full set of worker and establishment fixed effects using the universe of wage records in Germany.

Goldschmidt and Schmieder 2015
Figure VI: On-site Outsourcing and Establishment (AKM) Effects

Panel (a) shows the average estimated establishment (AKM) effect of the establishments where the workers in the outsourced and control groups are working before (t=-1) and after (t=0) the outsourcing event. The AKM effect is estimated from a wage regression including a full set of worker and establishment fixed effects using the universe of wage records for full-time male workers in Germany. Panel (b) shows regression estimates of the effects of being outsourced on log wages before and after the outsourcing event separately for workers who are outsourced from high and low AKM effect establishments. The bands are 95 percent confidence intervals (SE clustered on the level of the outsourcing establishment). The sample is restricted to workers who are at the same establishment as in time t=-1 in all years before outsourcing, and in the same establishment as in time t=1 in all years after outsourcing.

Notes: Panel (a) shows the average estimated establishment (AKM) effect of the establishments where the workers in the outsourced and control groups are working before (t=-1) and after (t=0) the outsourcing event. The AKM effect is estimated from a wage regression including a full set of worker and establishment fixed effects using the universe of wage records for full-time male workers in Germany. Panel (b) shows regression estimates of the effects of being outsourced on log wages before and after the outsourcing event separately for workers who are outsourced from high and low AKM effect establishments. The bands are 95 percent confidence intervals (SE clustered on the level of the outsourcing establishment). The sample is restricted to workers who are at the same establishment as in time t=-1 in all years before outsourcing, and in the same establishment as in time t=1 in all years after outsourcing.
Evolution of AKM Effects of CSL Establishments

Figure VII: Market Entry of New Establishments of Business Service Firms over Time

1. AKM Effects of New and Existing Establishments by Year

(a) AKM Effects of New and Existing Establishments by Year

Notes: The top figure shows the AKM effect (estimated over the entire duration of an establishment's existence) of establishments by the year the establishment was founded (first appears in the data). The figure is restricted to establishments with at least 10 employees in West Germany 1976-2008. The bottom figure shows the average county level index of employment weighted market concentration among business service firms. The index can be interpreted as the probability that two randomly picked workers at business service firms in a particular year and county are working for the same firm. The data is restricted to West Germany 1975-2008.
Decoupling of Wages in Logistics, Cleaning and Security Occupations from General Wage Growth

(a) Evolution of Wages by Occupations

(b) Evolution of Wages by Outsourced Status

(c) Evolution of AKM effects by Occupations

(d) Evolution of AKM Effects by Outsourced Status

Notes: The figures show how wages in logistics, cleaning, and security (LCS) occupations have evolved relative to wages in other occupations. Panel (a) shows the log wage for the different occupations. Panel (b) shows how wages for LCS workers have evolved depending on whether they are outsourced or not, relative to workers in other (non-LCS) occupations. Panel (c) shows the establishment (AKM) effects by occupation, and panel (d) shows the AKM effects for LCS workers by outsourcing status and the AKM effects for all other occupations.

Goldschmidt and Schmieder 2015
DFL AKM Counterfactual: Holding FCLS at 1985 Level

Figure X: The Evolution of the West German Wage Structure for Men, Actual and DFL Reweighted

(a) Var(log wage)
(b) Var(establishment effect)
(c) Cov(estab effect, person effect)
(d) Percentiles (15-50-85) of log wage dist.
### Why Are Companies Choosing to Outsource?

---

**Overseas Outsourcing**

By the end of next year, an estimated 830,000 U.S. service jobs will have been exported overseas. Why are companies choosing to outsource?

- All Americans already have great jobs
- Employees in India and the Philippines don’t demand perks like “flextime” or “sunlight”
- Remembered what a super job the Chinese did on the railroads
- Upper management would rather be spared the awkwardness of running into employees at Six Flags on weekend
- Following lead of Jay-Z, who outsourced his beat for “Beware Of The Boys” to Panjabi MC
- Good way to stack company cricket team
- Ironically, the best place to exploit workers is the largest communist nation on the planet
- Will result in cheaper products, which will increase demand, which will result in richer companies, whose wealth will be sprinkled onto unemployed U.S. workers like fairy dust
- Just want to help rest of world out
Outline

1. Labor coercion and contracting
2. What do unions do?
3. Firms effects and outsourcing
4. Competitive environment
   • ‘Superstar’ firms
Concentrating on the Falling Labor Share

Autor, Dorn, Katz, Patterson and Van Reenen
2017
Falling Labor Share of Value-Added
Evident in Many Countries, Esp. Since 2000

Karabaronis and Neiman, 2014

Fig. II
Declining Labor Share for the Largest Countries

Karabaronis and Neiman, 2014
Significance?

• Overturns a key ‘Kaldor fact’
• Fall is real and significant
  • Elsby et al. ‘13
  • Karbarbounis/Neiman ‘14
  • Rognlie ’14
  • Koh et al. ‘16
• Why is this a concern?
  1. Slow GDP growth → Labor getting a shrinking slice of slow-growing pie
  2. Since distribution of capital far more unequal than distribution of labor → Growing income inequality
Causes of the Falling Labor Share?

- **Role of technical change:** Karabaronis & Neiman ‘14
  - Falling capital price and, critically, elas. of L-K sub $\sigma > 1$
  - But empirical literature suggests $\sigma < 1$, e.g., Lawrence ’15, Oberfield-Raval ’14, Antras ’04, Hamermesh ’90

- **Role of trade exposure:** Elsby et al. ’13
  - Driven by falling labor share in trade-impacted manufacturing industries (China competition)

- **Role of growth vs. stagnation**
  - Piketty ‘14, Rognlie ’14, Krusell and Smith, ‘15

- **Role of rising profit share** – higher aggregate mark-up
  - Barkai ‘16: Also finds $\Delta$ Labor share falls with $\Delta$ Concentration (not using micro-data)
Summary of Evidence

1. A rise in sales concentration within four-digit industries across US private sector

2. Industries with larger increases in concentration see larger falls in labor share

3. Labor share fall largely due to reallocation of activity between firms, not primarily a general fall within incumbent firms

4. Reallocation component of falling labor share largest in industries with rising sales concentration

5. These patterns are broadly international in scope
Superstar firm model sketch (akin to Bartelsman et al. ‘13, AER)

- Heterogeneous firms \( i \) in an industry
  - Monopolistic competition: CES demand with consumer price elasticity \( \rho > 1 \)
  - Competitive factor markets: wage \( w \), capital cost \( r \)
  - Firms pay sunk cost of entry \( \kappa > 0 \) for random draw of productivity \( A_i \) (TFPQ)
  - \( F \) is overhead labor, a fixed cost of production
  - Low productivity firms who cannot cover fixed cost exit
Superstar firm model sketch

- Heterogeneous firms $i$ in an industry
  \[ Y_i = A_i V_i^\alpha K_i^{1-\alpha} \]
  - $Y_i$ = value-added
  - $K$ = capital, with share $1 - \alpha$
  - $V$ = variable labor with share $\alpha$
  - Total labor is $L = V + F$
The Labor Share, $S_i$

- Labor cost $wL$ share in nominal value added $PY$
  
  $S_i = \left( \frac{wL}{PY} \right)_i = \frac{\alpha_L}{\mu_i} + \frac{wF}{(PY)_i}$

- $\mu_i$ is mark-up of price $P$ over marginal cost $c$
- Given economy-wide values of $\alpha, w, F$
- Firm has a lower labor share if
  
  1. Its share of fixed costs in total revenues is lower
  2. Its mark-up is higher

- High $A_i$ firms will be larger $\rightarrow$ Lower labor shares
- In other imperfect comp models (e.g. Cournot), high $A_i$ firms will have large market shares and higher mark-ups
Some Predictions

- **Rise in product market competition** $\rho \uparrow$
  
  1. Increases concentration because shifts output to high $A_i$ (low labor share) firms
  
  2. This reallocation will push down the aggregate labor share (so long as it dominates any within firm changes)

- **More generally**
  
  - Any $\Delta$ to market structure that gives more market share to higher quality firms will have reallocation effect pushing down labor share
Data Sources

• Measuring labor share
  • US Economic Censuses, 1982 - 2012
  • Conducted every 5 years
  • Use six sectors covering ~80% of private sector jobs
    • 1. Manufacturing; 2. Retail; 3. Wholesale; 4. Services; 5. Finance; 6. Utilities & Transportation
  • Time consistent industries (built on 4-digit SIC-87)
    • 288 in non-manufacturing, 388 in manufacturing

• Measuring sales concentration
  • CR4, CR20, HHI (Herfindahl-Hirschman Index)
  • Robust to adjusting for (i) intermediate services; (ii) size of domestic market via imports
Rising Concentration: Manufacturing and Finance

Manufacturing Sector

Finance Sector

Average Concentration
4-digit Industries in Manufacturing

Average Concentration
4-digit Industries in Finance

Notes: Weighted average of 4 digit industries within each large sector. Manufacturing: 388 inds; Finance: 31; Services: 95; Utilities & Transport: 48; Retail: 58; Wholesale: 56
Rising Concentration: Services, Utils + Transport

Service Sector

Average Concentration
4-digit Industries in Services

Utilities + Transportation Sector

Average Concentration
4-digit Industries in Utilities and Transportation

Notes: Weighted average of 4 digit industries within each large sector. Manufacturing: 388 inds; Finance: 31; Services: 95; Utilities & Transport: 48; Retail: 58; Wholesale: 56
Rising Concentration: Retail and Wholesale Trade

Notes: Weighted average of 4 digit industries within each large sector. Manufacturing: 388 inds; Finance: 31; Services: 95; Utilities & Transport: 48; Retail: 58; Wholesale: 56
Summary of Evidence

1. A rise in sales concentration within four-digit industries across US private sector

2. Industries with larger increases in concentration see larger falls in labor share

3. Fall largely due to reallocation of employment between firms not a general fall within incumbent firms

4. Reallocation component of falling labor share largest in industries w/rising sales concentration

5. These patterns broadly international in scope
Rising Concentration → Falling Labor Share?  
Manufacturing: 5 year changes

\[ \Delta \left( \frac{\text{Payroll}}{\text{Value Added}} \right)_{jt} = \Delta S_{jt} = \alpha + \beta \Delta \text{Conc}_{jt} + \gamma_t + \varepsilon_{jt} \]

<table>
<thead>
<tr>
<th></th>
<th>CR4</th>
<th>CR20</th>
<th>HHI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>0.148 **</td>
<td>0.234 **</td>
<td>0.189 *</td>
</tr>
<tr>
<td></td>
<td>(0.036)</td>
<td>(0.047)</td>
<td>(0.096)</td>
</tr>
</tbody>
</table>

Notes: ** significant at 1% level; * = significant at 5% level; ~ = significant to 10% level
Regression of $\Delta$ Labor Share on $\Delta$ Concentration by period in U.S. Manufacturing, 1982 – 2012

Correlation Between the Change in Labor Share and the Change in Concentration

$$\Delta \left( \frac{\text{Payroll}}{\text{Value Added}} \right)_{jt} = \Delta S_{jt} = \alpha_t + \beta_t \Delta CR20_{jt} + \varepsilon_{jt}$$

Notes: Average $\beta = -0.148$ over period as a whole (including time dummies)
Robustness of the Rising Concentration & Falling Labor Share Association in U.S. Manufacturing

\[ \Delta \left( \frac{\text{Payroll}}{\text{Value Added}} \right)_{jt} = \Delta S_{jt} = \alpha + \beta \Delta \text{Conc}_{jt} + \gamma_t + \varepsilon_{jt} \]

<table>
<thead>
<tr>
<th></th>
<th>CR4</th>
<th>CR20</th>
<th>HHI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Baseline</td>
<td>-0.148**</td>
<td>-0.234**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.036)</td>
<td>(0.047)</td>
</tr>
<tr>
<td>2</td>
<td>Compensation Share of Value Added</td>
<td>-0.175**</td>
<td>-0.264**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.046)</td>
<td>(0.061)</td>
</tr>
<tr>
<td>3</td>
<td>Deduct Service Intermediates from VA</td>
<td>-0.331**</td>
<td>-0.517**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.062)</td>
<td>(0.071)</td>
</tr>
<tr>
<td>4</td>
<td>Industry Trends (Four-Digit Dummies)</td>
<td>-0.171**</td>
<td>-0.307**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.042)</td>
<td>(0.053)</td>
</tr>
<tr>
<td>5</td>
<td>1992 - 2012 Sub-Period</td>
<td>-0.181**</td>
<td>-0.316**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.044)</td>
<td>(0.063)</td>
</tr>
<tr>
<td>6</td>
<td>Including Imports (1992 - 2012)</td>
<td>-0.204**</td>
<td>-0.288**</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.052)</td>
<td>(0.045)</td>
</tr>
<tr>
<td>7</td>
<td>Employment-Based Concentration Measure</td>
<td>0.048</td>
<td>0.039</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(0.036)</td>
<td>(0.036)</td>
</tr>
</tbody>
</table>

Notes: ** significant at 1% level; * = significant at 5% level; ~ = significant to 10% level
### Results by Broad Sector: Switching from $\Delta$Labor/VA to $\Delta$Labor/Sales

\[ \Delta S_{jt} = \alpha + \beta \Delta \text{Conc}_{jt} + \gamma_t + \varepsilon_{jt} \]

**Stacked Five-Year Changes**

<table>
<thead>
<tr>
<th>Sector</th>
<th>CR4</th>
<th>CR20</th>
<th>HHI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Manufacturing</td>
<td>-0.064 **</td>
<td>-0.087 **</td>
<td>-0.107 **</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.024)</td>
<td>(0.027)</td>
</tr>
<tr>
<td>$n = 2328; 1,164$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Retail</td>
<td>-0.036 ~</td>
<td>-0.085 *</td>
<td>-0.045 ~</td>
</tr>
<tr>
<td></td>
<td>(0.021)</td>
<td>(0.037)</td>
<td>(0.026)</td>
</tr>
<tr>
<td>$n = 348; 174$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Services</td>
<td>-0.090</td>
<td>-0.127 **</td>
<td>-0.354 **</td>
</tr>
<tr>
<td></td>
<td>(0.057)</td>
<td>(0.037)</td>
<td>(0.083)</td>
</tr>
<tr>
<td>$n = 570; 285$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Wholesale</td>
<td>-0.035 **</td>
<td>-0.039 *</td>
<td>-0.079 *</td>
</tr>
<tr>
<td></td>
<td>(0.012)</td>
<td>(0.016)</td>
<td>(0.039)</td>
</tr>
<tr>
<td>$n = 336; 168$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Finance</td>
<td>-0.230 **</td>
<td>-0.265 **</td>
<td>-0.565 **</td>
</tr>
<tr>
<td></td>
<td>(0.083)</td>
<td>(0.080)</td>
<td>(0.204)</td>
</tr>
<tr>
<td>$n = 124; 62$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Utilities + Transport</td>
<td>-0.118 **</td>
<td>-0.116 **</td>
<td>-0.434 **</td>
</tr>
<tr>
<td></td>
<td>(0.026)</td>
<td>(0.044)</td>
<td>(0.054)</td>
</tr>
<tr>
<td>$n = 144; 48$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. All combined</td>
<td>-0.076 **</td>
<td>-0.093 **</td>
<td>-0.144 **</td>
</tr>
<tr>
<td></td>
<td>(0.016)</td>
<td>(0.022)</td>
<td>(0.028)</td>
</tr>
<tr>
<td>$n = 3,850; 1,901$</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Stacked Ten-Year Changes**

<table>
<thead>
<tr>
<th>Sector</th>
<th>CR4</th>
<th>CR20</th>
<th>HHI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Manufacturing</td>
<td>-0.044 *</td>
<td>-0.044</td>
<td>-0.096 **</td>
</tr>
<tr>
<td></td>
<td>(0.022)</td>
<td>(0.034)</td>
<td>(0.037)</td>
</tr>
<tr>
<td>2. Retail</td>
<td>-0.045 *</td>
<td>-0.070 *</td>
<td>-0.075 **</td>
</tr>
<tr>
<td></td>
<td>(0.018)</td>
<td>(0.029)</td>
<td>(0.023)</td>
</tr>
<tr>
<td>3. Services</td>
<td>-0.087</td>
<td>-0.129 **</td>
<td>-0.378 *</td>
</tr>
<tr>
<td></td>
<td>(0.070)</td>
<td>(0.043)</td>
<td>(0.158)</td>
</tr>
<tr>
<td>4. Wholesale</td>
<td>-0.037 *</td>
<td>-0.036 *</td>
<td>-0.067</td>
</tr>
<tr>
<td></td>
<td>(0.018)</td>
<td>(0.018)</td>
<td>(0.050)</td>
</tr>
<tr>
<td>5. Finance</td>
<td>-0.252 **</td>
<td>-0.291 **</td>
<td>-0.740 *</td>
</tr>
<tr>
<td></td>
<td>(0.091)</td>
<td>(0.070)</td>
<td>(0.294)</td>
</tr>
<tr>
<td>6. Utilities + Transport</td>
<td>-0.048</td>
<td>-0.122 *</td>
<td>-0.269 **</td>
</tr>
<tr>
<td></td>
<td>(0.072)</td>
<td>(0.051)</td>
<td>(0.104)</td>
</tr>
<tr>
<td>7. All combined</td>
<td>-0.063 **</td>
<td>-0.083 **</td>
<td>-0.122 **</td>
</tr>
<tr>
<td></td>
<td>(0.019)</td>
<td>(0.024)</td>
<td>(0.033)</td>
</tr>
</tbody>
</table>

Significance at the **1% level, *5% level, ~10% level. Each cell is the coefficient on a concentration measure from a separate OLS regression (standard errors in parentheses clustered by industry). Time period is 1982-2012 using different Censuses aggregated up to four digit industry-level. The combined regression in row 7 includes 6 sector fixed effects. Regressions are weighted by the share of sales of the four digit industry in total sector sales in the initial year.
\[ \Delta S_{jk\ell} = \alpha_k + \beta_k \Delta CR_{20j\ell} + \gamma_t + \varepsilon_{jt} \]

**Notes:** OLS Regression coefficient of \( \Delta \)lab share (payroll over sales) on CR20 (5 year changes); 95% confidence intervals; 1982-2012.
‘Explained’ Share of Falling Labor Share

Service Sector

Utilities + Transportation Sector

Dependent variable is the wage-to-sales ratio. Concentration is defined using sales.
‘Explained’ Share of Falling Labor Share

Manufacturing Sector

Finance Sector

5 Year Change Dummies With and Without CR20

Dependent variable is the wage-to-sales ratio.
Concentration is defined using sales ratio.

Manufacturing

Finance

Figure 11: The Role of Concentration in Explaining the Evolution of the Wage-to-Sales Ratio
‘Explained’ Share of Falling Labor Share

Dependent variable is the wage-to-sales ratio. Concentration is defined using sales.
Summary of Evidence

1. A rise in sales concentration within four-digit industries across US private sector
2. Industries with larger increases in concentration see larger falls in labor share
3. Labor share fall largely due to reallocation of activity between firms, not primarily a general fall within incumbent firms
4. Reallocation component of falling labor share largest in industries w/rising sales concentration
5. These patterns broadly international in scope
Basic Descriptive Relationship:
Larger Firms Have Lower Labor Shares

\[ S_{ij} = \alpha + \beta \text{Sales}_{\text{Share}_{ij}} + \pi_j + \gamma_t + \varepsilon_{jt} \]

- \( S = \bar{S} + [\Sigma (\omega_i - \bar{\omega})(S_i - \bar{S})] \)

- Aggregate labor share (\( S \)) divided into
  1. Cross-firm unweighted average, \( \bar{S} \)
  2. Reallocation (covariance) term \( \Sigma (\omega_i - \bar{\omega})(S_i - \bar{S}) \)

- Where \( \omega_i \) is the sales share of firm \( i \) and \( \bar{\omega} \) is the unweighted mean sales share

- Intuition is that overall labor share depends on within firm mean and between firm covariance (bigger firms have lower labor shares)

- $\Delta S = \Delta \bar{S}_S + \Delta \left[ \sum (\omega_i - \bar{\omega})(S_i - \bar{S}) \right]$
  
  \[ + \omega_{X,1} (S_{S,1} - S_{X,1}) + \omega_{E,2} (S_{E,2} - S_{S,2}) \]

1. $\Delta \bar{S}_S$ is the change in unweighted mean labor share within surviving firms
2. $\Delta \left[ \sum (\omega_i - \bar{\omega})(S_i - \bar{S}) \right]$ is reallocation between survivors
3. $\omega_{X,1} (S_{S,1} - S_{X,1})$ is contribution of exiting firms
4. $\omega_{E,2} (S_{E,2} - S_{S,2})$ is contribution of entering firms
Δ Labor-Share, Melitz-Polanec Decomposition in U.S. Manufacturing—Reallocation Major Component

Notes: MP decomposition over 5 year periods, aggregated to two 15 year periods
Δ Labor-Share Components in Six Sectors
Melitz-Polanec Decomposition, 1982 – 2012

- Retail ('82-'12)
  - Between-Firm: -4.0%
  - Within-Firm: 3.7%

- Manufacturing ('82-'12)
  - Between-Firm: -1.2%
  - Within-Firm: -5.0%

- Services ('82-'12)
  - Between-Firm: -0.4%
  - Within-Firm: 2.4%

- Wholesale ('82-'12)
  - Between-Firm: -4.4%
  - Within-Firm: 4.0%

- Finance ('92-'12)
  - Between-Firm: -3.6%
  - Within-Firm: 6.3%

- Utils+Transport ('92-'07)
  - Between-Firm: -2.4%
  - Within-Firm: 0.6%

Notes: MP decomposition over 5 year periods, aggregated over the full sample period.
Regression of ΔLabor Share Components on Sector Level Δ CR20

- Finance
- Utilities + Transport
- Manufacturing
- Retail
- Wholesale

- Between-Firm
- Within-Firm
- Firm Entry
- Firm Exits
Summary of Evidence

1. A rise in sales concentration within four-digit industries across US private sector
2. Industries with larger increases in concentration see larger falls in labor share
3. Fall largely due to reallocation of employment between firms not a general fall within incumbent firms
4. Reallocation component of falling labor share largest in industries w/rising sales concentration
5. Patterns broadly international in scope
Industry Regs of Δ Labor Share of Sales on Δ Concentration (COMPNET, 10 year change)

- Slovakia: -0.34
- Austria: -0.28
- Italy: -0.20
- France: -0.18
- Finland: -0.18
- Germany: -0.15
- Romania: -0.14
- Estonia: -0.13
- Slovenia: -0.10
- Portugal: -0.08
- Lithuania: -0.05
- Latvia: -0.04
- Poland: 0.01
- Belgium: 0.33
ΔLabor Share: Within/Between-Firm Decomposition by Country (BVD Orbis Data)

- **Sweden ('03-'08)**: -10.4 (Between-Firm), 7.6 (Within-Firm)
- **UK ('03-'08)**: -7.1 (Between-Firm), -0.5 (Within-Firm)
- **Germany ('05-'10)**: -5.5 (Between-Firm), -3.9 (Within-Firm)
- **Italy ('05-'10)**: -2.7 (Between-Firm), 0.6 (Within-Firm)
- **France ('03-'08)**: -1.3 (Between-Firm), -0.4 (Within-Firm)
- **Portugal ('05-'10)**: -1.2 (Between-Firm), 0.2 (Within-Firm)
Surprisingly, does not appear explained by

1. ‘China shock’ – Trade exposure not major predictor
2. Susceptibility to ‘routine-replacing technical change’
3. Purely U.S.-specific factors such as antitrust law; weakening labor institutions
Concentrating Industries Look “Dynamic” — Faster Rise in Patent Intensity, Labor Productivity, $\Delta K$
Conclusion: Much Supporting Evidence for ‘Superstar Firms’ – But What’s the Cause?

1. **Tougher competition?**
   - More consumer sensitivity to price/quality

2. **Shift towards ‘winner take most’ markets?**
   - IP and information-intensive goods

3. **Less creative destruction?**
   - Less entry/exit/startup, Decker et al ’14, Şahin et al ‘17
   - More persistent tech. leaders, Acemoglu-Hildebrand ‘17
   - Laggard firms catching up less quickly, Andrews et al, ‘16

4. **Does ↑ concentration indicate weak competition?**
   - Concentrating industries look dynamic
   - However, innovation could beget barriers to entry
Secretary Of Labor Assures Nation There Still Plenty Of Jobs For Americans Willing To Outwork Robots

Perez says individuals who can precisely install more than 60,000 rivets per day in aircraft-grade aluminum have their choice of thousands of jobs throughout the U.S.