Labor Mobility: Implications for Asset Pricing

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--PRESENTATION SLIDES--

Labor Mobility: Implications for Asset Pricing
The Journal of Finance

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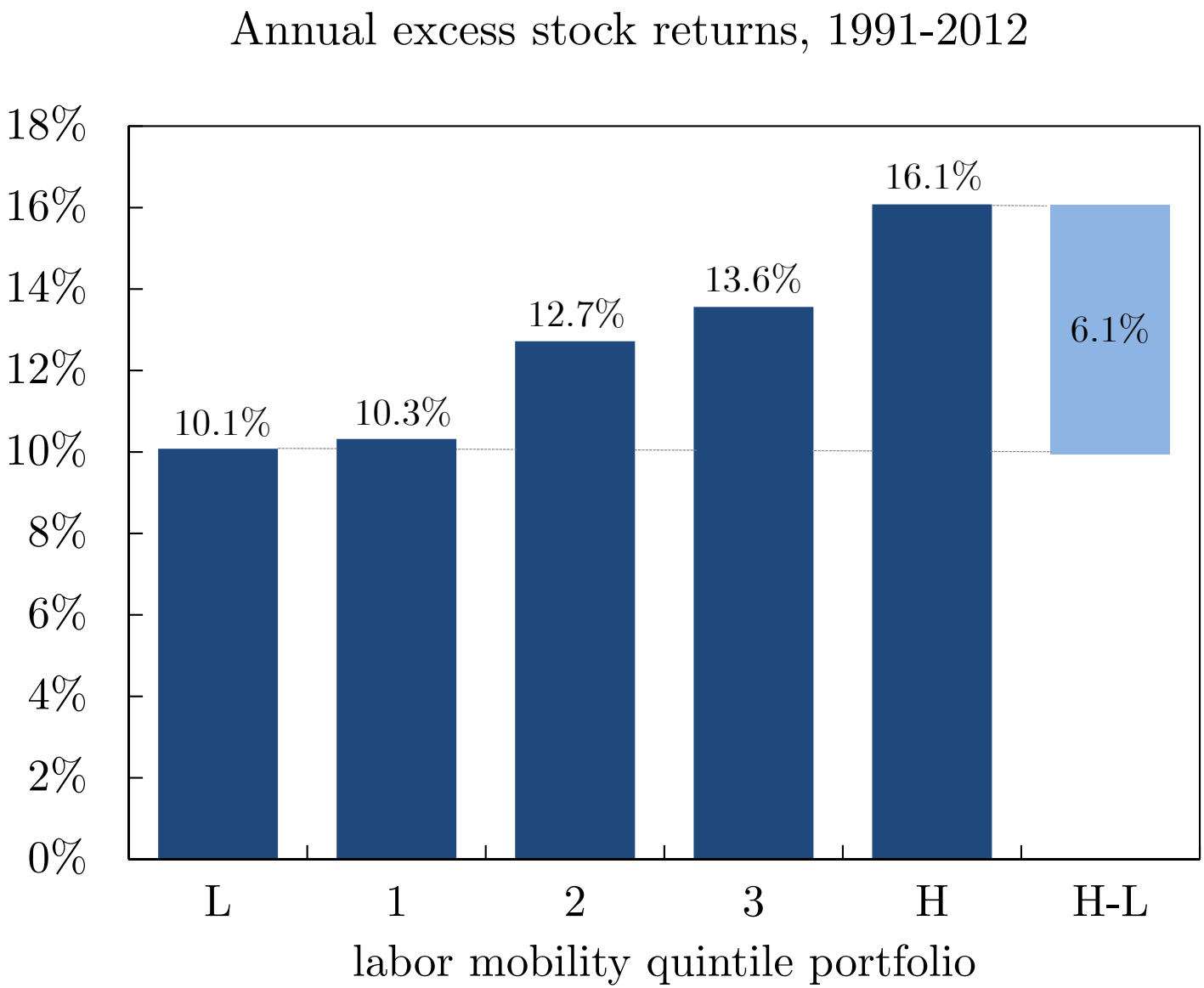
May 2013

Key Question

Does labor mobility affect a firm's exposure to risk?

The Labor Mobility Return Spread



Basic Idea of Labor Mobility (LM)

When productivity/demand in the industry is relatively low:

- LM enables inside workers to leave
  ⇒ prevents industry to lower wages/hour
  ⇒ lower operating profits

When productivity/demand in the industry is relatively high:

- LM enables outside workers to enter the industry
  ⇒ industry can hire with low impact to wages/hour
  ⇒ higher operating profits

⇒ LM acts as operating leverage

Related Literature

Firm's characteristics: Vast literature discussed in Fama and French (2008) and cataloged in Harvey, Liu, and Zhu (2013)

Adjustment costs and firm risk: Jermann (1998); Berk, Green, and Naik (1999); Carlson, Fisher, and Giammarino (2004); Zhang (2005); Merz and Yashiv (2007); Bazdresch, Belo, and Lin (2009); ...

Labor-induced operating leverage: Danthine and Donaldson (2002); Gourio (2007); Chen, Kacperczyk, and Ortiz-Molina (2011); Kuehn, Petrosky-Nadeau, and Zhang (2012)

Mobility and firm risk: Lustig, Syverson, and Nieuwerburgh (2011); Eisfeldt and Papanikolaou (2012)

Model Setup

- Two types of agents:
  1. Capital owners ("firms")
  2. Workers

- Two locations:
  1. Industry
  2. Economy

Economy

1. Pricing kernel:

$$\frac{d\Lambda_t}{\Lambda_t} = -rdt - \eta dZ_t$$

2. Labor Markets

Industry

- Large number of firms
- Large number of workers

$\Rightarrow$ Perfect competition in the goods and labor markets

Firms

- Revenues: $A_t L_t^{\alpha}$
- Productivity:

$$\frac{dA_t}{A_t} = \sigma_{\mathrm{A}} dZ_t$$

- Perfect competition:
  - Total wages: $\alpha A_t L_t^{\alpha}$
  - Total operating profits: $(1-\alpha) A_t L_t^{\alpha}$

Workers

- Each worker is endowed with mix of two types of labor skills:

  1. **Industry-specific skills:**
     - Can only be used inside the industry
     - Wage: $\alpha A_t L_t^{\alpha-1}$ (m.p.l.)
  2. **General skills:**
     - Can only be used outside the industry
     - Wage W_t^{G}:

$$\frac{dW_t^{\mathrm{G}}}{W_t^{\mathrm{G}}} = \sigma_{\mathrm{G}} dZ_t$$

Occupations

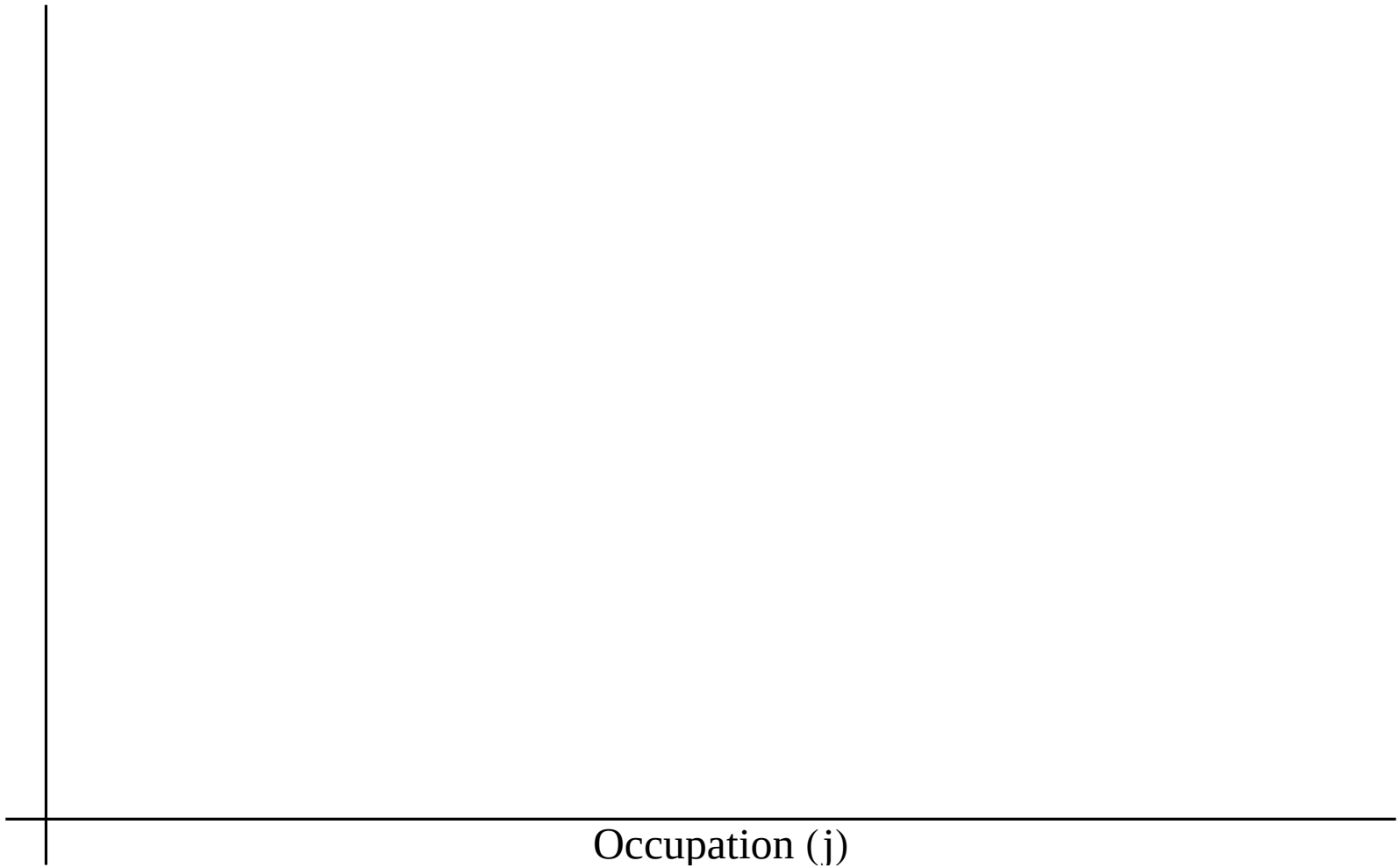
- Workers are distributed across occupations $j \in (0, \infty)$.
- A worker's occupation determined by ratio of endowed industry-specific to general skills:

$$\left(\frac{\delta}{j}\right)^{1-\delta} \text{ units of industry-specific / unit of general skills}$$

- $0 < \delta \leq 1$ property of industry that captures (the inverse of) **labor market segmentation**.

Labor Market Segmentation

Units of industry-specific skills / unit of general skills, $\left(\frac{\delta}{j}\right)^{1-\delta}$



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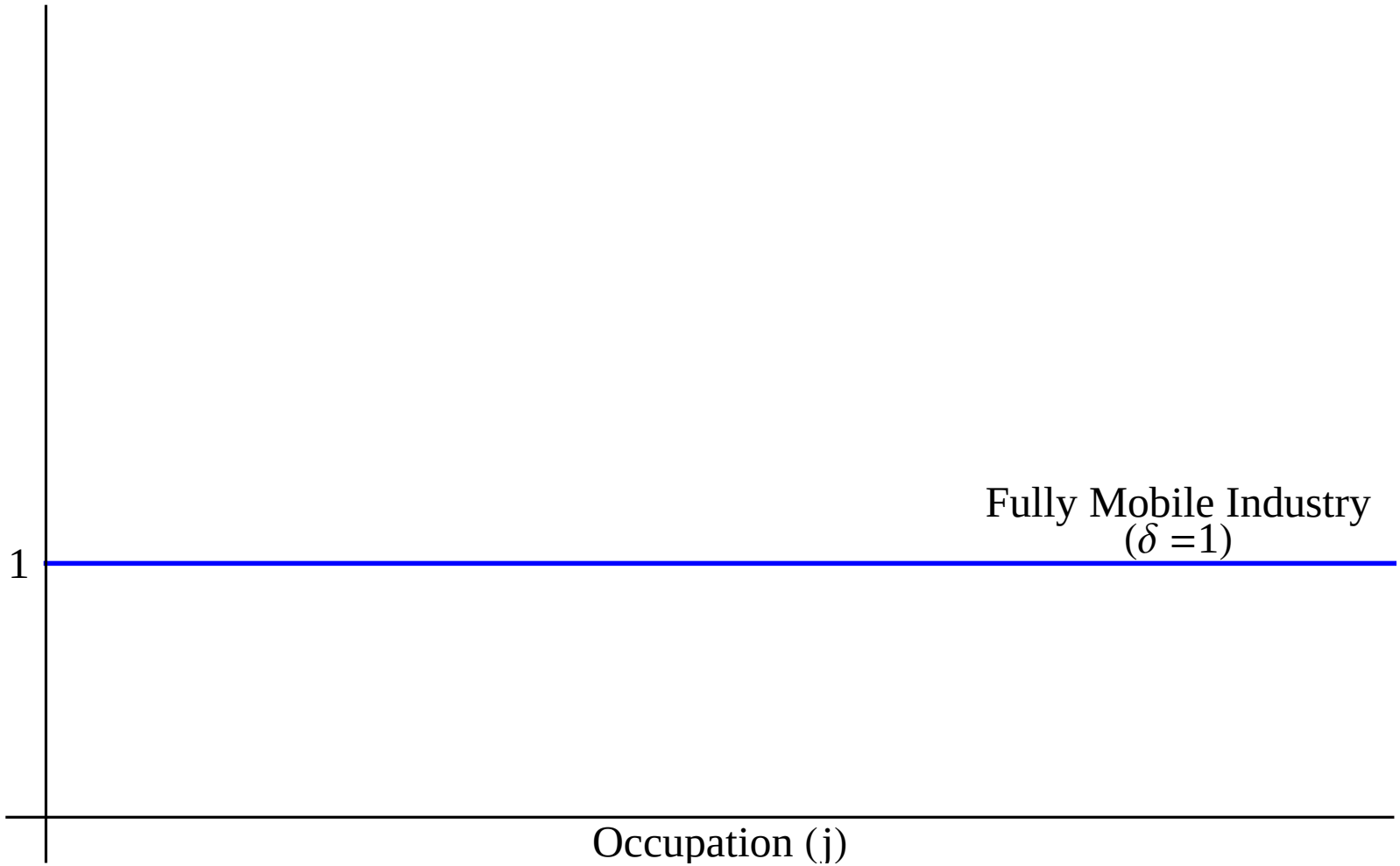

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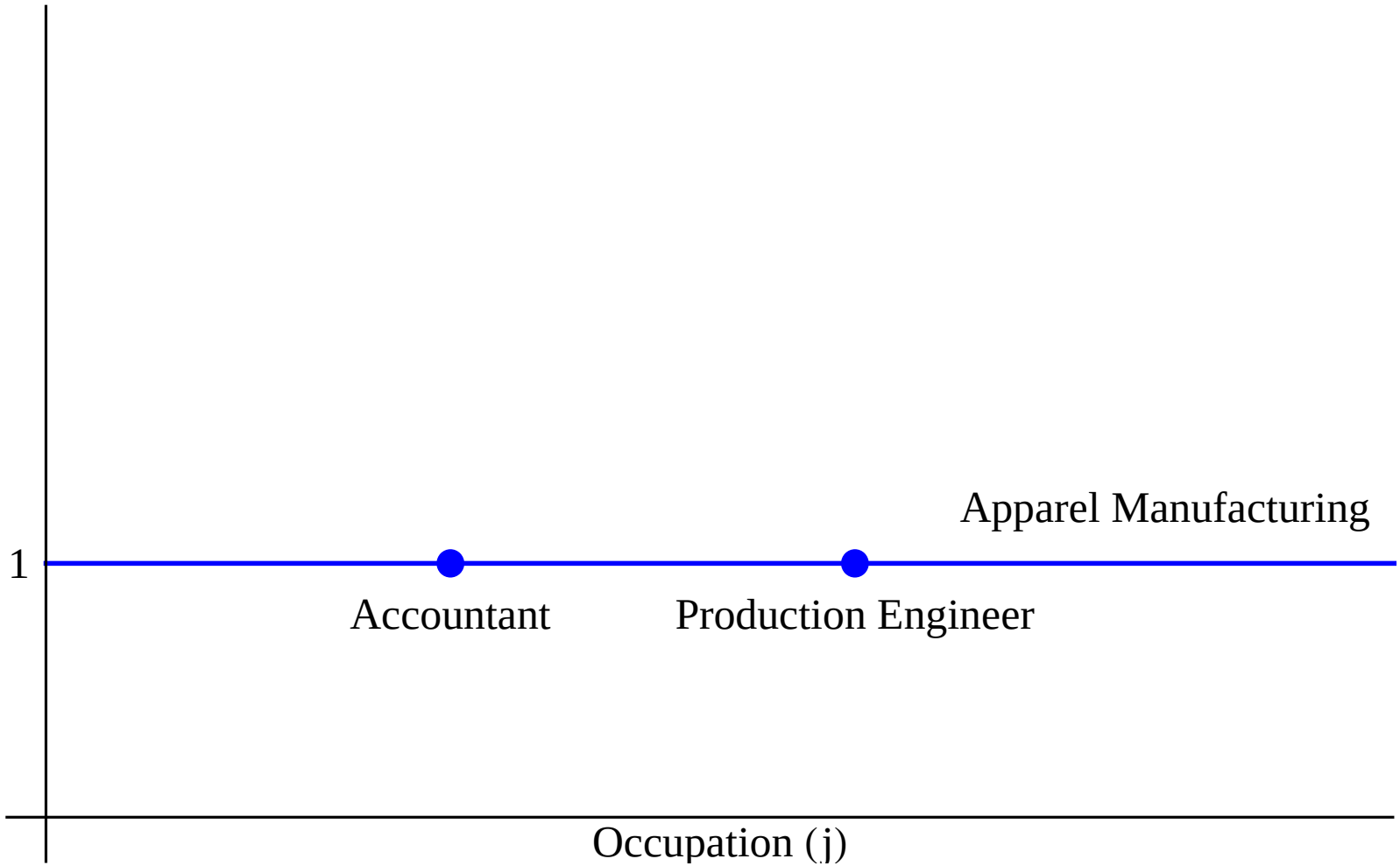

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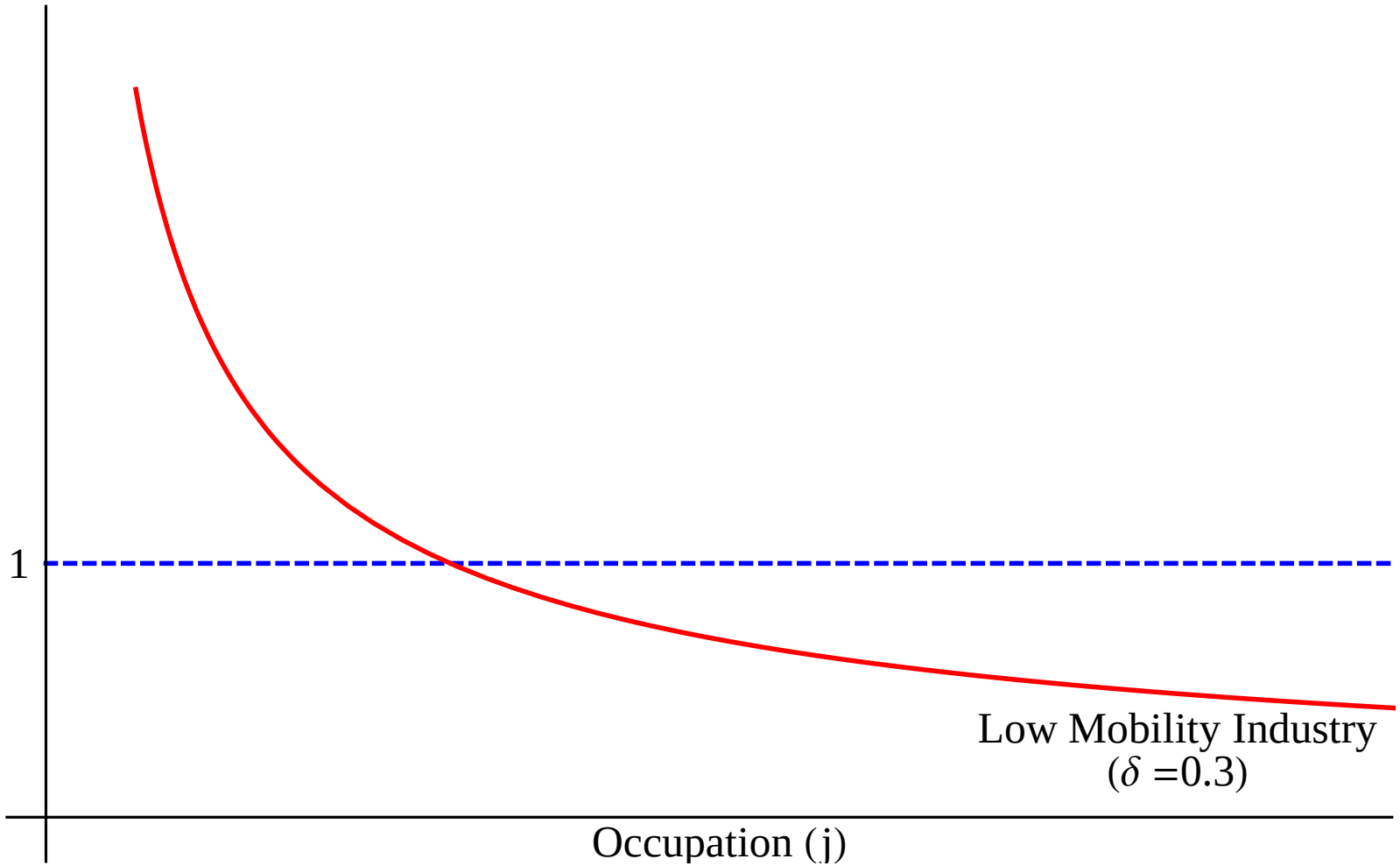

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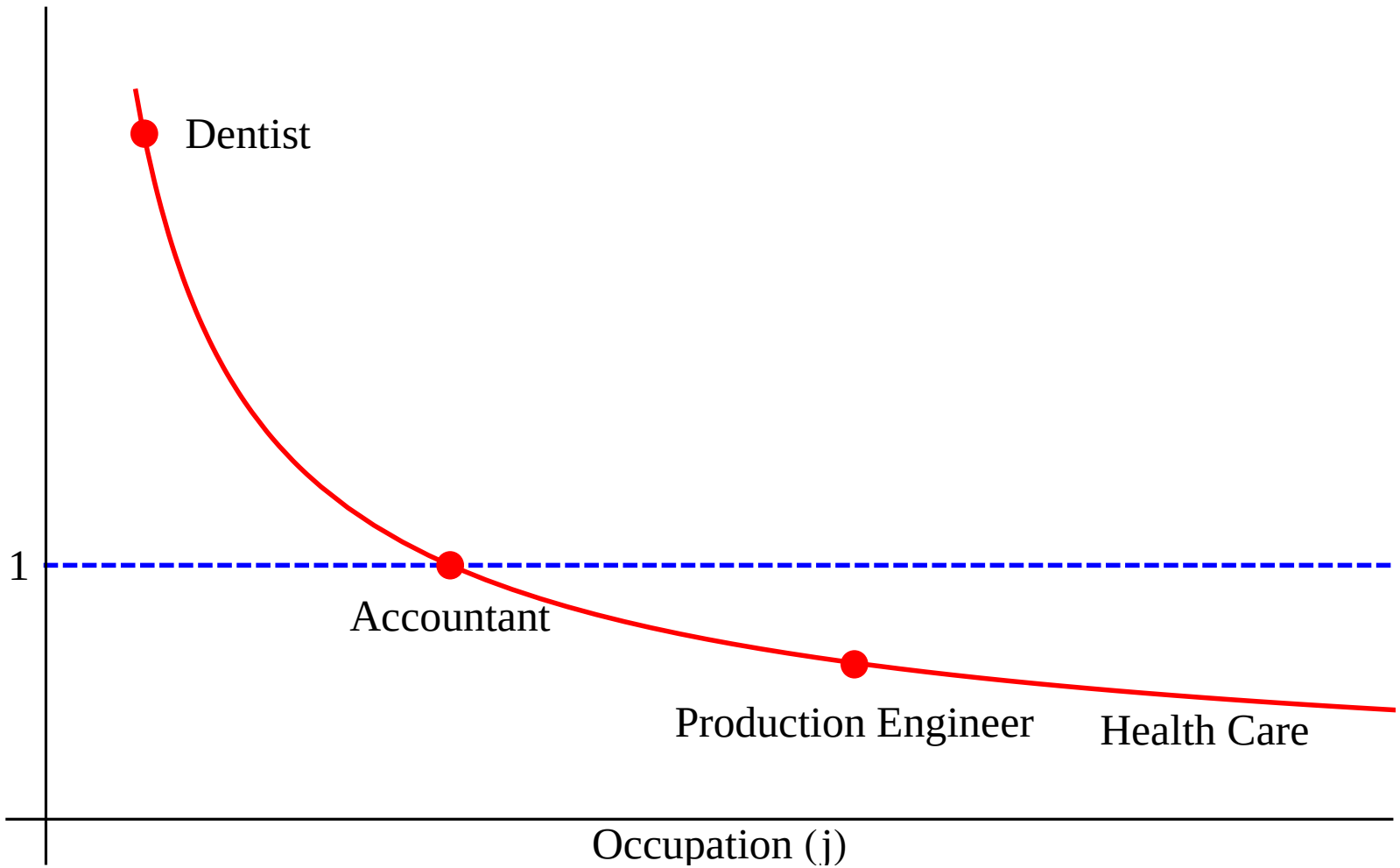

Labor Market Equilibrium

Equilibrium is determined by worker in marginal occupation j^*:

- Employment:

$$L_t^* \equiv \int_0^{j^*} \left(\frac{\delta}{j}\right)^{1-\delta} dj = x_t^{\frac{\alpha\delta}{1-\alpha\delta}}, \quad \text{where} \quad x_t \equiv \frac{\alpha A_t}{W_t^{\mathrm{G}}}$$

- Total operating profits: $\Pi_t^* = (1-\alpha) A_t x_t^{\frac{\alpha\delta}{1-\alpha\delta}}$

Operating Leverage

$$\text{Definition: } \Theta \equiv \text{Cov}\left[\frac{d\Pi}{\Pi}, \frac{dA}{A}\right] / \text{Var}\left[\frac{dA}{A}\right] - 1$$

Equilibrium operating leverage:

$$\Theta^*(\delta) = \frac{\delta\alpha}{1-\delta\alpha}\left(1 - \frac{\sigma_{\text{G}}}{\sigma_{\text{A}}}\right)$$

First Model Implication:

$$\sigma_{\text{A}} > \sigma_{\text{G}} \Leftrightarrow \frac{\partial\Theta(\delta)}{\partial\delta} > 0$$

Firm Value

$$\text{Definition: } V_t \equiv \mathrm{E}_t \left[\int_t^\infty \frac{\Lambda_s}{\Lambda_t} \Pi_s ds \right]$$

Expected Returns

$$\text{Definition: } \mathrm{E_t}[R_t] \equiv \mathrm{E_t}\left[\frac{dV_t + \Pi_t dt}{V_t}\right]$$

Equilibrium expected returns:

$$\mathrm{E_t}[R_t^*] = r + \beta\eta, \qquad \beta = \sigma_{\mathrm{A}} + \frac{\alpha\delta}{1-\alpha\delta}\sigma_{\mathrm{A}} - \frac{\alpha\delta}{1-\alpha\delta}\sigma_{\mathrm{G}}$$

Expected Returns

$$\text{Definition: } \mathrm{E_t}[R_t] \equiv \mathrm{E_t}\left[\frac{dV_t + \Pi_t dt}{V_t}\right]$$

Equilibrium expected returns:

$$\mathrm{E_t}[R_t^*] = r + \beta\eta, \qquad \beta = \underbrace{\sigma_{\mathrm{A}}}_{\text{“fundamental risk”}} + \frac{\alpha\delta}{1-\alpha\delta}\sigma_{\mathrm{A}} - \frac{\alpha\delta}{1-\alpha\delta}\sigma_{\mathrm{G}}$$

$$= \beta_{\mathrm{TFP}}$$

Expected Returns

$$\text{Definition: } \mathrm{E_t}[R_t] \equiv \mathrm{E_t}\left[\frac{dV_t + \Pi_t dt}{V_t}\right]$$

Equilibrium expected returns:

$$\mathrm{E_t}[R_t^*] = r + \beta\eta, \qquad \beta = \sigma_{\mathrm{A}} + \underbrace{\frac{\alpha\delta}{1-\alpha\delta}\sigma_{\mathrm{A}}}_{\text{“quantity effect”}} - \underbrace{\frac{\alpha\delta}{1-\alpha\delta}\sigma_{\mathrm{G}}}_{\text{“cost effect”}}$$

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Second Model Implication:

$$\sigma_{\mathrm{A}} > \sigma_{\mathrm{G}} \Leftrightarrow \frac{\partial\beta}{\partial\delta} > 0 \Leftrightarrow \frac{\partial \mathrm{E}[R]}{\partial\delta} > 0$$

Challenge for Empirical Analysis

An industry's workforce ability to move is not directly observable.

Useful Insights from Labor Economics

1. Ability to move is mainly determined by specificity of labor skills: Becker (1964), Neal (1995), and Parent (2000).

2. Occupations capture most of the differences in labor skills: Kambourov and Manovskii (2009) and Sullivan (2010).

Quote from Kambourov and Manovskii (2009, pg. 64):

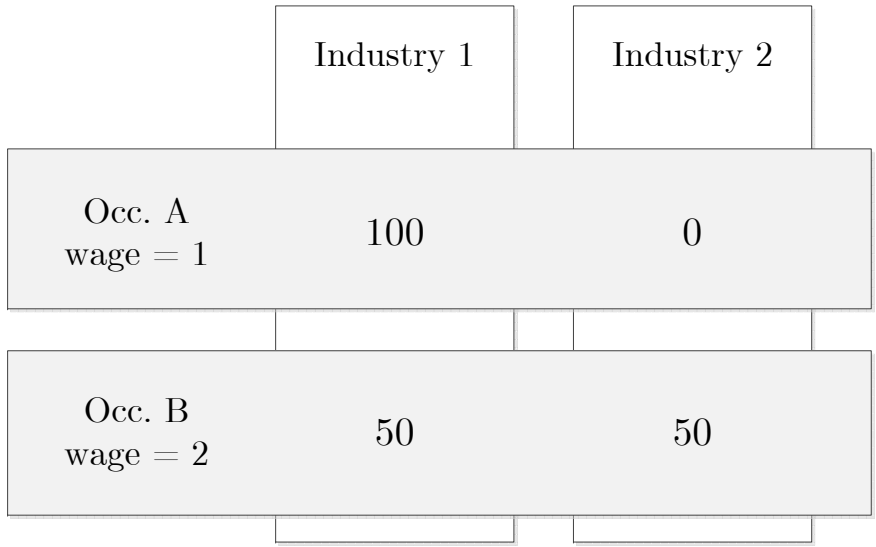
"(...) it appears natural to expect that when a truck driver switches industries (say, from wholesale trade to retail trade) or employers, he loses less of his human capital generated by the truck-driving experience than when he switches his occupation and becomes a cook."

Data

- Yearly occupation data per industry from BLS, from 1988 – 2011
- Over 250 industries per year
- Over 500 occupations per year

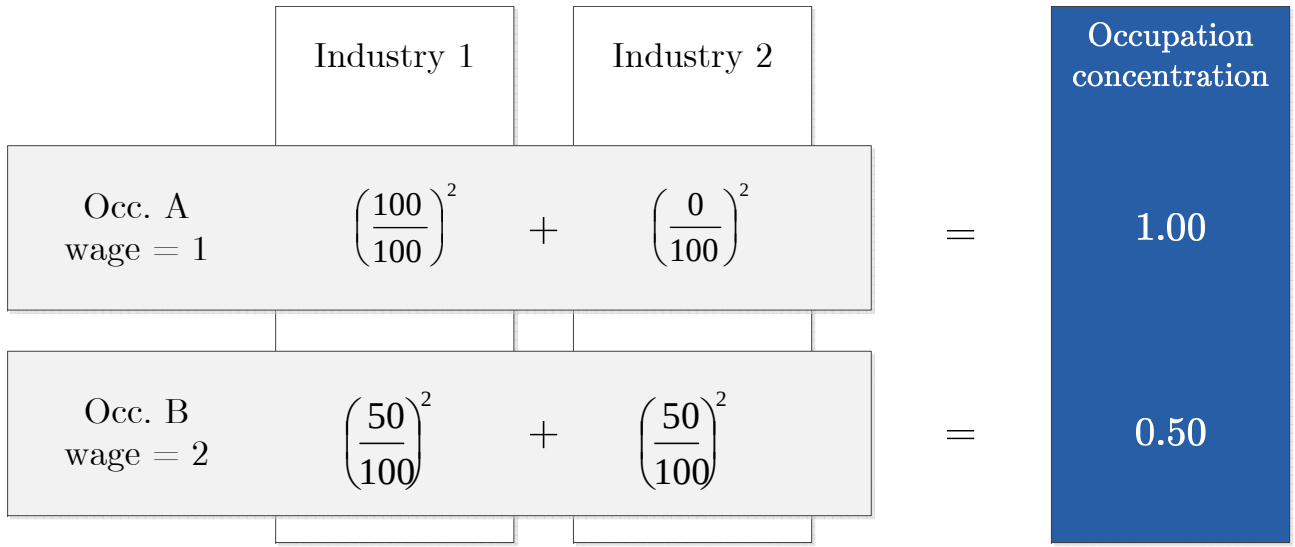
Construction of the Measure of Labor Mobility

Idea: occupation concentration and labor (im)mobility



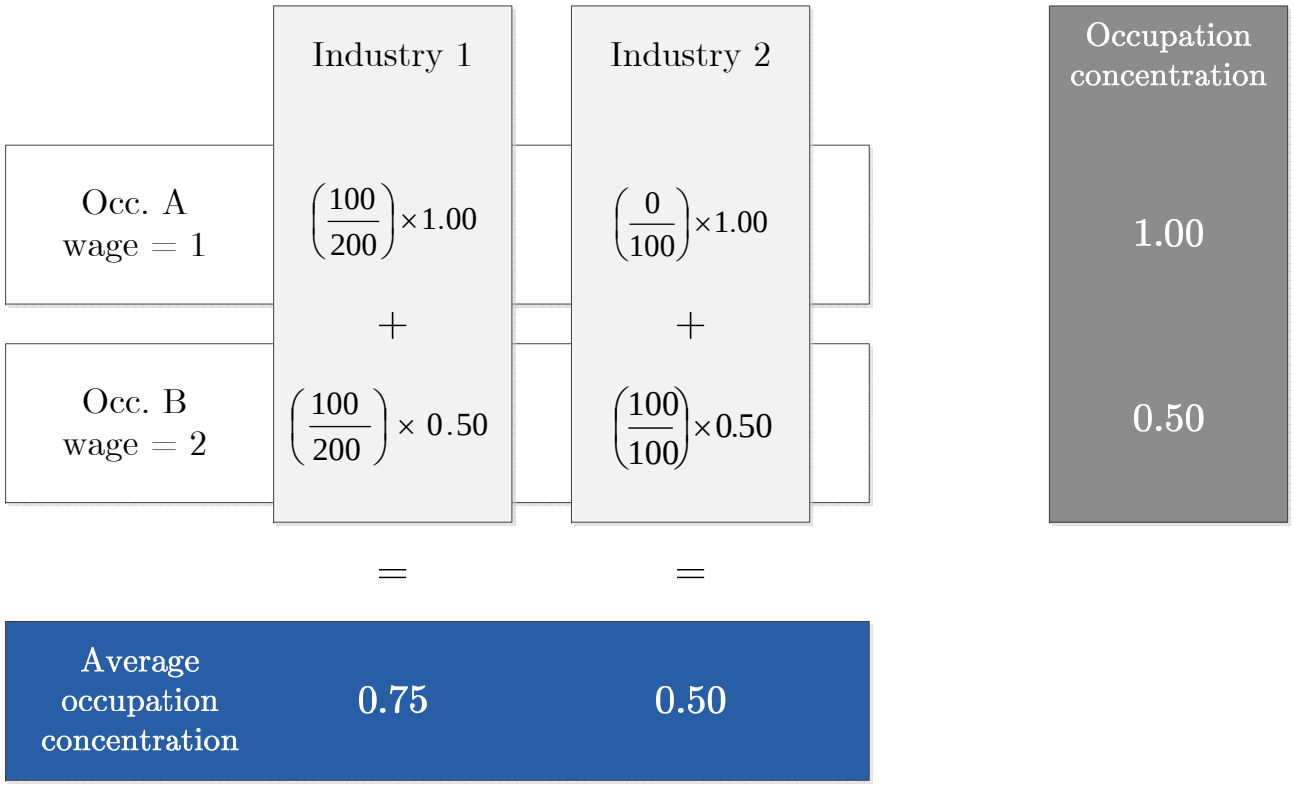
Construction of the Measure of Labor Mobility

First stage: inter-industry concentration by occupation



Construction of the Measure of Labor Mobility

Second stage: concentration of occupations by industry (weighted by wages)



Construction of the Measure of Labor Mobility

Labor mobility: inverse of average labor concentration

	Industry 1	Industry 2	Occupation concentration
Occ. A wage = 1	100	0	1.00
Occ. B wage = 2	50	50	0.50
Average occupation concentration	0.75	0.50	
Labor mobility (1/ concentration)	1.33	2.00	

Validation

Are concentrated occupations in fact less mobile?

Validation

Are concentrated occupations in fact less mobile?

$$\text{OIEG}_{i,j,t} = \lambda_1 \text{TFPG}_{i,t} + \lambda_2 (\text{TFPG}_{i,t} \times \text{CONC}_{j,t}) + ...$$

OIEG: growth in employment in occupation-industry cell

TFPG: growth in industry's productivity

CONC: dummy for high occupation concentration

	I	II
TFPG	38.79***	38.54***
	(11.62)	(11.63)
TFPG x CONC	-42.45***	-58.44***
	(10.38)	(11.68)
TFPG x CONC x PREP		1.54
		(8.70)
TFPG x CONC x WAGE		9.00
		(6.61)
Fixed Effects		
Year	Y	Y
Occupation	Y	Y
Industry	Y	Y
R-square (%)	4.7	4.6
Observations	173,344	173,344

Sample: 1989-2010. Standard errors clustered by occupation (*= 10%, **= 5%, and ***= 1% level).

Least Mobile Occupations

SOC	Occupation Title	Mobility
119130	Postmasters and Mail Superintendents	0.01
394010	Embalmers	0.01
394020	Funeral Attendants	0.01
534040	Subway and Streetcar Operators	0.02
372020	Building Cleaning Workers, All Other	0.03
537110	Mine Shuttle Car Operators	0.04
292020	Dental Hygienists	0.06
519140	Semiconductor Processors	0.06
474020	Elevator Installers and Repairers	0.08
475060	Roof Bolters, Mining	0.08
291010	Chiropractors	0.09
534020	Railroad Brake, Signal, and Switch Operators	0.09
413040	Travel Agents	0.09
331020	First-Line Supervisors of Fire Fighting and Prevention Workers	0.12
474060	Rail-Track Laying and Maintenance Equipment Operators	0.12

Most Mobile Occupations

SOC	Occupation Title	Mobility
111020	General and Operations Managers	82.89
435060	Production, Planning, and Expediting Clerks	72.86
112020	Marketing Managers	64.79
511010	First-Line Supervisors of Production and Operating Workers	59.75
433030	Bookkeeping, Accounting, and Auditing Clerks	56.05
499040	Industrial Machinery Mechanics	51.49
436010	Executive Secretaries and Executive Administrative Assistants	51.25
113050	Industrial Production Managers	48.16
173020	Drafters, All Other	45.36
435070	Shipping, Receiving, and Traffic Clerks	45.27
131020	Buyers and Purchasing Agents, Farm Products	45.25
439060	Office Clerks, General	43.66
519060	Inspectors, Testers, Sorters, Samplers, and Weighers	41.25
514030	Cutting, Punching, and Press Machine Operators	40.79
111010	Chief Executives	39.60

Least Mobile Industries

NAICS	Industry Title	Mobility
482100	Rail Transportation	-1.71
812200	Death Care Services	-1.70
561500	Travel Arrangement and Reservation Services	-1.59
238200	Building Equipment Contractors	-1.50
481100	Scheduled Air Transportation	-1.44
481200	Nonscheduled Air Transportation	-1.35
611200	Junior Colleges	-1.31
622100	General Medical and Surgical Hospitals	-1.27
611300	Colleges, Universities, and Professional Schools	-1.26
212100	Coal Mining	-1.24
621600	Home Health Care Services	-1.20
213100	Support Activities for Mining	-1.18
721100	Traveler Accommodation	-1.16
541300	Architectural, Engineering, and Related Services	-1.08
515100	Radio and Television Broadcasting	-1.08

Most Mobile Industries

NAICS	Industry Title	Mobility
315200	Cut and Sew Apparel Manufacturing	2.29
447100	Gasoline Stations	1.99
423500	Metal and Mineral (except Petroleum) Merchant Wholesalers	1.94
425100	Wholesale Electronic Markets and Agents and Brokers	1.77
424600	Chemical and Allied Products Merchant Wholesalers	1.76
532200	Consumer Goods Rental	1.60
312200	Tobacco Manufacturing	1.57
332800	Metal Heat Treating	1.55
325500	Paint, Coating, and Adhesive Manufacturing	1.48
424400	Grocery and Related Product Merchant Wholesalers	1.44
325600	Soap, Cleaning Compound, and Toilet Preparation Manufacturing	1.44
335100	Electric Lighting Equipment Manufacturing	1.44
334300	Audio and Video Equipment Manufacturing	1.43
314100	Textile Furnishings Mills	1.41
423600	Electrical and Electronic Goods Merchant Wholesalers	1.39

Summary Statistics of Firms Sorted on LM

Port.	LM	Log Size	B/M	Lev.	Lab. Int.	Log Emp.	Occ. Prep.	Union	Log Wage*
L	-0.94	5.42	0.57	0.37	3.03	7.25	3.07	0.11	2.92
2	-0.19	5.37	0.54	0.28	3.49	7.18	3.27	0.09	3.10
3	0.23	5.16	0.44	0.23	3.53	6.36	3.37	0.11	3.12
4	0.88	5.09	0.49	0.25	3.66	6.48	3.39	0.08	3.19
H	1.30	5.08	0.50	0.27	3.66	6.65	3.00	0.11	2.96

Time-series averages of median portfolio characteristics.

* BLS wage data at the industry level is only available for the period 1997–2011.

Empirical Implications of the Model

1. Operating leverage (Θ) is increasing in LM (δ)

2a. Expected asset returns ($\mathrm{E}[R]$) are increasing in LM (δ)

2b. Loading on systematic risk (β) is increasing in LM (δ)

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Labor Mobility and Sensitivity of Profits, Wages, and Employment to Industry Shocks

$$\text{MG}_{k,i,t} = \lambda_{0,k,i} + \lambda_{1,k,i}\text{TFPG}_{i,t} + \epsilon_{k,i,t}$$

where:

TFPG : Total Factor Productivity Growth

$\text{MG}_{:,i,t} : \{\Delta\text{Profit}_{i,t}, \Delta\text{Wage}_{i,t}, \Delta\text{Emp}_{i,t}, \Delta\text{Emp}_{i,t+1}\}$

Labor Mobility and Sensitivity of Profits, Wages, and Employment to Industry Shocks

Sample	Industries	Profits_t	Wages_t	Emp_t	Emp_{t+1}
Full Sample	57	2.23***	0.68***	-0.09	0.00
		(0.38)	(0.13)	(0.05)	(0.06)
Low Mobility	28	1.22***	0.94***	-0.10	-0.10
		(0.36)	(0.25)	(0.07)	(0.07)
High Mobility	29	3.21***	0.44***	-0.09	0.09
		(0.64)	(0.08)	(0.08)	(0.10)
H-L (t-test)		2.00***	-0.50*	0.01	0.19*
		(0.73)	(0.26)	(0.10)	(0.10)

Sample: 1990-2010. Robust standard errors (*= 10%, **= 5%, and ***= 1% level).

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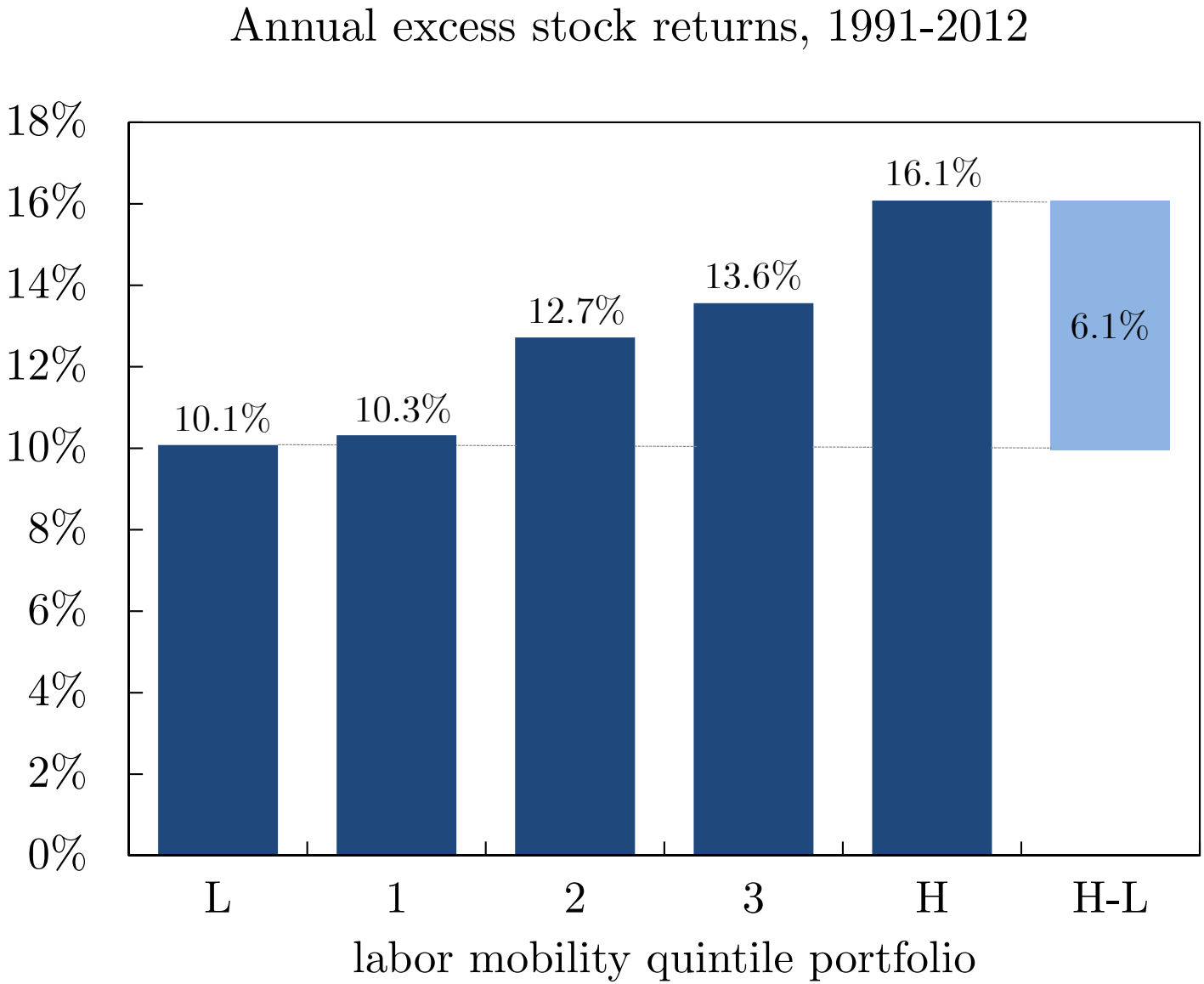
Portfolio Sorts



Portfolio Sorts

Post-ranking monthly returns

Portfolio	Value weighted				Equally weighted			
	Excess		Unlevered		Excess		Unlevered	
	Raw	Adj.	Raw	Adj.	Raw	Adj.	Raw	Adj.
L	0.58	-0.15	0.30	-0.09	0.84	-0.16	0.39	-0.10
2	0.46	-0.23	0.23	-0.15	0.86	-0.10	0.39	-0.06
3	0.65	-0.03	0.46	0.00	1.06	0.12	0.65	0.16
4	0.65	-0.06	0.37	-0.04	1.13	0.15	0.67	0.15
H	1.12	0.38	0.81	0.34	1.34	0.29	0.80	0.25
H-L	0.54**	0.53***	0.50***	0.42***	0.50**	0.46**	0.41**	0.35**
	(0.22)	(0.18)	(0.17)	(0.13)	(0.25)	(0.19)	(0.20)	(0.14)

Adj.= Methodology from Daniel, Grinblatt, Titman, and Wermers (1997).
Sample: 1991-2012. Newey-West standard errors (*= 10%, **= 5%, and ***= 1% level).

Labor Mobility and Stock Returns

Dependent variable: ex-post annual excess stock returns.

	I	II
Mobility$_{t-1}$	2.52***	2.64***
	(0.34)	(0.30)
Log Size$_{t-1}$	-0.41**	
	(0.18)	
Log B/M$_{t-1}$	4.28***	
	(0.52)	
Lag Ret.$_{t-1}$	-0.03***	
	(0.00)	
MKT Beta$_{t-1}$	2.30**	
	(1.12)	
Lab.Int.$_{t-1}$	-0.53**	
	(0.22)	
Leverage$_{t-1}$	0.19	
	(1.85)	
Year Eff.	Y	Y
R-sq. (%)	6.67	4.75
Obs.	41,833	63,798

Sample: 1991-2011. Standard errors clustered by firm (*= 10%, **= 5%, and ***= 1% level).

Labor Mobility and Implied Cost of Capital

Dependent variable: measures of implied cost of capital (ICC)

GLS: ICC measure from Gebhardt, Lee, and Swaminathan (2002)

HVDZ: ICC measure from Hou, Dijk, and Zhang (2012)

Dep. Var.	GLS		HVDZ	
	I	II	I	II
Mobility_{t-1}	0.16***	0.08*	0.18***	0.18***
	-0.04	-0.05	-0.05	-0.07
Log Size_{t-1}	-0.22***		-0.85***	
	-0.02		-0.04	
Log B/M_{t-1}	0.79***		1.40***	
	-0.08		-0.09	
MKT Beta_{t-1}	0.45***		-1.10***	
	-0.1		-0.13	
Leverage_{t-1}	3.43***		1.54***	
	-0.22		-0.29	
Year Eff.	Y	Y	Y	Y
R-sq. (%)	9.7	1.0	19.2	3.7
Obs.	26,404	26,404	30,002	30,002

Sample: 1991-2010. Standard errors clustered by firm (*= 10%, **= 5%, and ***= 1% level).

Empirical Implications of the Model

1. Operating leverage (Θ) is increasing in LM (δ)

2a. Expected asset returns ($\mathrm{E}[R]$) are increasing in LM (δ)

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Labor Mobility and CAPM Tests

Value Weighted Stock Returns

	L	2	3	4	H	H-L
$E[R] - r_f$(%)	0.58*	0.46	0.65**	0.65*	1.12***	0.54**
	(0.35)	(0.40)	(0.28)	(0.34)	(0.31)	(0.22)
			Unconditional CAPM			
Alpha (%)	-0.06	-0.24	0.20	0.05	0.57***	0.63***
	(0.16)	(0.19)	(0.15)	(0.14)	(0.15)	(0.23)
MKT Beta	1.12***	1.24***	0.80***	1.06***	0.96***	-0.16
	(0.05)	(0.06)	(0.04)	(0.04)	(0.04)	(0.07)
R-sq. (%)	77.0	77.4	74.4	79.9	78.1	2.5
			Conditional CAPM			
Avg. Alpha (%)	-0.02	-0.06	0.20*	-0.04	0.32*	0.34
	(0.13)	(0.10)	(0.11)	(0.13)	(0.16)	(0.22)
Avg. MKT Beta	1.03***	1.12***	0.81***	1.16***	1.07***	0.04
	(0.07)	(0.08)	(0.06)	(0.07)	(0.07)	(0.11)
Avg. R-sq. (%)	81.2	87	76.2	83.1	83.3	24.7

Conditional CAPM estimated as in Lewellen and Nagel (2006). Sample: 1991-2012. Newey-West standard errors (*= 10%, **= 5%, and ***= 1% level).

Labor Mobility and CAPM Tests

Equally Weighted Stock Returns

	L	2	3	4	H	H-L
			Excess Returns			
$E[R] - r_f$(%)	0.84**	0.86*	1.06**	1.13**	1.34***	0.50**
	(0.40)	(0.48)	(0.44)	(0.44)	(0.47)	(0.25)
			Unconditional CAPM			
Alpha (%)	0.12	-0.01	0.30	0.34	0.54**	0.42*
	(0.20)	(0.27)	(0.23)	(0.22)	(0.25)	(0.22)
MKT Beta	1.29***	1.55***	1.35***	1.41***	1.43***	0.13*
	(0.06)	(0.08)	(0.07)	(0.06)	(0.07)	(0.06)
R-sq. (%)	70.5	67.2	67.6	70.8	66.7	3.1
			Conditional CAPM			
Avg. Alpha (%)	0.07	0.15	0.00	0.21	0.22	0.15
	(0.27)	(0.30)	(0.42)	(0.32)	(0.35)	(0.28)
Avg. MKT Beta	1.35***	1.58***	1.67***	1.63***	1.68***	0.32*
	(0.08)	(0.14)	(0.15)	(0.13)	(0.13)	(0.17)
Avg. R-sq. (%)	72.3	74.8	75.5	74.8	76.5	31.1

Conditional CAPM estimated as in Lewellen and Nagel (2006). Sample: 1991-2012. Newey-West standard errors (*= 10%, **= 5%, and ***= 1% level).

Conclusion

- This work corroborates the intuition that the most important factor of production–labor–should have a first order effect on firm risk.

- Empirical findings suggest economic significance of labor mobility as an industry characteristic that explains the cross-section of asset returns.

- More work is needed to improve our understanding of the dynamic relation between labor and capital.