Human Capital in the U.S. Financial Industry: 1909-2006

Thomas Philippon and Ariell Reshef

Toulouse, April 9, 2010

Motivation: studying the financial sector

1. Recent financial crisis.

2. Finance and development
   - Bagehot (1873), Schumpeter (1912), Gurley and Shaw (1955), Goldsmith (1969), McKinnon (1973), Miller (1988)... Levine (2005).

Ignoring finance can substantially limit our understanding of economic activity and growth.

3. Over 1970-2005 finance contributed to increase in inequality:
   - 10-15% to *wage* inequality (90/10, 97/10, Theil, Gini)
   - 8% to *residual* inequality (90-10, 97-10, Variance)

Output/production approach

Hard to measure output of financial services. So people look at:

1. Financial innovation
   - Silber (1983), Miller (1986), Tufano (1989), Merton (1992), Frame and White (2004), Lerner (2006).

Very few studies relative to manufacturing, health: we don't know much.

2. Financial deepening
   - Broad measures of assets, borrowing, lending over GDP.
   - Many insights: rule of law, contract enforcement, etc.

Little information on how finance obtains financial deepening: organization, costs, efficiency, productivity, **inputs**...

Our approach: the input approach

We study the most important input in finance: **human capital**.

- What determines allocation of human capital/talent to finance?
- Why have wages in finance increased so much?

Understanding these may tell us something about the role of finance, internal changes within, needs of the non financial sector.

Allocation of talent and growth

- Baumol (1990), Murphy, Shleifer and Vishny (1991).

Institutions (read: regulation), private returns and increasing returns to ability are more important than overall supply of talent.

Allocation of talent to finance

Finance employs many highly skilled and highly paid individuals.

Oyer (2008): Stanford (GSB) MBAs, 1960-1995

- Higher stock returns $\Rightarrow$ more entry into investment banking.
- Lifetime income difference: 216% ("only" 64% v. consulting).

Goldin and Katz (2008): Harvard undergraduates

- C1970: 5%. C1990: 15%.
- Earning premium: 200% controlling for background, SATs, GPAs, major, etc.

Allocation of talent to finance

Finance employs many highly skilled and highly paid individuals.

Oyer (2008): Stanford (GSB) MBAs, 1960-1995

- Higher stock returns $\Rightarrow$ more entry into investment banking.
- Lifetime income difference: 216% ("only" 64% v. consulting).

Goldin and Katz (2008): Harvard undergraduates

- C1970: 5%. C1990: 15%.
- Earning premium: 200% controlling for background, SATs, GPAs, major, etc.
- Well, at least until very recently...

What we do

First we go historic (if not epic): 1909-2006

1. Characterize allocations and wages in finance
   - Education, occupations and complexity, activities.
2. What determines allocations and wages?

Then we ask: Are there excess wages in finance?

1. Historic excess wage 1909-2006.
2. Micro data: CEOs in finance 1935-2005 (engineers v. financiers).
3. Micro data: wage regressions 1967-2005 (CPS).

We find excess wages in 1920s-30s, 1986-2005. Why?

- An increase in moral hazard?

Preview of results

1. New stylized facts: **U-shape**
   - Finance was relatively skill intensive, highly paid and complex until 1930s and from 1980, but **not** in the interim period.
   - Finance in 2005 looked a lot like in 1929.

Preview of results

1. New stylized facts: **U-shape**
   - Finance was relatively skill intensive, highly paid and complex until 1930s and from 1980, but **not** in the interim period.
   - Finance in 2005 looked a lot like in 1929.

2. **Financial regulation** is the most important determinant for 1.
   - Regulation (read: many rules) lower demand for skill.
   - De-regulation increases demand for skill, creativity.
   - *Less important*: corporate activity, technology.

Preview of results

1. New stylized facts: **U-shape**
   - Finance was relatively skill intensive, highly paid and complex until 1930s and from 1980, but **not** in the interim period.
   - Finance in 2005 looked a lot like in 1929.

2. **Financial regulation** is the most important determinant for 1.
   - Regulation (read: many rules) lower demand for skill.
   - De-regulation increases demand for skill, creativity.
   - *Less important*: corporate activity, technology.

3. We find **excess wages** in 1920s-30s, 1986-2005.
   - This correlates with de-regulated periods.

Preview of results

1. New stylized facts: **U-shape**
   - Finance was relatively skill intensive, highly paid and complex until 1930s and from 1980, but **not** in the interim period.
   - Finance in 2005 looked a lot like in 1929.

2. **Financial regulation** is the most important determinant for 1.
   - Regulation (read: many rules) lower demand for skill.
   - De-regulation increases demand for skill, creativity.
   - *Less important*: corporate activity, technology.

3. We find **excess wages** in 1920s-30s, 1986-2005.
   - This correlates with de-regulated periods.

4. Evidence for an **increase in moral hazard** post 1980.
   - This can help explain excess wages.

The main idea

Dergulation $\Rightarrow$

more competition, more innovation, more scope for complexity $\Rightarrow$

higher demand for skilled workers

and

harder to monitor, increase in moreal hazard

$\Rightarrow$ higher wages, excess wages

New Stylized Fact: U-Shape in 1909-2006

Data on education, occupations and wages

- U.S. Censuses, 1910-2000
- March CPS, 1967-2008
- Martin (1939) NBER volume
- Kuznets (1941)
- Goldin and Katz (2008) book
- BEA industrial tables, 1929-2005
- Dictionary of occupational titles
- Frydman and Saks (2007) CEO compensation 1936-2005

Other series:

- IPOs: Jovanovic and Rousseau (2005)
- Credit risk: Moody's
- Patents: Lerner (2006), Historical Statistics of the U.S.
- Bank regulation: Legislation, Black and Strahan (2001)
- IT capital: BEA fixed assets tables
- Misc.: Historical Statistics of the United States

Definitions

- **Financial sector**: Credit intermediation, insurance, "other finance". No real estate.

- **Relative skill intensity**:

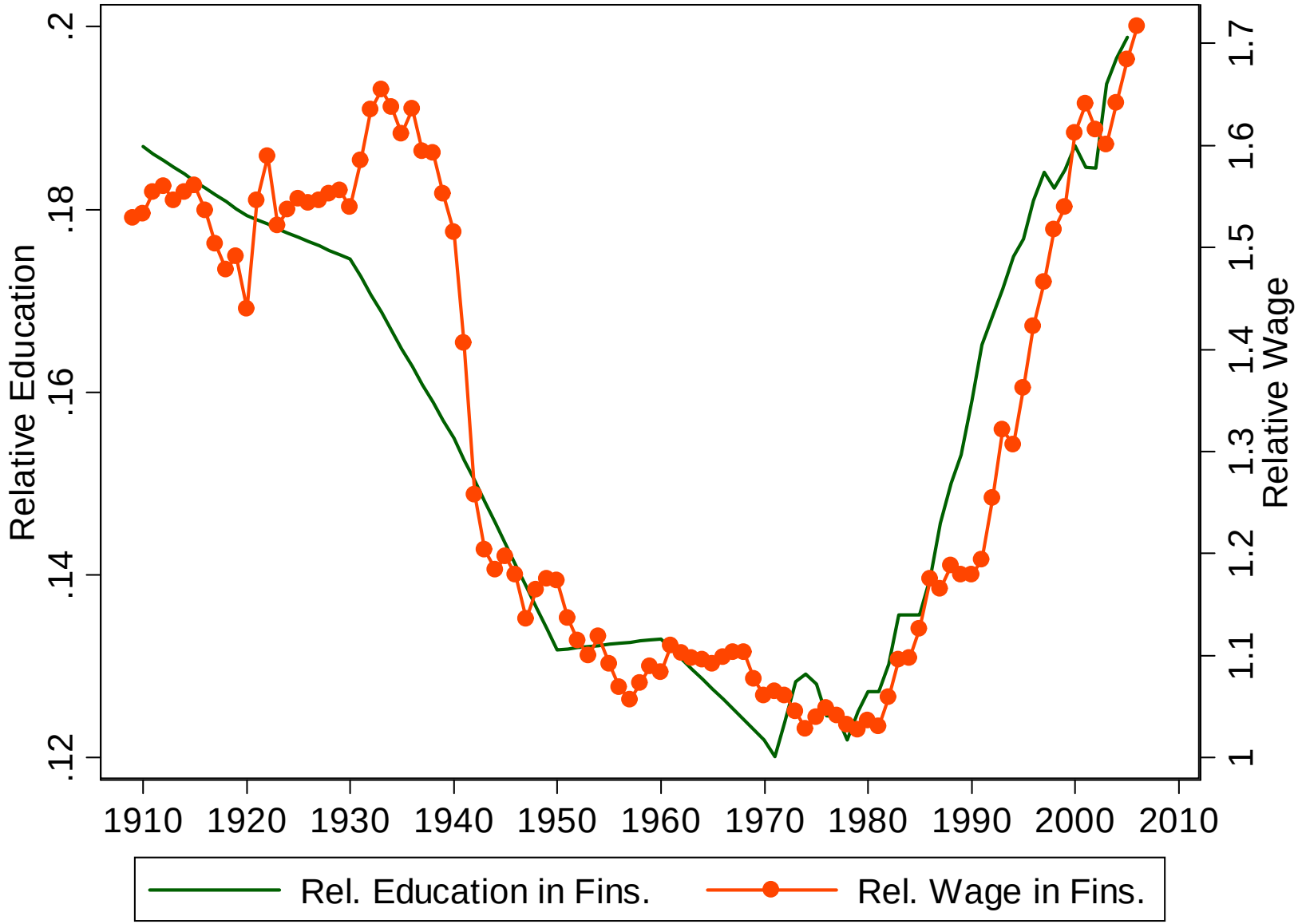
$$\rho_{fin,t} \equiv \frac{more\ than\ HS_{fin,t}}{emp_{fin,t}} - \frac{more\ than\ HS_{nonfarm,t}}{emp_{nonfarm,t}} .$$

- **Relative wages**:

$$\omega_{fin,t} \equiv \frac{average\ wage_{fin,t}}{average\ wage_{nonfarm,t}} .$$

All variables are calculated for full time equivalents, when possible.

Relative education and relative wages: U-shape



Complexity

We rely on the Dictionary of Occupational Titles.

Each occupation is characterized by **complex tasks**,

- *Math Aptitude*: analytical thinking.
- *Direction, Control and Planning*: communication and decision making.

...and **non-complex**, routine tasks

- *Finger Dexterity*: routine manual.
- *Set Limits, Tolerances and Standards*: routine cognitive.

DOT: **ordinal ranking** of intensity of each task $\in [0, 10]$.

Complexity: 1910-2007

For each type of *task*:

1. Average intensity by sector and year

$$task_{s,t} = \frac{\sum_{i \in s} task_{\mathbf{i}} \ \lambda_{i,t} \ hrs_{i,t}}{\sum_{i \in s} \lambda_{i,t} \ hrs_{i,t}} \ ,$$

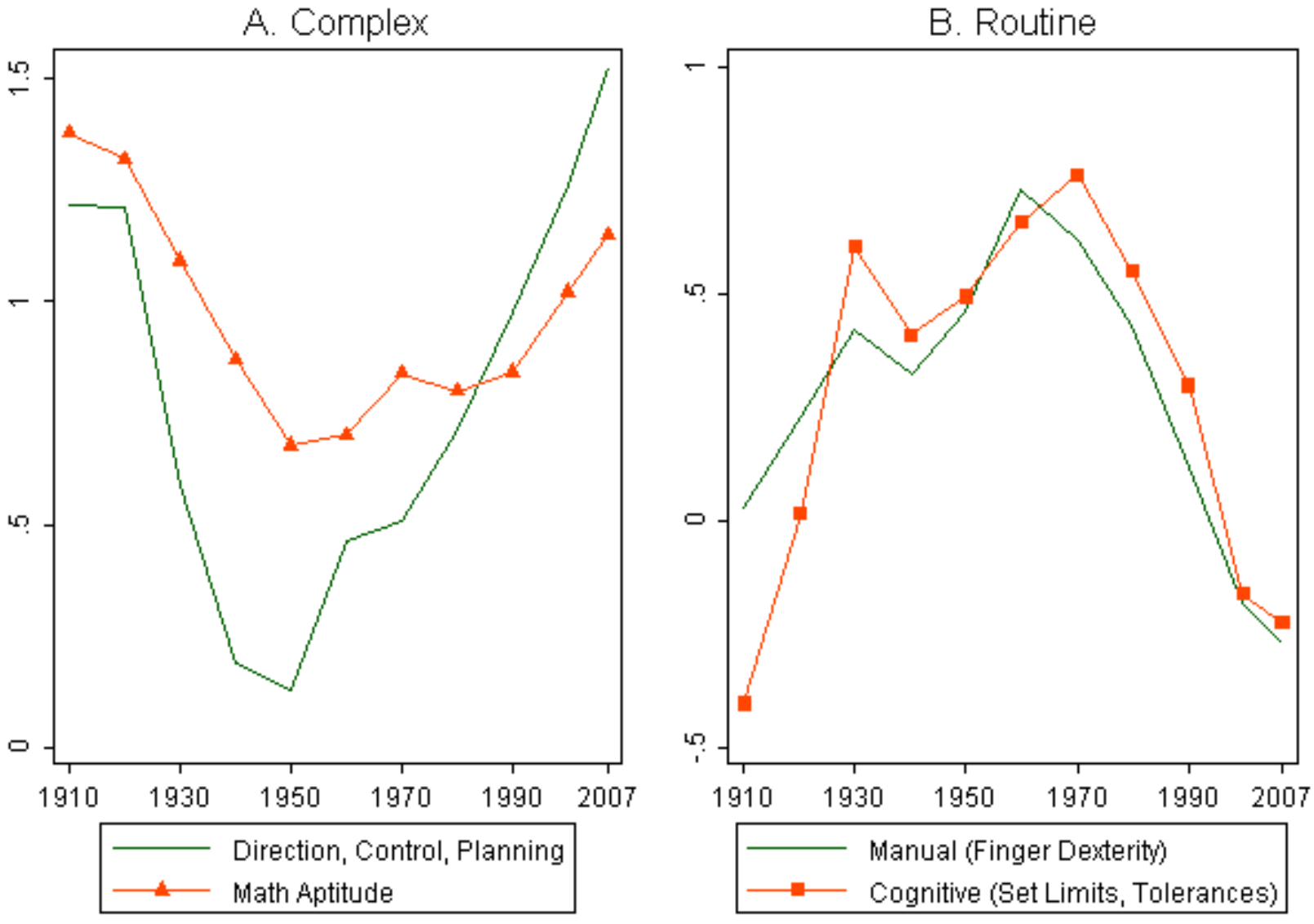
2. Relative task intensity for finance

$$rel\_task_{fin,t} \equiv task_{fin,t} - task_{nonfarm,t} \ .$$

Assumption:
Ranking of occupations' characteristics stable over time ($task_{\mathbf{i}}$).

- Not so bad: focus on **relative** complexity; ordinal ranking.

Relative complexity: U-shape



Determinants of U-Shape

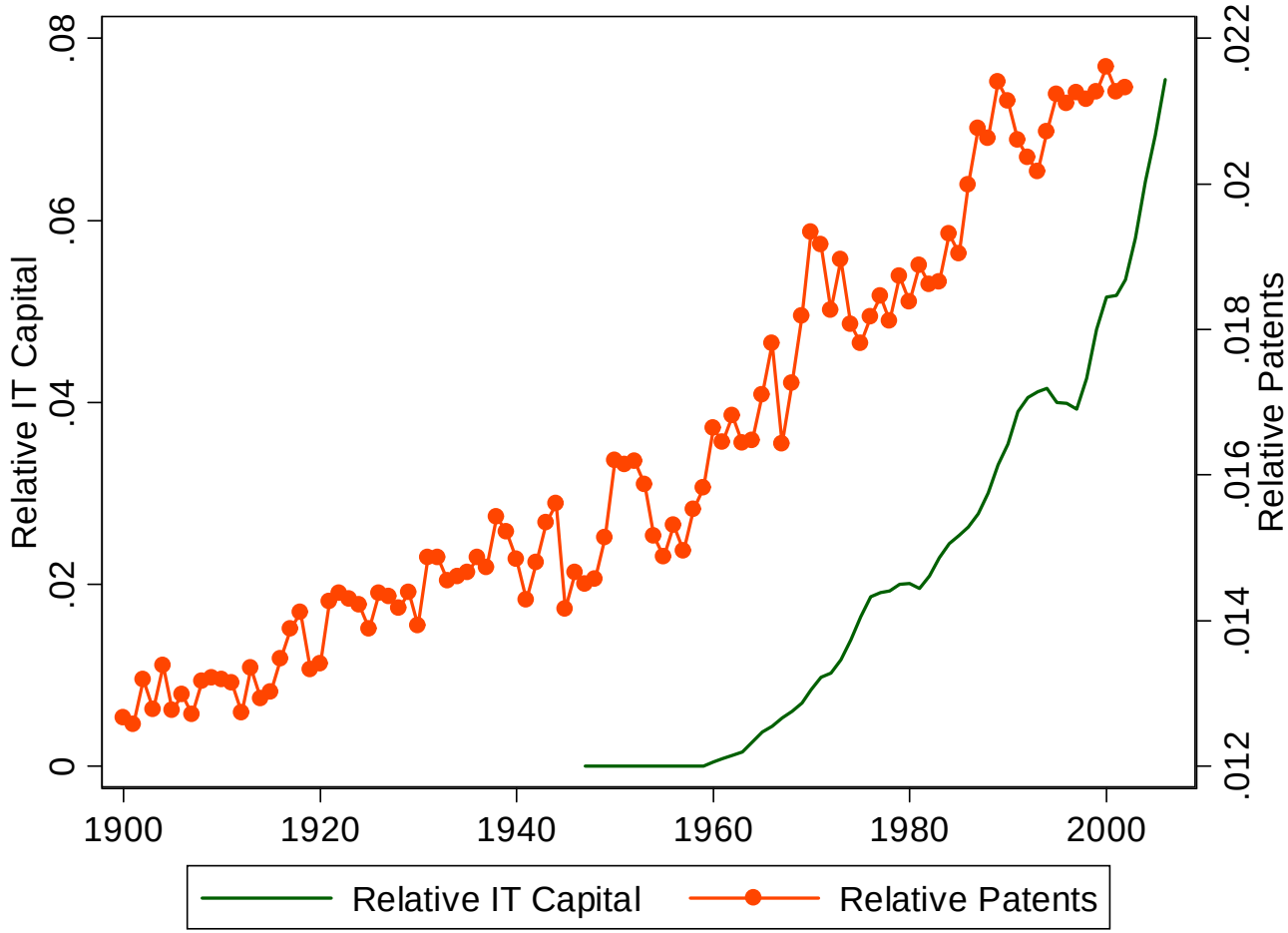
What determines relative demand in finance?

1. Technology:
   - Relative use of patents 1909-2005.
   - Relative IT intensity 1960-2005 (in 3 subsectors).

2. Corporate finance activity:
   - IPO intensity.
   - Default risks.

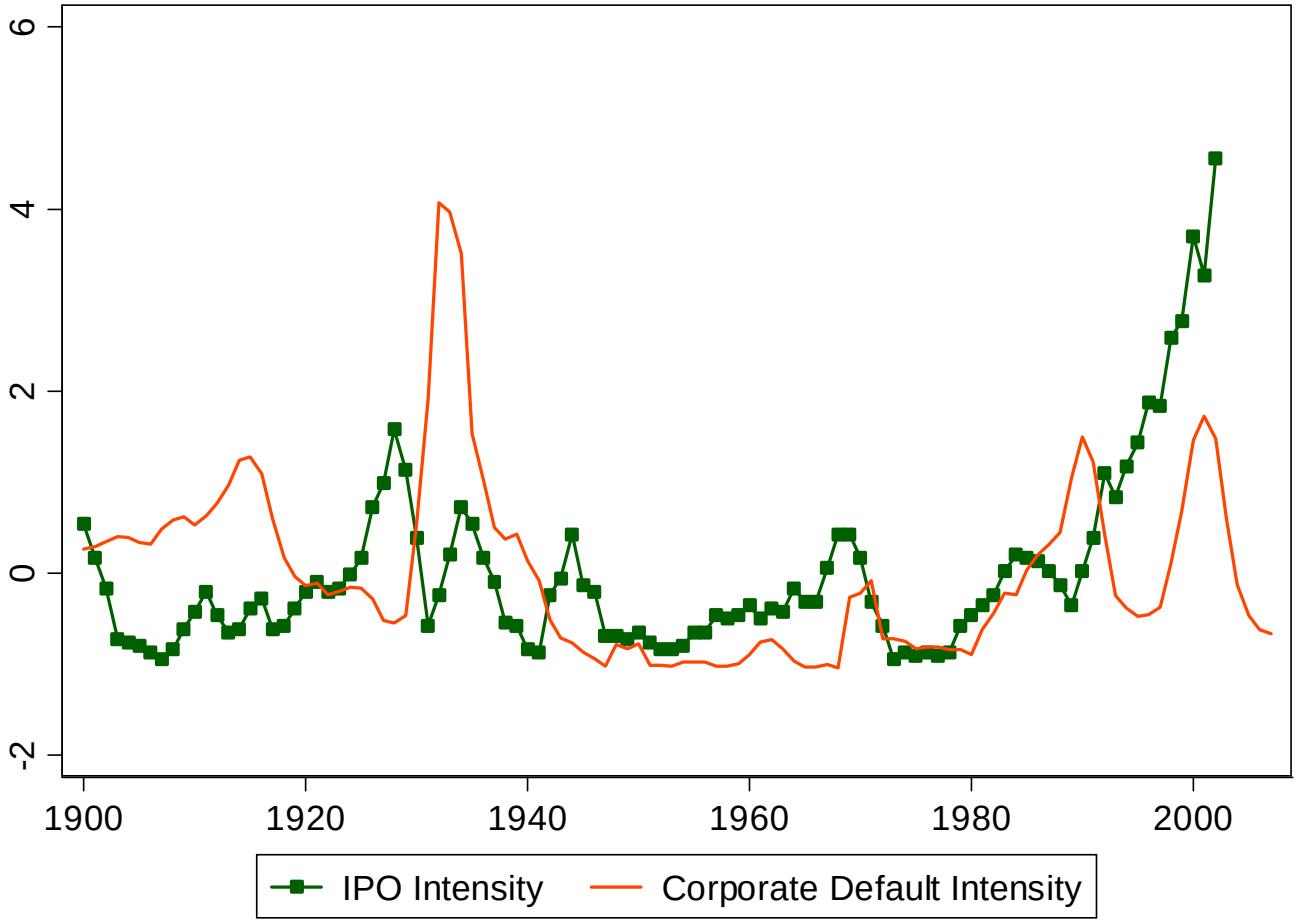
3. Regulation.

Relative use of IT and patents in finance



IT cannot explain early sample. Patents: not necessarily financial.

IPOs and credit risk (normalized)



Sources: Jovanovic and Rousseau, Moody's.

Financial deregulation index

1. **Bank branching restrictions**. Percent of U.S. population in deregulated states; $[0, 1]$.

2. Separation of commercial and investment banks. **Glass-Steagall** Act legislated in 1933 and gradually weakened starting in 1987 until final repeal in 1999; $[0, 1]$.

3. **Interest rate ceilings**. Legislation introduced in 1933 and removed gradually between 1980 and 1984; $[0, 1]$.

4. **Separation of banks from insurance companies**. Legislation introduced in 1956 and repealed in 1999; $[0, 1]$.

Index is given by $(1) - (2) - (3) - (4)$; $[-3, 1]$.

Financial deregulation index

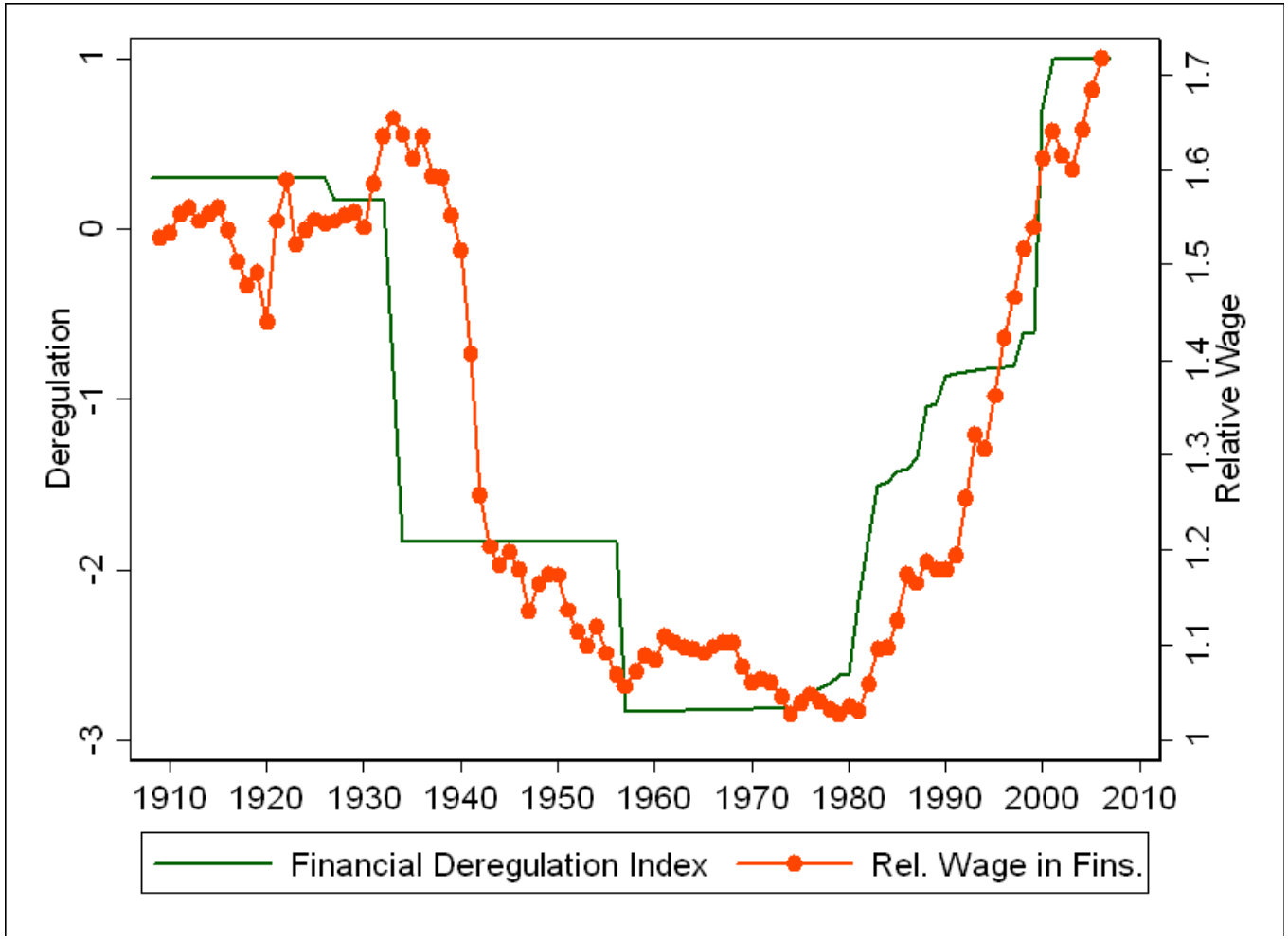


Table 3: Education and Wages in Historical Perspective

	(1)	(2)	(3)	(4)	(5)	(6)
	Relative Education			Relative Wage		
Deregulation Index (t-5)	0.0215***	0.0194***	0.0177***	0.183***	0.174***	0.113***
	(0.00174)	(0.00228)	(0.00235)	(0.0140)	(0.0152)	(0.0189)
Financial Patents over Total Patents (t-5)		4.713**	4.204*		21.02	19.30
		(2.119)	(2.370)		(17.11)	(17.75)
IPO share of market capitalization (t-5)			0.00235			0.0896***
			(0.00168)			(0.0183)
Default rate (all american corporates) (t-5)			0.00168			0.0327**
			(0.00128)			(0.0154)
Time trend	0.000303***	-0.000177	-0.000180	0.00109	-0.00100	-0.00309
	(0.000073)	(0.000243)	(0.000268)	(0.000879)	(0.00182)	(0.00193)
Sample	1910-2005	1910-2005	1910-2005	1909-2006	1909-2006	1909-2006
Observations	96	96	96	98	98	98
R-squared	0.893	0.906	0.914	0.832	0.835	0.914

Notes. Newey-West Standard errors with 10 lags of autocorrelation in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Financial deregulation explains most of the variation (beta coef.)

Time series regressions: issues

1. Causality
   - Crisis in 1930s $\Rightarrow$ Regulation.
   - Crisis in 1970s and 1980s $\Rightarrow$ **De**-regulation.
   - GPTs $\Rightarrow$ IPOs: exogenous to finance.

2. Overall historic skill premium cannot explain U-shape:
   - Finance is relatively skill intensive.
   - Finance shed skilled jobs when they become cheaper and hired skilled workers when they became expensive.

3. Other determinants that "loose the race" to deregulation:
   - International trade, financial globalization.
   - Bargaining power: labor share in finance is remarkably stable.

Panel regressions: subsectors, 1950-2005

Table 4: Education and Wages in a Panel of Financial Sub-sectors

	(1)	(2)
VARIABLES	Relative Education	Relative Wage
Deregulation Index (t-5)	0.0206***	0.267***
	(0.00280)	(0.0991)
Share of IT in Capital Stock of Subsector (t-5)	0.252***	1.522
	(0.0388)	(1.374)
Subsector fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Sample	1951-2005	1951-2006
Observations	165	168
R-squared	0.792	0.476
Number of sectors	3	3

Notes: Standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Financial subsectors: Credit Intermediation, Insurance and Other Finance.

Deregulation explains 50% more than technology (IT) (beta coef.)

Are There Excess Wages in Finance?

Are there excess wages in finance?

Cannot answer whether financiers are *overpaid*.

- Impossible to measure the discrepancy between social returns and private returns to working in finance.

Instead, we ask: are wages in finance in excess?

- Individuals with same characteristics but different wages.

We do find excess wages

1. 1920s-30s, post 1990: historical data, controlling for composition and employment risk.
2. Post 1990: comparing CEOs (financiers v. engineers).
3. 1986-2005: wage regressions using CPS.

All indicate similar timing: the period of deregulation.

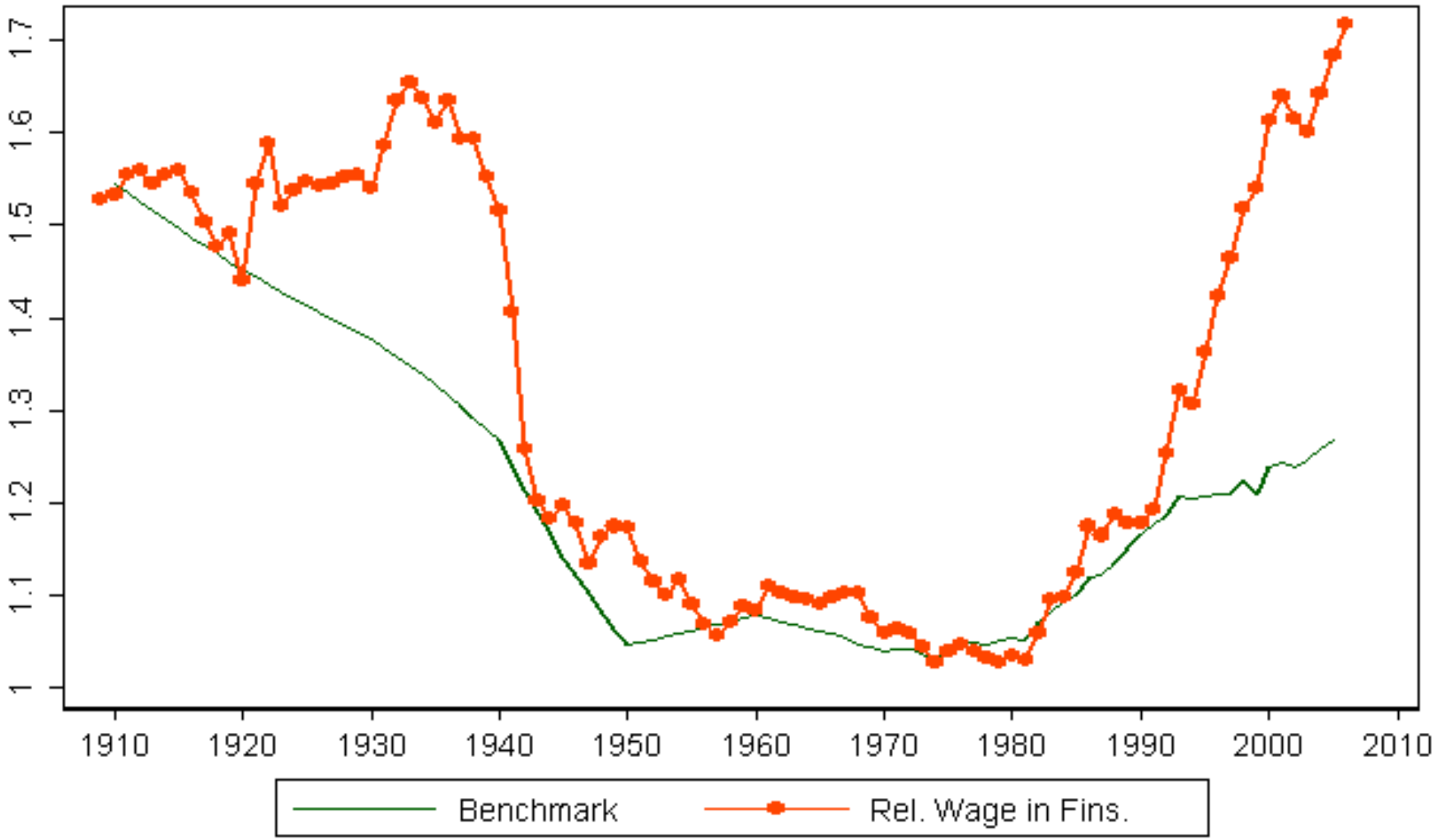
Construction of benchmark wage

Estimate relative wage in finance with no rents and/or unobserved heterogeneity:

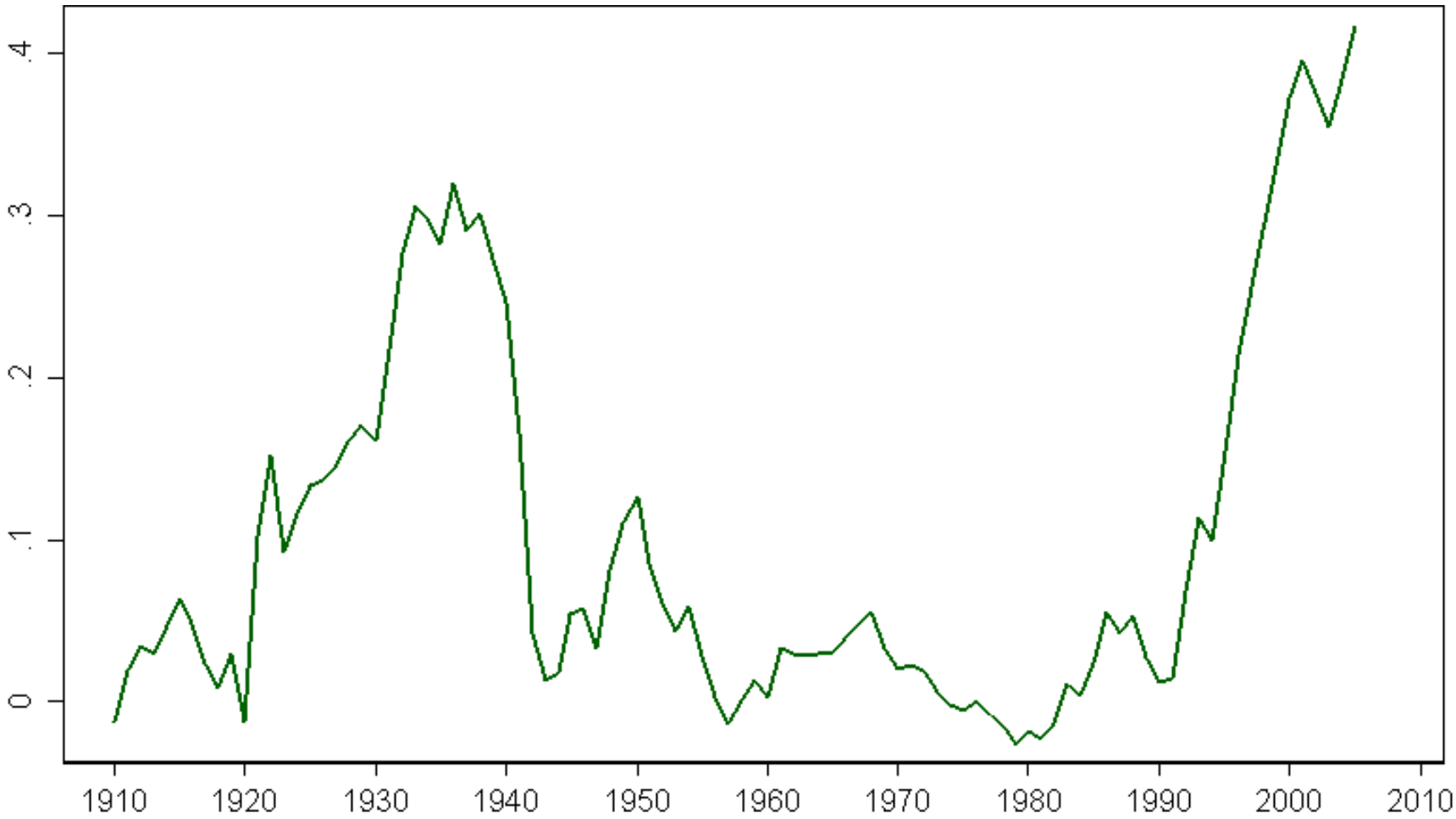
$$\widehat{\omega}_{fin} = \rho_{fin} \cdot (1 + \pi) + \theta$$

- θ risk premium due to unemployment risk.
  (income fluctuations model, see Philippon and Reshef 2007).
- ρ_{fin} relative education.
- π education wage premium from Goldin-Katz.

Benchmark wage



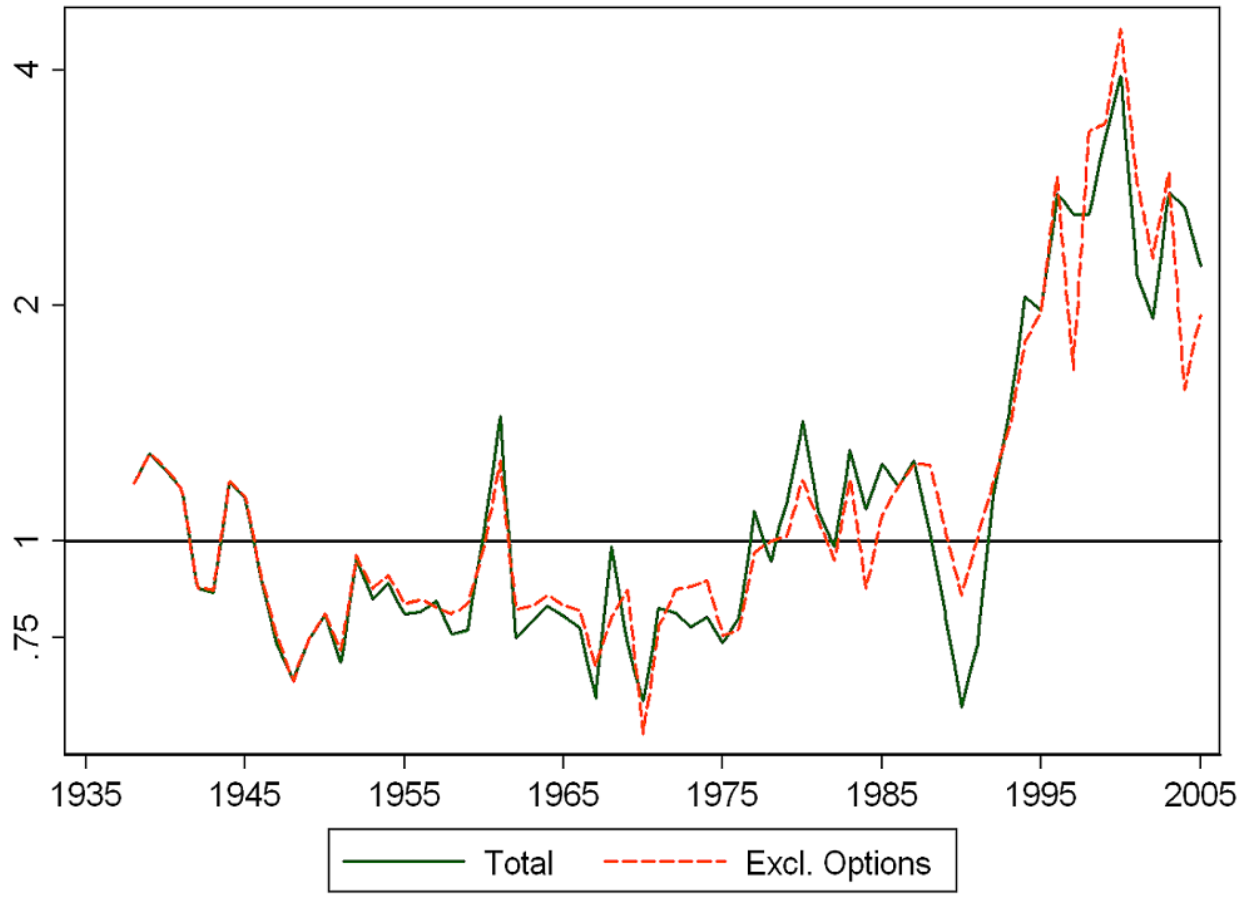
Excess wage = actual wage - benchmark



Unobserved heterogeneity? Rents?

CEOs in finance v. nonfarm private sector (log scale)

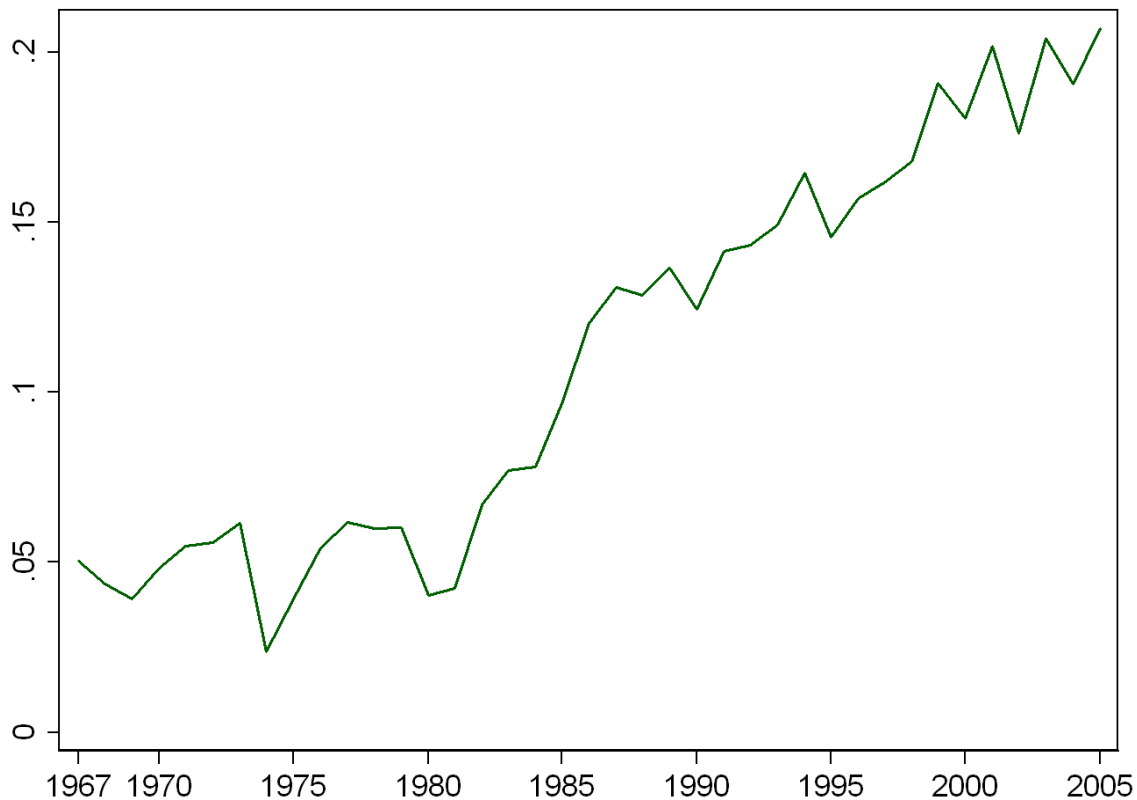
Sample of 50 largest firms, of which 7 in finance.



Data: Frydman and Saks (2007).

Finance dummy in 1967-2005

Fit $\log(w_i) = \alpha + \boldsymbol{\phi}_{ols} 1_i^{\boldsymbol{\phi}} + X_i'\beta + u_i$ and plot $\boldsymbol{\phi}_{ols}$ in every year:



Data: CPS. Issues: top coding.

Controlling for unobserved heterogeneity

Fit fixed effects regressions in 8 subsamples:

$$\log(w_{it}) = \alpha_{\mathbf{i}} + \boldsymbol{\phi}_{fe} 1_{it}^{\phi} + X_{it}'\beta + \delta_t + u_{it} \tag{1}$$

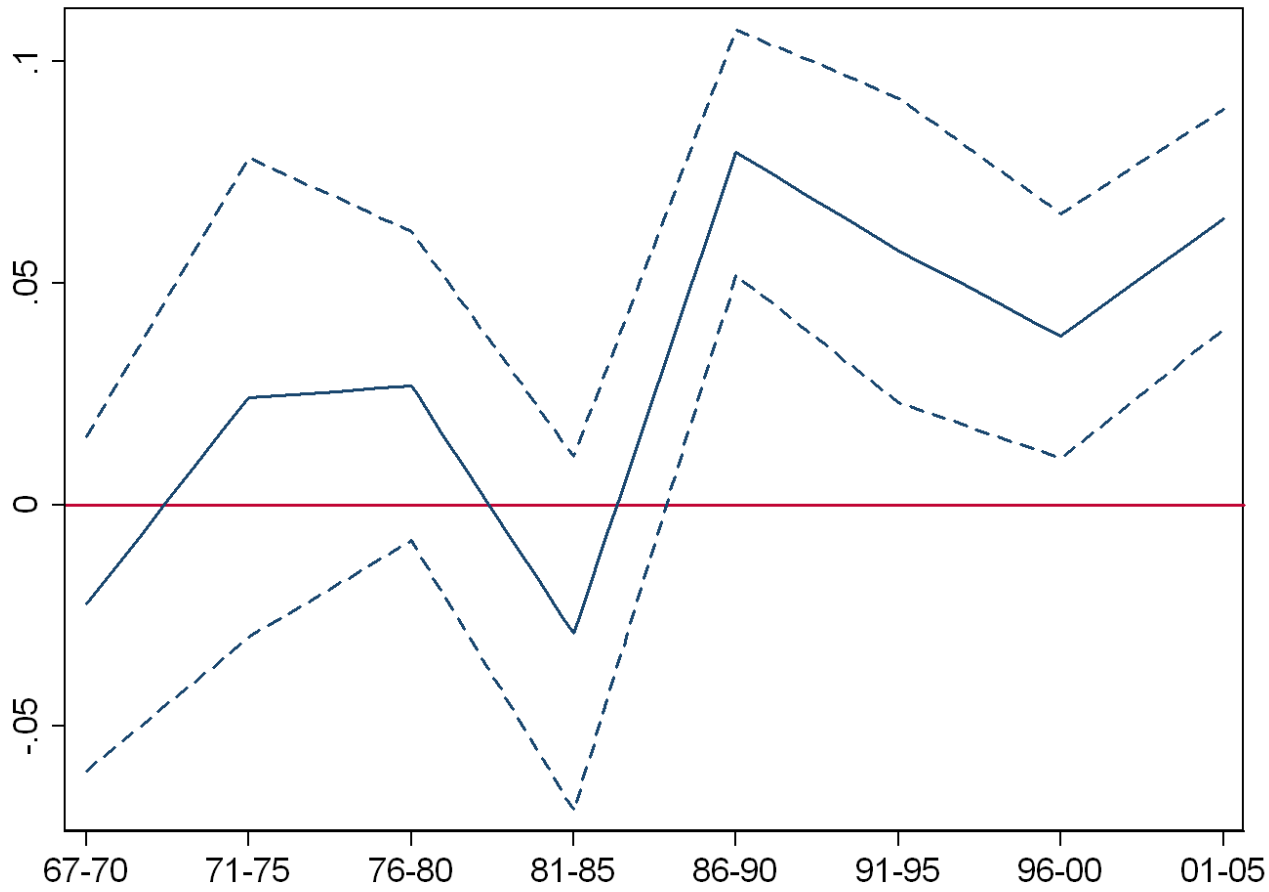
Data: Matched CPS

- Each i is observed only in two consecutive years, therefore α_i absorbs changes in returns to education.
- Issues: top coding, measurement error – work against us.
- Freeman (1984), Krueger and Summers (1988), etc.

Compare ϕ_{fe} from (1) to ϕ_{ols} from (2)

$$\log(w_i) = \alpha + \boldsymbol{\phi}_{ols} 1_i^{\boldsymbol{\phi}} + X_i'\beta + u_i \tag{2}$$

Finance premium: a lower bound



ϕ_{fe}/ϕ_{ols}: 30% to 50% can be explained by factors other than individual ability, education, etc.

- Controlling for m. error increases ϕ_{fe}/ϕ_{ols} to almost 70%.

Why wage differential? Increase in moral hazard?

1. Theoretically, can show (dynamic contracts): an increase in moral hazard will

   - defer monetary payments farther into the future, and
   - increase those payments.

Intuition: sensitivity to hidden actions gives incentives to pay later.

2. Why might moral hazard increase?

   - Increase in complexity.
   - Change in industry organization: partnerships to publicly traded (investment banks) and increase in firm size.

All make monitoring harder.

3. Empirically, this will be reflected in a relative increase in experience gradient in finance and in "duration".

Increase in experience gradient

$$\begin{aligned}\log(w_{it}) &= \alpha_0 + \alpha_1 1_{it}^{\phi} + \alpha_2 1_{it}^{\tau} + \alpha_3 \left(1_{it}^{\phi} \cdot 1_{it}^{\tau}\right) + X_{it}'\beta_0 + \left(1_{it}^{\tau} \cdot X_{it}'\right)\beta_1 \\ &\quad + \gamma_0 x_{it} + \gamma_1 \left(1_{it}^{\phi} \cdot x_{it}\right) + \gamma_2 \left(1_{it}^{\tau} \cdot x_{it}\right) + \boldsymbol{\gamma_3} \left(1_{it}^{\phi} \cdot 1_{it}^{\tau} \cdot x_{it}\right) \\ &\quad + \delta_t + u_{it} \ .\end{aligned}$$

Compare men and male college graduates with experience$\leq$5 years:

- 1990-2005 v. 1970s: men $\widehat{\gamma}_3 = 3.1\%$, college $\widehat{\gamma}_3 \approx 5\%$.

For non-finance workers $\widehat{\gamma}_0 + \widehat{\gamma}_2 \approx 6.5\%$, so $\widehat{\gamma}_3$ is big.

Duration $D = \sum_t t \frac{w(t)/R(t)}{W_{NPV}}$: increased from 9 to 11 in finance, but hardly changes (9) for rest of private sector.

Conclusions

1. New stylized fact: relative education, wages and complexity in finance exhibit a **U-shape** from 1909 to 2005.

2. **Financial regulation** is the most important determinant for 1.

3. **Excess wages** in 1920s-30s, post 1986.

This can help explain regulatory failure in 1920s and early 2000s.

4. **Increase in moral hazard** post 1980 may help explaining 3.

The main idea

Dergulation $\Rightarrow$

more competition, more innovation, more scope for complexity $\Rightarrow$

higher demand for skilled workers

and

harder to monitor, increase in moreal hazard

$\Rightarrow$ higher wages, excess wages

Future research

- Does the increase in skilled labor in the financial sector lead to more innovations in this sector?
  - How do financial innovations affect the rest of the economy?
- Construct true measure of financial productivity.
- Do other countries exhibit similar trends? Globalization?
  - Israeli experience with financial deregulation: 1986 and on.
- Welfare consequences of the shift in the allocation of talent.