Occupational Mobility and Wage Inequality

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Overview

This paper aims at providing a theory that in a coherent way can explain the following changes from the end of the 1960's to early 1990's

- The increase in wage inequality
- The increase in wage instability
- The increase in occupational mobility

KM argue that their theory is complementary to explanations for inequality across groups (say SBTC) while it substantiates the notion of an increase in turbulence.

Facts on changes in wages and occupational mobility

Table 1: Changes in the U.S. Labor Market.

	1969-72	1990-93	Change
Gini Coefficient	0.264	0.330	25.0%
Variance of permanent log wages, $var(\pi_i)$	0.178	0.230	29.2%
Average variance of transitory log wages, average $var(\eta_i)$	0.110	0.172	56.4%
Occupational mobility	0.155	0.188	21.3%

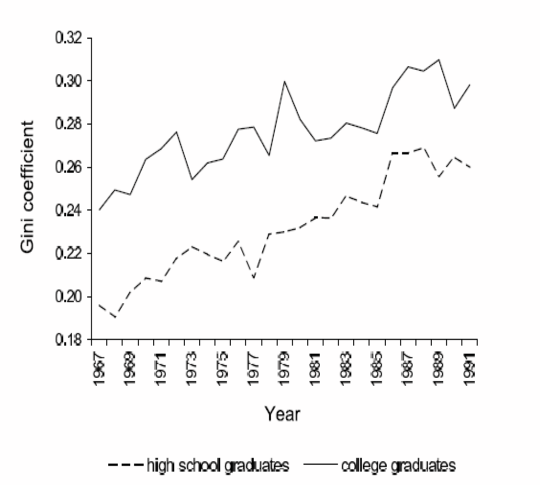
In a companion paper KM argue strongly in favor of the view that human capital is occupation specific

Table 2: Occupational Specificity of Human Capital.

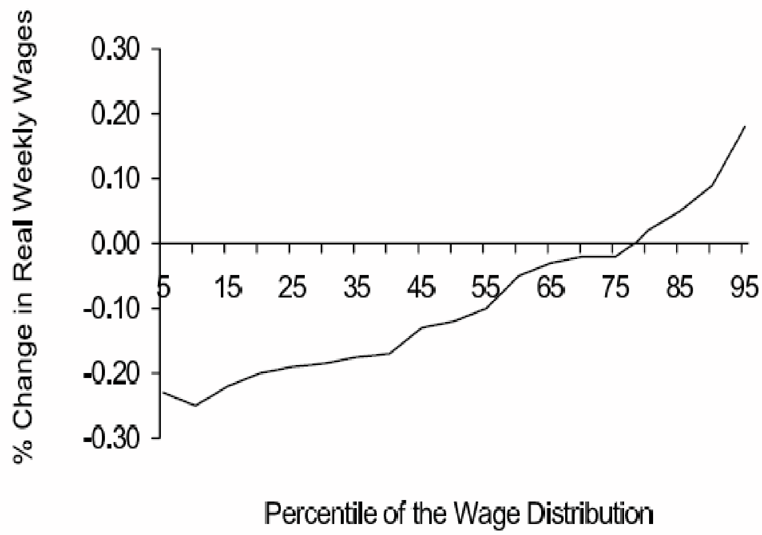
	Returns to Experience		
	2 years	5 years	10 years
Occupation	.0535	.1188	.1900
	(.0068)	(.0154)	(.0258)
Industry	-.0030	-.0086	-.0207
	(.0071)	(.0149)	(.0226)
Employer	.0012	.0027	.0079
	(.0096)	(.0136)	(.0212)

Wage inequality increased also within educational groups

Figure 1: The Gini Coefficient of Hourly Wages for High-School Graduates and College Graduates in the United States, 1967-1991.



The wage distribution has been stretched at both ends



The experiment

- KM write down a Lucas Prescott (1974) island model where each island represents an occupation.
- Each island is exposed to idiosyncratic productivity risk. KM solve for two stationary equilibria that represent 1969-1972 and 1990-1993. Most parameters are constant across the equilibria. However, KM solve for the parameters of the AR(1) process for occupation specific productivity to match statistics on occupational mobility in each time period.
- At no point in the calibration are KM directly matching wage inequality or wage instability.
- Are changes in wage inequality and wage instability from one equilibrium to the other coherent with the empirical facts?

An island model

The economy consists of a continuum of occupations of measure one and ex-ante identical individuals of measure one. Each period an inexperienced worker in an occupation becomes experienced with probability p. The measure of inexperienced and experienced agents in an occupation is (g_1, g_2).

Individuals are risk-neutral and maximize

$$E \sum_{t=0}^{\infty} \beta^t (1-\delta)^t c_t$$

There is one good. Output y in an occupation is produced with the production technology

$$y = z \left[a g_1^{\rho} + (1-a) g_2^{\rho} \right]^{\frac{\gamma}{\rho}}$$

Idiosyncratic productivity shocks evolves according to

$$\ln\left(z'\right) = \alpha + \phi \ln\left(z\right) + \varepsilon'$$

where $0 < \phi < 1$ and $\varepsilon' \sim N(0, \sigma_{\varepsilon}^2)$.

Timing and occupation population dynamics

An occupation is defined by a population distribution and a productivity level (ψ, z). Timing:

- Let $\psi = (\psi_1, \psi_2)$ denote the beginning of period distr. of inexperienced and experienced workers
- z is realized
- The measure one of agents undertake a search decision given (ψ, z)
- Denote $g(\psi, z) = (g_1, g_2)$ the measure of workers who decide to stay and work in occupation (ψ, z)
- Let S be the economy-wide measure of workers searching for a new occupation. S and $g(\psi, z)$ determine ψ'
- $\psi' = (\psi'_1, \psi'_2) = \Gamma(g(\psi, z)) = (\delta + (1-\delta)S + (1-p)(1-\delta)g_1, p(1-\delta)g_1 + (1-\delta)g_2)$

Individual value functions

Let V^s denote the value of leaving an occupation and searching for a new one. The value of an inexperienced worker in occupation (ψ, z) who takes $g(\psi, z), S$ and V^s as given is

$$V_1(\psi, z) = \max\left\{ \begin{array}{c} V^s, w_1(\psi, z) + \beta(1-\delta)\cdot \\ \int \left[(1-p)V_1(\psi', z') + pV_2(\psi', z')\right] Q(z, dz') \end{array} \right\}$$

Similarly, the value of an experienced worker in occupation (ψ, z) is

$$V_2(\psi, z) = \max\left\{ \begin{array}{c} V^s, w_2(\psi, z) + \beta(1-\delta)\cdot \\ \int V_2(\psi', z') Q(z, dz') \end{array} \right\}$$

Equilibrium

A stationary equilibrium consists of $\{V_1(\psi,z), V_2(\psi,z), g_1(\psi,z), g_2(\psi,z), \mu(\psi,z), V^s, S\}$ such that

- $V_1(\psi,z)$ and $V_2(\psi,z)$ satisfy the Bellman equations, given $V^s, g(\psi,z)$ and S
- Wages in an occupation are competitively determined:

$$w_1 = z\gamma a g_1^{\rho-1}\left[a g_1^{\rho} + (1-a)g_2^{\rho}\right]^{\frac{\gamma-\rho}{\rho}}$$

$$w_2 = z\gamma (1-a) g_2^{\rho-1}\left[a g_1^{\rho} + (1-a)g_2^{\rho}\right]^{\frac{\gamma-\rho}{\rho}}$$

- The occupation employment rule $g(\psi,z)$ is consistent with individual decisions
  - If $g_1(\psi,z) = \psi_1$ and $g_2(\psi,z) = \psi_2$, then $V_1(\psi,z) \geq V^s$ and $V_2(\psi,z) \geq V^s$
  - If $g_1(\psi,z) < \psi_1$ and $g_2(\psi,z) = \psi_2$, then $V_1(\psi,z) = V^s$ and $V_2(\psi,z) \geq V^s$
  - If $g_1(\psi,z) = \psi_1$ and $g_2(\psi,z) < \psi_2$, then $V_1(\psi,z) \geq V^s$ and $V_2(\psi,z) = V^s$
  - If $g_1(\psi,z) < \psi_1$ and $g_2(\psi,z) < \psi_2$, then $V_1(\psi,z) = V^s$ and $V_2(\psi,z) = V^s$

Equilibrium (cont.)

- Individual decisions are compatible with the invariant distribution:

$$\mu(\Psi', Z') = \int_{\{(\psi,z):\psi' \in \Psi'\}} Q(z, Z')\mu(d\psi, dz)$$

- For an occupation (ψ, z), the feasibility conditions are satisfied:

$$0 \leq g_j(\psi, z) \leq \psi_j; j = 1, 2$$

- Aggregate feasibility is satisfied:

$$S = 1 - \int \left[g_1(\psi, z) + g_2(\psi, z)\right] \mu(d\psi, dz)$$

- The value of search V^s is generated by $V_1(\psi, z)$ and $\mu(\psi, z)$:

$$V^s = (1 - \delta)\beta \int V_1(\psi, z)\mu(d\psi, dz)$$

The experiment

- Invariant parameters: calibrate $\{\delta, \beta, p, \gamma, a, \rho\}$ and keep them fixed in the 1968-1972 and 1990-1993 equilibria

δ	γ	β	a	ρ	p
0.0125	0.68	0.9804	0.44	0.73	0.05

(a, ρ) calibrated from regressing $\left(\frac{w_1}{w_2}\right)_{it}$ on $\left(\frac{g_1}{g_2}\right)_{it}$.

The experiment (cont.)

- Time-dependent parameters: vary $\{\alpha, \phi, \sigma_\varepsilon^2\}$ to be consistent with statistics on occupation mobility in 1968-1972 and 1990-1993, respectively
  - Statistic 1: 3d occupational mobility (0.155 vs. 0.188)
  - Statistic 2: The average number of switches for those who switched a 3d occupation at least once in a 4-year period (1.56 vs. 1.62)

Parameter	1969-72	1990-93
ϕ	0.934	0.881
σ_ϵ	0.244	0.375
θ	0.684	0.792
α	0.000	-0.090

Main results

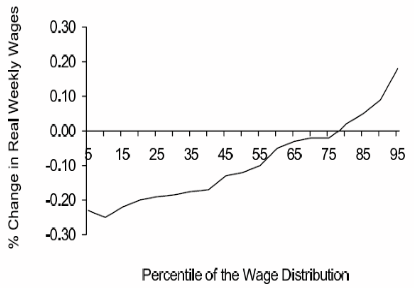
Table 1: Changes in the U.S. Labor Market.

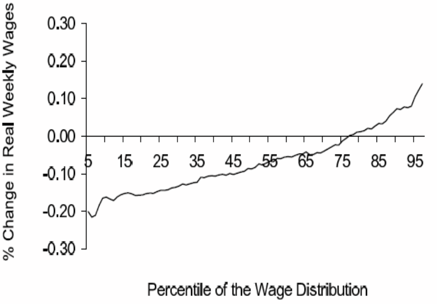
	1969-72	1990-93	Change
Gini Coefficient	0.264	0.330	25.0%
Variance of permanent log wages, $var(\pi_i)$	0.178	0.230	29.2%
Average variance of transitory log wages, average $var(\eta_i)$	0.110	0.172	56.4%
Occupational mobility	0.155	0.188	21.3%

Table 7: Results from the Calibrated Model.

	1969-72	1990-93
Gini coefficient	0.250	0.313
Variance of permanent log wages, $var(\pi_i)$	0.069	0.074
Average variance of transitory log wages, average $var(\eta_i)$	0.104	0.183

The wage distribution stretches at both ends just as in the data

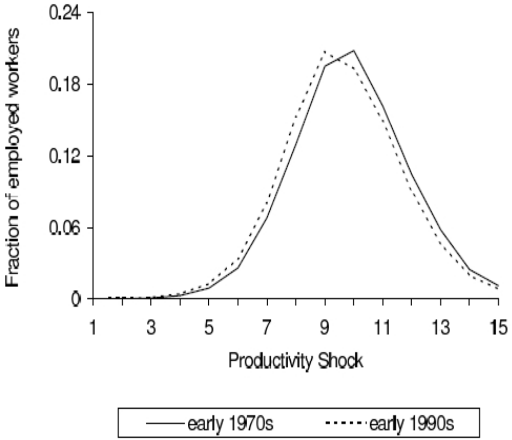




Does occupational mobility dampen or amplify the response of wage inequality?

- Fix $g(\psi, z)$ to the 1970's and change the shock process for z to the parameter values of the 1990's
- It turns out that inequality is 30% smaller relative to 1990's equilibrium
- KM argue that one reason why mobility amplifies inequality is that on average, people are employed in lower productivity occupations in the 1990's
  - persistence ϕ lower in 90's implies that the agents are less prone to move upon a negative shock
  - variance σ_{ε}^2 higher in 90's implies that the agents are more likely to experience a big positive shock after a negative shock
  - it turns out that more agents are concentrated at middle levels of productivity. If occupations belonging to these levels of productivity levels experience a very big negative shock, then the outflow from that occupation will be big, which drives up the overall mobility statistic and HC depreciation.

Figure 5: Distribution of Workers over Productivity Shocks in the Calibrated Model, early 1970s vs. 1990s.



Does occupational mobility dampen or amplify the response of wage inequality? (cont.)

- A second reason for the higher inequality in the presence of mobility is that upon a positive shock the inflow is high, which leads to decreasing wages of inexperienced workers. The experienced workers also receive lower wages but their wage fall is smaller ($\gamma < \rho$). In the second equilibrium inexperienced workers will more frequently go to highly productive occupations (due to increasing production risk) and accept low wages (due to congestion) because of the potential promotion to an experienced worker.

Sensitivity analysis - comparative statistics

	Benchmark (1)	a=0.40 (2)	a=0.48 (3)	ρ=0.50 (4)	ρ=1.00 (5)	p=0.04 (6)	p=0.07 (7)
Occupational Mobility:							
1969-72	0.155	0.133	0.168	0.148	0.152	0.148	0.158
1990-93	0.188	0.160	0.214	0.178	0.203	0.187	0.196
Gini Coefficient:							
1969-72	0.250	0.265	0.236	0.262	0.237	0.254	0.242
1990-93	0.313	0.333	0.293	0.326	0.295	0.312	0.305
Variance of Permanent Log Wages:							
1969-72	0.069	0.083	0.053	0.077	0.062	0.072	0.058
1990-93	0.074	0.097	0.058	0.089	0.059	0.079	0.063
Average Variance of Transitory Log Wages:							
1969-72	0.104	0.112	0.095	0.113	0.093	0.104	0.101
1990-93	0.183	0.209	0.172	0.208	0.165	0.190	0.180