Occupational Mobility and Wage Inequality, Review of Economic Studies, 2009

Wenzhi Wang [*]

June 16, 2023

1. An Equilibrium Model with Occupation-Specific Experience

1.1. Environment

- The economy consists of a continuum of occupations and a measure one of ex-ante identical individuals. Individuals die (leave the labour force) each period with probability δ and are replaced by newly born ones.
- There are two experience levels in each occupation: workers are either inexperienced or experienced. Experience is occupation specific, and newcomers to an occupation, regardless of the experience they had in their previous occupations, begin as inexperienced workers. Each period, an inexperienced worker in an occupation becomes experienced with probability p.
- Those who, at the beginning of the period, decide to leave their occupation, search for one period and arrive in a new occupation at the beginning of the next period. Search is random in the sense that the probability of arriving to a specific occupation is the same across all occupations.

1.2. Preferences

Individuals are risk neutral and maximize:

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

The decisions rules and equilibrium allocations in the model with risk-neutral workers are equivalent to those in a model with risk-averse individuals and complete insurance markets.

[*]This note is written in my MPhil period at the University of Oxford.

1.3. Production

All occupations produce the same homogenous good. Output y in an occupation is produced with the production technology

$$y = z\left[a g_1^{\rho} + (1-a)\, g_2^{\rho}\right]^{\gamma/\rho}, \tag{2}$$

where $\rho \leq 1, 0 < \gamma < 1, 0 < a < 1$, g_1 is the measure of inexperienced individuals working in the occupation, g_2 is the measure of experienced individuals working in the occupation, and z denotes the idiosyncratic productivity shock. The productivity shocks evolve according to the process

$$\ln\left(z'\right) = \alpha\left(1-\phi\right) + \phi \ln(z) + \varepsilon', \tag{3}$$

where $0 < \phi < 1$ and $\varepsilon' \sim N\left(0, \sigma_{\varepsilon}^2\right)$. We denote the transition function for z as $Q\left(z, dz'\right)$.

There are a large number of competitive employers in each occupation, and the wages that the inexperienced and experienced workers receive in an occupation are equal to their respective marginal products. We assume that there are competitive spot markets for the fixed factor in each occupation, implied by the production function. Households own the same market portfolio of all the fixed factors in the economy which yields the same return. Since we study only the inequality of wages in this paper, without loss of generality, we do not explicitly model households' asset income.

1.4. Occupation Population Dynamics

Let $\psi = \left(\psi_1, \psi_2\right)$ denote the beginning of the period distribution of workers present in an occupation, where ψ_1 is the measure of inexperienced workers while ψ_2 is the measure of experienced ones. At the beginning of the period, the idiosyncratic productivity shock z is realized. Some individuals in an occupation $\left(\psi, z\right)$ could decide to leave the occupation and search for a better one. Denote by $g\left(\psi, z\right) = \left(g_1, g_2\right)$ the end of the period distribution of workers in an occupation, where g_j is the measure of workers with experience $j = 1, 2$ who decide to stay and work in an occupation (ψ, z).

Let S be the economy-wide measure of workers searching for a new occupation. Then S and $g\left(\psi, z\right)$ determine the next period's starting distribution, ψ', of workers over experience levels in each occupation. The law of motion for ψ in an occupation is

$$\psi' = \left(\psi_1', \psi_2'\right) = \Gamma\left(g(\psi, z)\right) = \left(\delta + (1-\delta)S + (1-p)(1-\delta)g_1, p(1-\delta)g_1 + (1-\delta)g_2\right) \tag{4}$$

In the beginning of the next period, the number of inexperienced workers who will start in an occupation is equal to (i) the employed inexperienced workers this period who survive and do not advance to the next experience level, plus (ii) the newly arrived wrokers–those who are searching this period and survive, $(1-\delta)S$, and the new entrants into the labor market, δ. Similarly, the measure of experienced workers in the beginning of the next period is equal to the employed experienced workers this period who survive, plus those employed inexperienced this period who survive and become experienced next period.

1.5. Individual Value Functions

Consider the decision problem of an individual in an occupation (ψ, z) who takes as given $g(\psi, z)$, S, and V^S–the value of leaving an occupation and searching for a new one. Denote by $w_1(\psi, z)$ the wage of inexperienced workers in occupation (ψ, z). Then $V_1(\psi, z)$, the value of starting the period in occupation (ψ, z) as an inexperienced worker is

$$V_1(\psi, z) = \max\left\{V^s, w_1(\psi, z) + \beta(1-\delta)\int \left[(1-p)V_1\left(\psi', z'\right) + pV_2\left(\psi', z'\right)\right] Q\left(z, dz'\right)\right\}. \tag{5}$$

If the worker leaves the occupation, her expected value is equal to V^s. The value of staying and working in the occupation is equal to the wage received this period plus the expected discounted value from the next period on, taking into account the fact that with probability p she will become experienced next period and with probability δ she will die.

Similarly, $V_2(\psi, z)$, the value of an experienced worker in an occupation (ψ, z), is

$$V_2(\psi, z) = \max\left\{V^s, w_2(\psi, z) + \beta(1-\delta)\int V_2\left(\psi', z'\right) Q\left(z, dz'\right)\right\}. \tag{6}$$

As in the case of inexperienced workers, if an experienced worker leaves the occupation, her expected value is equal to V^s. The value of staying and working in the occupation is equal to the wage received this period plus the expected discounted value from the next period on.

1.6. Stationary Distribution

We are focusing on a stationary environment characterized by a stationary, occupation-invariant distribution $\mu(\psi, z)$:

$$\mu\left(\Psi', Z'\right) = \int_{\{(\psi,z):\psi'\in\Psi'\}} Q\left(z, Z'\right)\mu(d\psi, dz), \tag{7}$$

where Ψ', and Z' are sets of experience distributions and idiosyncratic shocks, respectively.

2. Equilibrium

Definition 1. A stationary equilibrium consists of value functions $V_1(\psi, z)$ and $V_2(\psi, z)$, occupation employment rules $g_1(\psi, z)$ and $g_2(\psi, z)$, an occupation-invariant measure $\mu(\psi, z)$, the value of search V^S, and the measure S of workers switching occupations, such that

1. $V_1(\psi, z)$ and $V_2(\psi, z)$ satisfy the Bellman equations, given V^S, $g(\psi, z)$, and S.

2. Wages in an occupation are competitively determined:

$$w_1 = z\gamma a g_1^{\rho-1}\left[a g_1^{\rho} + (1-a) g_2^{\rho}\right]^{(\gamma-\rho)/\rho}$$
$$w_2 = z\gamma (1-a) g_2^{\rho-1}\left[a g_1^{\rho} + (1-a) g_2^{\rho}\right]^{(\gamma-\rho)/\rho}$$

3. The occupation employment rule $g(\psi, z)$ is consistent with individual decisions:

   (a) If $g_1(\psi, z) = \psi_1$ and $g_2(\psi, z) = \psi_2$, then $V_1(\psi, z) \geq V^S$ and $V_2(\psi, z) \geq V^S$.
   (b) If $g_1(\psi, z) < \psi_1$ and $g_2(\psi, z) = \psi_2$, then $V_1(\psi, z) = V^S$ and $V_2(\psi, z) \geq V^S$.
   (c) If $g_1(\psi, z) = \psi_1$ and $g_2(\psi, z) < \psi_2$, then $V_1(\psi, z) \geq V^S$ and $V_2(\psi, z) = V^S$.
   (d) If $g_1(\psi, z) < \psi_1$ and $g_2(\psi, z) < \psi_2$, then $V_1(\psi, z) = V^S$ and $V_2(\psi, z) = V^S$.

4. Individual decisions are compatible with the invariant distribution:

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

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

$$0 \leq g_j(\psi, z) \leq \psi_j \text{ for } j = 1, 2.$$

6. Aggregate feasibility is satisfied:

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

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

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