Wage Inequality and Barriers to Entry

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Introduction

Wage inequality in US and UK is much higher than in non-UK Europe.
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Wage inequality in US and UK is much higher than in non-UK Europe.

Idea: barriers to entrepreneurship matter.
Outline of the Talk

- Data
- Model - Main Intuition
- An Numerical Exercise
The Data

Wage Inequality - 90th/10th log differential - year 2000

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>USA</td>
<td>1.55</td>
</tr>
<tr>
<td>UK</td>
<td>1.22</td>
</tr>
<tr>
<td>Europe Average</td>
<td>1.08</td>
</tr>
</tbody>
</table>
REGREF is an index ranging from 0 to 6 ‘...constructed from the perspective of regulations that create barriers to entrepreneurship and restrict competition in domestic markets where technology and demand conditions make competition viable’. 
The Data

![Graph showing wage inequality and barriers to entry across different countries.](image)

- Countries represented: AUS, BEL, CAN, FIN, FRA, GER, IRL, ITA, JAP, NLD, NZL, SWE, CH, UK, US
- The graph plots the 90th/10th log wage differential against regulation as measured by REGREF.
The Data

Correlations

\[ \log w_{90}^{it} = \beta \log \text{REGREF}_{it} + \psi_i + \delta_t + \theta_i t + \varepsilon_{it} \]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Std. Err.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta )</td>
<td>-0.236</td>
<td>0.032</td>
</tr>
<tr>
<td>N.Obs.</td>
<td>203</td>
<td></td>
</tr>
<tr>
<td>R-sq</td>
<td>0.52</td>
<td></td>
</tr>
<tr>
<td>N. of countries</td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>

Robust to different specifications
The data - A counterfactual

<table>
<thead>
<tr>
<th>REGREF</th>
<th>log $w_{90}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>1.8</td>
</tr>
<tr>
<td>EU</td>
<td>4.1</td>
</tr>
<tr>
<td>USA as EU</td>
<td>4.1</td>
</tr>
<tr>
<td>EU as USA</td>
<td>1.8</td>
</tr>
</tbody>
</table>
The Data

Entrepreneurship across Countries - % of Adult Population Starting a Business

<table>
<thead>
<tr>
<th>Country</th>
<th>% Starting a Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>8.4</td>
</tr>
<tr>
<td>UK</td>
<td>6.2</td>
</tr>
<tr>
<td>Europe Average</td>
<td>4.6</td>
</tr>
</tbody>
</table>

Regulation acts as a detriment to entrepreneurship (Ardagna and Lusardi (2008), Klapper, Laeven, Rajan (2006), Desai, Gompers, Lerner (2003)).
Entrepreneurs are on average more educated than the rest of the population (Ardagna and Lusardi (2008), De Nardi et al. (2007)).
The Model

Standard firms dynamics model (Hopenhayn (1992a), Melitz (2003), Restuccia and Rogerson (2008)), in which I introduce

- agents ex-ante heterogeneity and
- occupational choice

in a general equilibrium setting.
The Model

Time is continuous and horizon infinite.

Two types of risk-neutral agents, $r > 0$.

- Measure $L_u$ of 'unskilled' who provide raw labor.
- Measure 1 of 'skilled' agents who perform two mutually exclusive activities:
  - workers in existing production processes,
  - entrepreneurs by starting up new firms.
The Model

Firms

Production takes place in firms.

Each firm consists of

- an entrepreneur,
- skilled and unskilled labor,
- physical capital,

and a specific productivity drawn when the firm is started.

Firms are owned and run by entrepreneurs.
At any point in time, skilled agents make an occupational choice: 'workers' or 'entrepreneurs'.

Skilled agents become 'entrepreneur' once they get an idea. Ideas arrive at Poisson rate $\lambda$.

Each idea has a productivity $x \sim G(\cdot)$.

In case he does decide to become an entrepreneur, he pays a fixed cost $\kappa$.

Once an entrepreneur opens up a firm, he hires skilled and unskilled workers and capital on their respective markets and production starts.

Skilled agents die at rate $\sigma$. 

The Model

Skilled Agents

Figure 2: Flow across states

\[ \sigma \]

allow for different probabilities of death for firms

The production function of a firm with productivity \( x \) is

\[ y(x) = zx^{1-\chi}F(l_s, l_u, k)\chi \]

where \( k \) represents the physical capital and \( l_s \) and \( l_u \) respectively the skilled and the unskilled labor. The parameter \( z \) is the overall productivity and parameter \( \chi \in (0, 1) \) the degree of diminishing returns at the firm level, what Lucas (1978) calls the span-of-control.

The function \( F(l_s, l_u, k) \) is strictly increasing in its arguments and linearly homogenous of degree one.

Markets for skilled and unskilled labor and physical capital are competitive. Their respective prices are given by \( w_s, w_u \) and \( r \). The problem of the firm can be summarized as follows,

\[
\max l_s, l_u, k \left[ zx^{1-\chi}F(l_s, l_u, k)\chi - w_s l_s - w_u l_u - rk \right].
\]

One way this would be implemented is allowing the hazard rate to be a function of the quality of the idea.
The Model

The Production Function

Firm with productivity $x$

$$y(x) = x^{1-\chi} F(l_s, l_u, k)^{\chi}$$

- $\chi \in (0, 1)$ span-of-control,
- $F(l_s, l_u, k)$ homogenous of degree 1.
The Model
Markets

Markets for factors are competitive:

- Skilled workers, \( w_s \),
- Unskilled workers, \( w_u \),
- Physical capital, \( r \).

Net profit of firm \( x \)

\[
\pi(x) \equiv \max_{l_s,l_u,k} x^{1-\chi} F(l_s, l_u, k)^\chi - w_s l_s(x) - w_u l_u(x) - rk(x)
\]

Entrepreneurs enjoy a dividend, \( \pi(x) = (1 - \chi)y(x) > 0 \).
The Model

Value functions - Value of a skilled agent

\[ V = \max\{V_s, V_i\} \]
The Model

Value functions

Value of a skilled worker:

\[ rV_s = w_s - \sigma V_s. \]

Value of entrepreneur of firm \( x \):

\[ rV_e(x) = \pi(x) - \sigma V_e(x). \]
The Model
Value functions

Value of a skilled agent looking for ideas:

\[ rV_i = \lambda \int \max\{V_e(x) - \kappa - V_i, 0\} dG(x) - \sigma V_i, \]

Reservation productivity

\[ V_e(R) - \kappa \geq V_i \]

with \( = \) if \( R > x_{min}, \)
The Model
Towards the Equilibrium

\[ i \text{ fraction of skilled agents looking for an idea.} \]

\[ e \text{ fraction of skilled agents who are established entrepreneurs.} \]

\[ L_s \text{ fraction of skilled agents who are workers.} \]

\[ \mu(x) \text{ mass of firms with productivity smaller or equal to } x. \]

\[ e = \mu \equiv \int d\mu(x) \text{ total mass of firms.} \]

\[ \dot{\mu}(x) = \lambda[G(x) - G(R)]i - \sigma\mu(x) \]
The Model

The Equilibrium

**Definition**

A stationary competitive equilibrium is a reservation productivity $R$, a set of prices $w_s, w_u, r$, and values $V_e(x), V_i$ and $V_s$, together with measures $\mu(x)$ of firms, a fraction $i$ of skilled agents looking for ideas and a fraction $L_s$ of skilled agents who work, such that

1. $R$ satisfies the entry condition $V_e(R) - \kappa = V_i$ and
2. the functional equations $V_i, V_e(x), V_s$,
3. the indifference condition $V_s = V_i$,
4. the steady state condition $\dot{\mu}(x) = 0$,
5. the resource constraints $e + i + L_s = 1$, $\int l_s(x) d\mu(x) = L_s$, $\int l_u(x) d\mu(x) = L_u$, and $\int k(x) d\mu(x) = K$, are satisfied.
The Model

The Equilibrium

Assumption

Let $\tilde{x} \equiv \frac{\int_y x dG(x)}{1-G(y)}$, $\frac{\partial \log \tilde{x}}{\partial \log y} \leq 1$, $\forall y \in \zeta$.

Lemma

A unique equilibrium exists.
The supply of skilled workers is an increasing function of the entry cost \( \frac{\partial L_s}{\partial \kappa} > 0 \).
The skill premium is a decreasing function of entry cost, \( \frac{\partial w_s}{w_u} \frac{\partial w_s}{\partial \kappa} < 0 \). Moreover, the number of firms decreases when the cost of entry increases \( \frac{\partial \mu}{\partial \kappa} < 0 \).
The Model
The Skill Premium - The Market for Relative Skills

Figure 3: The Relative Demand and Relative Supply for Skills

\[ \frac{w_s}{w_u} = \frac{\eta}{1-\alpha} L_u \]

\[ \frac{1-\alpha}{1-\alpha+\eta} \frac{1}{L_u} \to \frac{L_s}{L_u} \]
The Model

The Market for Relative Skills - A decrease in $\kappa$

Figure 4: The Relative Demand and Relative Supply for Skills, $\eta' > \eta$

The first part of this lemma follows immediately from the previous two since, as noticed before, $L_s$ is increasing in $\eta$. For $\rho < 1$ the second part is obvious, while the third follows from (8).
Numerical Exercise

Parametrization

\[ F(k, l_s, l_u) = 1_s k^{\alpha} l_u^{1-\alpha} \]
\[ G(x) = 1 - x^{-\rho} \]

<table>
<thead>
<tr>
<th>Parameter</th>
<th>US Data</th>
<th>Model</th>
<th>Parameters</th>
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<tbody>
<tr>
<td>Interest Rate</td>
<td>0.04</td>
<td>0.04</td>
<td>( r = 0.04 )</td>
</tr>
<tr>
<td>Physical Capital Share</td>
<td>0.19</td>
<td>0.19</td>
<td>( \alpha \chi = 0.19 )</td>
</tr>
<tr>
<td>Skill Premium</td>
<td>1.63</td>
<td>1.63</td>
<td>( \chi = 0.76 )</td>
</tr>
<tr>
<td>Entry Rate</td>
<td>8.4</td>
<td>8.6</td>
<td>( \rho = 8 )</td>
</tr>
<tr>
<td>Labor Share</td>
<td>0.66</td>
<td>0.67</td>
<td>( \lambda = 3 )</td>
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</table>
Numerical Exercise

A Counterfactual - $\kappa = 48\%$ of the profit of the average firm

<table>
<thead>
<tr>
<th></th>
<th>Entry Rate</th>
<th>Skill Premium</th>
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</thead>
<tbody>
<tr>
<td>U.S. Data</td>
<td>8.4</td>
<td>1.63</td>
</tr>
<tr>
<td>Italy Data</td>
<td>5.5</td>
<td>1.12</td>
</tr>
<tr>
<td>U.S. as Italy</td>
<td>5.5</td>
<td>1.35</td>
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</table>
Conclusions
Wage Inequality and Business Income

![Graph showing wage inequality and business income changes over time in the US. The x-axis represents years from 1970 to 2005, while the y-axis shows the skill premium and business income flow of funds. The graph illustrates an upward trend in both metrics over the period, highlighting the relationship between wage inequality and barriers to entry.]
Wage Inequality and Business Income

Federico De Francesco

Wage Inequality and Barriers to Entry
## Wage Inequality and REGREF - Correlations

<table>
<thead>
<tr>
<th></th>
<th>logREGREF</th>
<th>Union Coverage</th>
<th>Unemployment</th>
<th>Ls/Lu</th>
<th>EPL</th>
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<tr>
<td></td>
<td>−0.236</td>
<td>−0.320</td>
<td>−0.002</td>
<td>−0.985</td>
<td>−0.120</td>
</tr>
<tr>
<td></td>
<td>(0.032)**</td>
<td>(0.072)**</td>
<td>(0.002)</td>
<td>(0.289)**</td>
<td>(0.019)***</td>
</tr>
<tr>
<td></td>
<td>−0.205</td>
<td>−0.281</td>
<td>−0.956</td>
<td>−0.956</td>
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<tr>
<td></td>
<td>(0.031)**</td>
<td>(0.074)**</td>
<td>(0.001)</td>
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<tr>
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<td>−0.250</td>
<td>−0.599</td>
<td>−1.204</td>
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<tr>
<td></td>
<td>(0.031)**</td>
<td>(0.122)**</td>
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<tr>
<td></td>
<td>−0.219</td>
<td>−0.54</td>
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<tr>
<td></td>
<td>(0.030)**</td>
<td>(0.352)**</td>
<td></td>
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<tr>
<td></td>
<td>−0.144</td>
<td>−1.204</td>
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<tr>
<td></td>
<td>(0.026)**</td>
<td>(0.352)**</td>
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<tr>
<td>N.Obs.</td>
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<td>203</td>
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<td>203</td>
<td>169</td>
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<tr>
<td>R-sq</td>
<td>0.52</td>
<td>0.57</td>
<td>0.54</td>
<td>0.60</td>
<td>0.64</td>
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<tr>
<td>N. of countries</td>
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<td>17</td>
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