INSTITUTO DE ECONOMÍA
FACULTAD DE CIENCIAS ECONÓMICAS
Y ADMINISTRATIVAS

Lecture : Thesis
Professor : Tomás Rau
Date : March 14, 2023
Student : Valentina Andrade
email : vandrade@uc.cl

Literature Review

Thesis project

Autor, D. H., Katz, L. F., Kearney, M. S. (2008). Trends in US wage inequality: Revising the revisionists. The Review of economics and statistics, 90(2), 300-323.

Overview

What causes the trends of wage inequality in the United States? The authors note that while many researchers have suggested that technological changes, globalization, and other factors are primarily responsible for the rise in wage inequality, other researchers suggest institutional and political factors.

Analyzing the data, they find limited support for these claims.

- The growth of wage inequality is not accurately described as an episodic event. Inequality in the upper half of the male wage distribution (90/50 wage gap) grew rapidly and nearly continuously form 1980 to 2005.
- Relationship between minimum wage and upper-tail inequality is spurious: earnings inequality over the last two decades occurred in the upper half of the earnings distribution. Is not plausible that a declining minimum wage could cause large increases in upper-tail earnings inequality.

Evidence of polarization

The wages of very high and very low-skilled workers rise relative to those of middle-educated workers.

A central role for relative supply growth fluctuations and trend demand growth in explaining the evolution of the college wage premium. Patterns in which wage gaps within postcollege and only college diverge. Secular increase in the relative demand for college workers combined with fluctuations in relative skill supplies.

Therefore, employment has expanded in high-wage and low-wage work at the expense of middle-wage jobs: skill-biased technical change hypothesis that emphasizes the complementing high education with substitute middle education).

Wage inequality measure

To address these claims, the authors propose a new approach to measuring wage inequality in the United States: using the ratio of earnings at the 90th percentile to earnings at the 10th percentile, rather than the more commonly used measure of the gap between the mean or median wages of high- and low-wage workers.

They show that the ratio of earnings at the 90th percentile to earnings at the 10th percentile has increased significantly since the 1970s, while the gap between the mean or median wages of high- and low-wage workers has increased more modestly.

Goldin Claudia y Katz Lawrence (2007) Long run changes in the US Wage structure: narrowing, widening, polarizing

Main research topic

The paper studies the long-term US wage structure (1910-2005), delving deeper into educational and technological factors. The principal focus is re-assessing the skill-biased technological change hypothesis in a **log-run** historical context.

Findings

They show three tendencies in wage structure:

1. Narrowing (1910-1960): rapid growth in the relative demand for more educated workers and increases in the supply of skills (rising educational attainment).

The wage structure was narrowing because the **supply skills grew faster** than did **demand for skills**.

2. Widening (1970-1980): deceleration in the relative skill supply growth (slow educational attainment), increase in wage differentials.

3. Polarizing (1980-now): growth employment polarized in 90s and was in the highest-skill jobs, declines in employment shares occurred for middle-skill jobs, and rising employment shares in lowest-skill occupations.

Then, we can see a persistent rise in upper-tail wage inequality

Polarization patterns can also be observed in skill-biased technology: computers are strong complements to the abstract tasks of college graduated in the top positions, substitute middle occupations, and have a little direct impact on lower-end service jobs for non-college workers.

Other From, 1980 to 2005 returns to schooling increased and **convexified**. This played a key role in the divergence of upper and lower-tail inequality since the late 1980s.

Contribution to the thesis

- Growing together and growing apart.

- Understand the rising within groups (residuals) wage dispersion.

- Weekly earnings of the 90th percentil worker relative to 10th increased by 49%. An offsetting factors has been the substantial narrowing of gender wage differentials since 1980.

- Rising education returns explain 62 percent of the growth of hourly wage variance for men and 37 percent for women.

- Rising education returns represent the largest component of recent increases in male wage inequality (as Lemieux say).

Bowlus, A., Bozkurt, E., Lochner, L., and Robinson, C. (2017). Wages and Employment: The Canonical Model Revisited.

Main research topic

The standard implementation of the canonical model of wages and employment uses composition adjustment to construct "unit" wages and employment for low and high skilled labor. While this implementation of the canonical model performed well for the 1963-1987 period studied in Katz and Murphy (1992), subsequent literature has pointed to a failure of the model to predict the aggregate college premium outside the sample period or to predict the observed deviations in college premia for younger vs. older workers. This paper documents that these failings are due to mismeasurement of the relevant prices and quantities for low and high-skill labor when using the standard composition adjustment methods, which ignore cohort effects that are particularly important in the 1980s and 1990s.

Re-estimating the basic canonical model with prices and quantities that incorporate changes in skill levels across cohorts.

$$\ln \omega_{ct} = \ln \omega_t + \ln \left(B_{Ht}/B_{Lt} \right) = [\underbrace{\frac{\sigma - 1}{\sigma} \ln \left(A_{Ht}/A_{Lt} \right)}_{\text{Demand } (SBTC)} - \underbrace{\frac{1}{\sigma} \ln \left(H_t/L_t \right)}_{\text{Supply}}] + \underbrace{\ln \left(B_{Ht}/B_{Lt} \right)}_{\text{Cohort quality}}. \quad (1)$$

Findings

Re-estimating produces a much better fit for the out-of-sample prediction even with perfect substitutability across age or experience groups.

An essential consequence of accounting for cohort effects is that the model implies a much **higher elasticity of substitution** between high and low-skill labor than has been found in the standard literature. Implications

1. The higher estimated elasticity results in a much smaller role for SBTC in explaining the path of the college wage premium
2. the elasticity of substitution is also an important parameter for assessing general equilibrium responses to government policies

The higher elasticity obtained when accounting for cohort differences in skill levels produces much weaker general equilibrium relative price changes and stronger enrolment effects. (Heckman, Lochner and Taber (1998b)

Contribution to the thesis

- Elasticity parameter and General equilibrium responses to policies

Summary Lecture 1

Introduction

The rise of inequality serve is one of the central social facts and as labor economists, we viewed this tendency through several inequality debates: discrimination by sex and other characteristics, the effect of labor-market institutions (minimum wages, unions) and safety regimes, technological change, changes in educational systems, social mobility, etc. This rise pushes to improve the methods to study much complex relations and questions (Lecture 2,3 and 4)

As follows, this document review on the "neoclassical" wage structure, which emphasises

1. The college wage premium
2. Skill-biased technical change (SBTC)

The structure of the text is:

1. Concept: wage premiums and residual inequality
2. Canonical model: a supply-demand framework of Katz and Murphy (1992)
3. The race between college wage premium and SBTC
4. Extensions

Trends in wage inequality

In the following section, I will summarize some facts about wage inequality tendency present in Goldin and Katz, 2007. In general, we focus on college premiums because three reasons

1. A big share of wage inequality (level and trend) is due to college premiums and it co-moves with the rise of wage inequality.
2. The rapid rise of the college wage premium can be understood as the result of long-term demand shifts favoring high-skill workers coupled with a slowdown in the relative growth of the supply of college-educated workers (Katz & Murphy, 1992)
3. Also, an interesting fact about college wage premiums is the possibility to study the general equilibrium response due to educational or labor policies (Bowlus et al., 2017)

Three tendencies in wage structure (Goldin & Katz, 2007)

In social history sometimes we grow "together" and sometimes "apart". Three tendencies in inequality

1. **Narrowing (1910-1960)**: rapid growth in the relative demand for more educated workers and increases in the supply of skills (rising educational attainment).

The wage structure was narrowing because the **supply skills grew faster** than did **demand for skills**.

2. Widening (1970-1980): Inequality rose **monotonically** during this decade (Autor et al., 2008). Katz and Autor (1999) shows the log 90-10 workers rose 20 log points to men and 25 for women.

- Inequality rose *between* education: deceleration in the relative skill supply growth (slow educational attainment), increase in wage differentials.
- Though gender wage gap narrowed significantly

3. Polarizing (1980-now): growth employment polarized in 90s and was in the highest-skill jobs, declines in employment shares occurred for middle-skill jobs, and rising employment shares in lowest-skill occupations (Autor et al., 2008)

When Autor et al., 2008 intent to explain polarization pattern indicates a central role for relative supply growth fluctuations and trend demand growth in explaining the evolution of the college wage premium. Patterns in which wage gaps within post-college and only college diverge. Secular increase in the relative demand for college workers combined with fluctuations in relative skill supplies. Goldin and Katz, 2007 indicates that from 1980 to 2005 returns of schooling increased and **convexified**, playing an important role in the divergence of upper and lower tail inequality.

Other facts:

- Rising education returns explain 62 percent of the growth of hourly wage variance for men and 37 percent for women.
- Instead, Autor et al., 2008 indicates that real wages do not have any important effect on inequality, Acemoglu and Autor, 2011 points that real wages have fallen for some groups since 1980, especially for **less-educated workers**

Researchers have advanced in possible causes for the changes in wage inequality, including skill-biased technological change (SBTC), rising import competition from low-wage countries, **deunionization**, decline in the real minimum wage and *growing monopsony power in the labor market*. I will discuss many of these candidate explanations through a direct reading course.

Canonical model

A key factor for understanding wage inequality is **college wage premium**, ie., the **ratio of wage paid to college graduates vs. high school graduates** (also called *"skill premium"*) [1].

Katz and Murphy (1992) (hereafter "KM") explain the changes in the college wage premium using a **simple supply-demand framework** that Acemoglu and Autor, 2011 name as "canonical model".

- KM concludes that "observed fluctuations in the rate of growth of the relative supply of college graduates combined with smooth trend demand growth in favor of more-educated workers, can explain fluctuations in the college/high school differential over the 1963-1987 period"
- They attribute the rapid growth in the skill premium in the 1980s not to an acceleration of demand growth for skilled labor, but to a deceleration of growth in the supply of more-educated workers (Goldin and Katz, 2007 too)
- An interesting explanation of "where the variation is coming from", ie, identification of the driver that accelerate and then decelerate growth in the college share in 1970s and 1980s is *postwar baby booms and post-boom cohorts.*

1..1 The price and quantity of college vs. non-college workers

KM constructs two samples: (1) a "wage sample" for measuring changes in wages for workers of a given skill, and (2) a "count sample" for tallying up labor supply in different skill categories. The purpose is two: (1) to try to maximize comparability over time (changes in skill prices) and (2) to compositional changes for each demographic group (sex graduates). The composition-adjusted measure was constructed wage by group weighted by employment participation.

1..2 The race between education and technology

Katz and Murphy (1992) formalize Tinbergen's race [2], and then Goldin and Katz, 2007 and Autor et al., 2008 adopt this discussion.

Assuming a CES production in which college equivalents and high school equivalents are **imperfect substitutes**

$$Y_t = [(A_{1t}x_{1t})^\rho + (A_{2t}x_{2t})^\rho]^{\frac{1}{\rho}}$$

[1] Presumption that education confers productive skills rather than has a function as a signal of latent ability

[2] Tinberg (1974): race between education (attainment) and technology (SBTC)

where x_{gt} denotes group-g supply and A_{gt} is a a g-aumenting technology shifter.

Setting each group's wage equal to its marginal product and taking rations

$$log\frac{w_{1t}}{w_{2t}} = \frac{(\sigma-1)}{\sigma}log(\frac{A_{1t}}{A_{2t}}) - \frac{1}{\sigma}log(\frac{x_{1t}}{x_{2t}}))$$

where $\sigma = \frac{1}{1-\rho}$ is the elasticity of substitution. Notice σ is the key parameter that **relates changes in skill supplies to changes in the skill premium**.

- When σ is large, the groups are close substitutes, so that the relative prevalence doesn't affect relative wage much
- KM obtain $\sigma = 1.41$, then, college and non-college workers are *gross substitutes* $\Longrightarrow$ skill-biased technical change will increase the college wage premium ADD HERE LO DE BOWLES

Extensions and refinements

Based on the canonical model, a lot of subsequent works add extensions and refinements. I will summarize some notable

Card and Lemieux, 2001

According to the canonical mode, college wage premium should evolve proportionally over time for workers of different age groups, but empirics show that the premium has been largely concentrated among younger workers. Then, Card and Lemieux, 2001 augment production function allowing **imperfect substitutability** across workers of different experience levels within each education group. The change in CES production is that now the supply of each education group is itself a CES aggregate of the labor supplied by different education-experience cells ("nested CES")

As shown in the paper, σ is the cross-age elasticity of substitution within each education group. The results of the authors imply that **younger and older workers are close but not perfect substitutes**

Carneiro and Lee, 2011

Decline in the average "quality" of recent college graduation cohorts, which in turn implies that the quality-adjusted college premium has risen even faster than the raw premium

Bowlus et al., 2017

Re-estimating the basic canonical model with prices and quantities that incorporate changes in skill levels across cohorts.

$$\ln \omega_{ct} = \ln \omega_t + \ln (B_{Ht}/B_{Lt}) = [\underbrace{\frac{\sigma - 1}{\sigma} \ln (A_{Ht}/A_{Lt})}_{\text{Demand } (SBTC)} - \underbrace{\frac{1}{\sigma} \ln (H_t/L_t)}_{\text{Supply}}] + \underbrace{\ln (B_{Ht}/B_{Lt})}_{\text{Cohort quality}}. \quad (2)$$

Re-estimating produces a much better fit for the out-of-sample prediction even with perfect substitutability across age or experience groups.

An essential consequence of accounting for cohort effects is that the model implies a much **higher elasticity of substitution** between high and low-skill labor than has been found in the standard literature. Implications

1. The higher estimated elasticity results in a much smaller role for SBTC in explaining the path of the college wage premium
2. the elasticity of substitution is also an important parameter for assessing general equilibrium responses to government policies

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Contributions to thesis

Notions of inequality

There are several constructs, each of them useful for answering different questions

- **Wage inequality** w_i: individual receive different wages *for an hour of work*. In economics, this measure is used to reflect different levels of productivity or the price paid (law of the one price for a productivity unit of labor). Empirically, this law doesn't always hold: CCK(2016) and others show there is substantial cross-firm dispersion in wage setting (high-wage firms and low-wage firms)
- **Earning inequality** $w_i h_i$: hourly wage and hourly worked (earned income by work).

Goal: understand changes in how the labor market rewards different kinds of workers and hourly wages are the best indicator: in a competitive equilibrium the wage tells us the market price placed on a worker's time.

Measuring wage inequality

Taking logs makes our wage measure "scale-free" and facilitates comparison over time and across countries

1. Variance of log wages: If we use a linear model for the conditional expectation function, $w = X'\beta + \varepsilon$ we can obtain the variance by using the **total variance law**

$$Var(w_i) = Var[E(w|X)] + E[Var(w|X)]$$

   This lets us decompose wage variation into "between-group" and "within-group" components (variance of residual). For this reason, "within-group" inequality is often referred to as *"residual inequality"*

2. Quantiles: Let us characterize changes in inequality **at different points in the wage distribution**. One measure used in Autor et al., 2008 and Goldin and Katz, 2007 is "log 90-10" (log ratio of the 90th percentile to 10th)

$$log(\frac{w_{90}}{w_{10}}) = log(\frac{w_{90}}{w_{50}}) + log(\frac{w_{50}}{w_{10}})$$

   This lets us decompose total wage inequality into "lower tail" and "upper tail" components. Sometimes, the lower and upper tails don't move "together". For example, minimum wage may influence the 50-10 but is unlikely to affect 90-50 (Autor et al., 2008)

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