

Real Wage Inequality

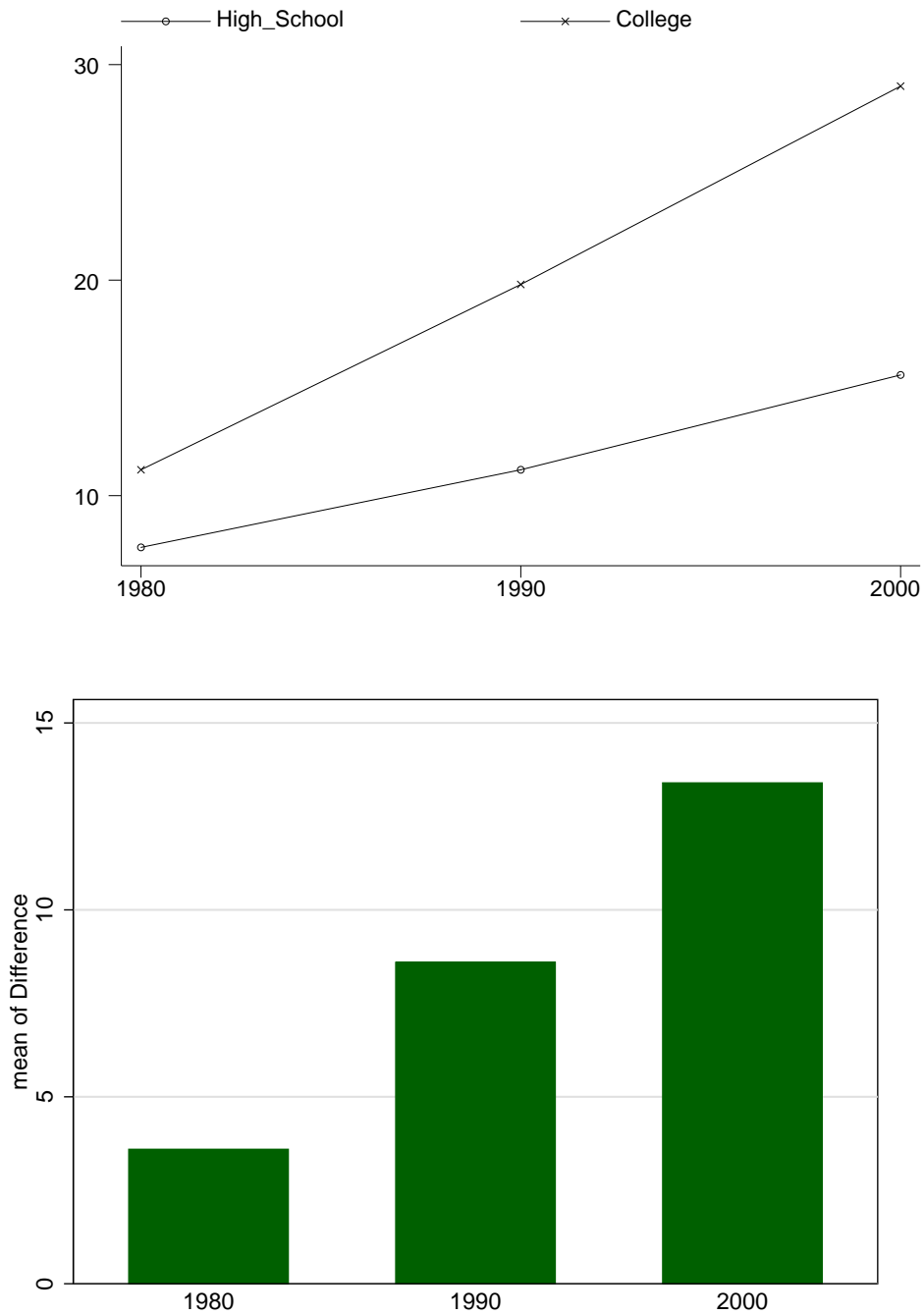
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Introduction

- Wage inequality has increased substantially in the US since 1980
 1. Difference between top 10% and bottom 10%
 2. Difference between CEO and white collar workers
 3. Difference between college graduates and high school graduates
 4. Wage dispersion within skill groups ("residual inequality")

Figure 1: Hourly Wage of High School Graduates and College Graduates, by Year



Notes: The top panel plots the average wage of high school and college graduates, by year. The bottom panel plots the difference between the average wage of college graduates and the average wage of high school graduates, by year.

Important political implications

- Widespread unease among the US middle class
- Large number of policy proposals in Congress aimed at reducing inequality
- High profile topic in the media

Important role in presidential race

- Barack Obama:

"While some have prospered beyond imagination in this global economy, middle-class Americans—as well as those working hard to become middle-class—are seeing the American dream slip further and further away"

- John McCain:

"Inequality is one of the most difficult challenges that we face. [...] It has to be a very high priority and it has to be turned around for the good of nation"

**The increase in inequality is not limited to the
US**

a) Large increase: US, UK

b) Moderate increase: Italy, France, Germany, Canada,
Japan

c) No increase: Netherlands, South Korea.

What caused the increase in wage inequality?

Existing literature

1. Increase in the demand for skills
2. Decline in the supply of skills
3. Erosion of labor market institutions that protect
low-wage workers

Explanation 1: Increase in Demand for Skills

- Skill biased technical change (Katz and Murphy, 1992; Autor, Katz, and Krueger, 1998)
 - Secular rise in the demand for skills
 - Acceleration during the 1980s with the computer revolution
- International Trade
 - Import of manufactured goods from LDCs is only 4% of GDP. Can trade flows this small explain large changes in relative earnings? Trade theory says yes: it is prices rather than quantities that matter.
 - Evidence suggests it matters (Feenstra, 1994 and 1996)

Explanation 2: Decline in Supply of Skills

- Slowdown in the growth of the relative supply of college graduates during the 1980s (Card and Lemieux, 2001)
- Possible reasons:
 - Falling returns to education in previous decade
 - Vietnam war
 - Crowding out at universities

Explanation 3: Institutions

- Erosion of labor market institutions that protected low-wage workers:
 - decline of labor unions (Di Nardo, Fortin, Lemieux, 1996)
 - decline of minimum wage (Lee, 2001)

In this paper

- I study the role that changes in the geographical location of economic activity have on inequality
- I focus on changes in the returns to college between 1980 and 2000
- I document that college graduates are increasingly concentrated in expensive cities
 - In 1980 they are already over-represented in expensive cities
 - They move to expensive cities between 1980 and 2000

- I create a cost of living index that varies across cities and skill groups
- I calculate returns to college using real wages
- The real return to college is much smaller than the nominal return and has grown much less
→ Inequality is less than half of what previously thought

- Implications for inequality in well-being depend on why college graduates live in expensive cities
 1. Supply push
 2. Demand pull

- I use a simple general equilibrium model to interpret my findings

- I conclude that inequality in well-being has increased less than nominal wage inequality

My story can explain two outstanding puzzles that are at odds with the existing explanations

- Lack of supply reaction

The rate of growth in the number of college graduates is still low relative to earlier periods

- Lack of rise in consumption inequality

Consumption inequality in the US has not increased significantly (Krueger and Perri, 2005)

Table 1: Cities with the Largest and Smallest Share of College Graduates

	College Share in 2000	College Share in 1980	1980-2000 Change
<u>Cities with the Largest Share in 2000</u>			
Stamford, CT	.66	.38	.28
Washington, DC	.56	.47	.09
San Jose, CA	.50	.32	.18
San Francisco, CA	.50	.33	.17
Tallahassee, FL	.48	.39	.09
Boston, MA	.48	.29	.19
Austin, TX	.47	.35	.12
Honolulu, HI	.46	.36	.10
Raleigh-Durham, NC	.46	.32	.14
New York , NY	.46	.32	.14
<u>Cities with the Smallest Share in 2000</u>			
Hickory-Morgantown, NC	.16	.13	.02
Ocala, FL	.16	.13	.02
Williamsport, PA	.15	.11	.04
Lima, OH	.15	.10	.05
Danville, VA	.15	.10	.05
Johnstown, PA	.14	.13	.01
Vineland-Milville, NJ	.14	.11	.03
Flint, MI	.13	.14	-.01
Mansfield, OH	.13	.12	.01

Notes: Share of college graduates is the share of workers with a college degree or more.

Figure 5: How the 1980-2000 Change in the Share of College Graduates Relates to the 1980 Share of College Graduates

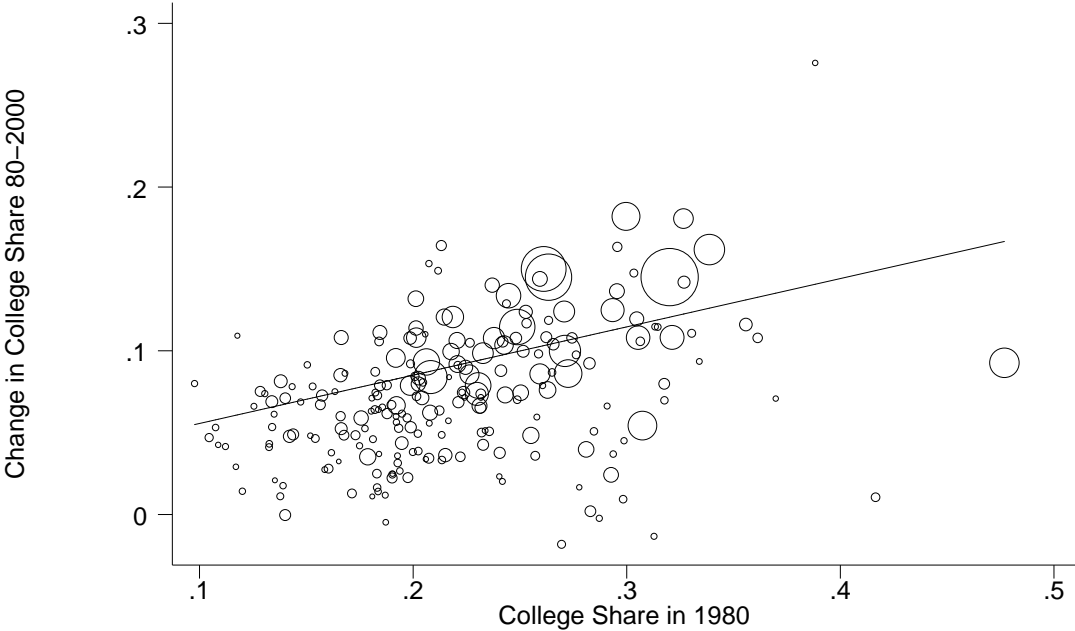
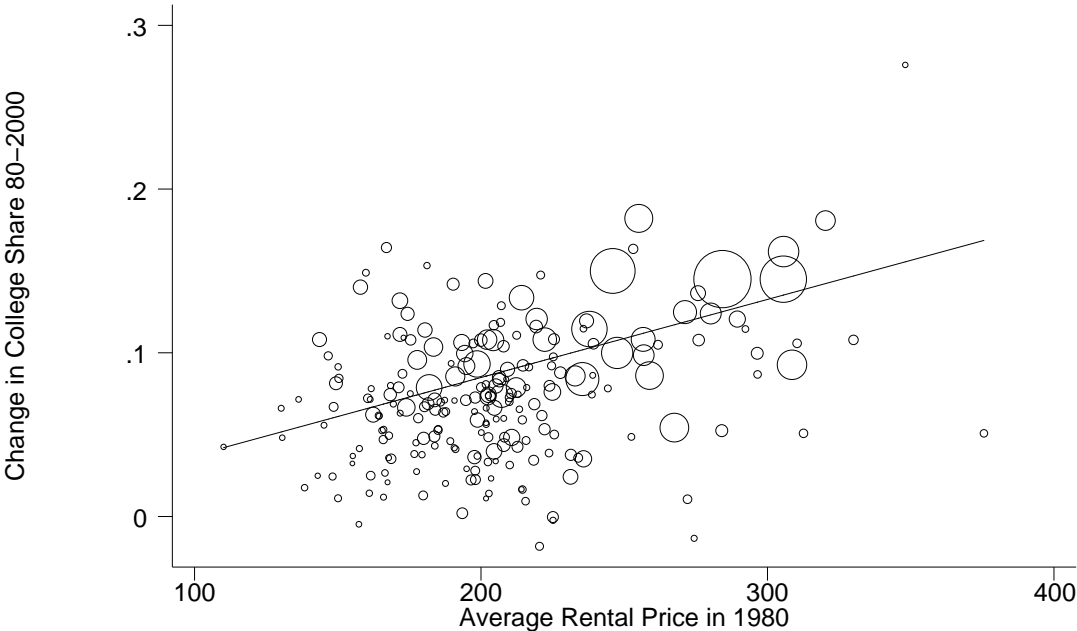


Figure 6: How the 1980-2000 Change in the Share of College Graduates Relates to the 1980 Cost of Housing



The official consumer price index

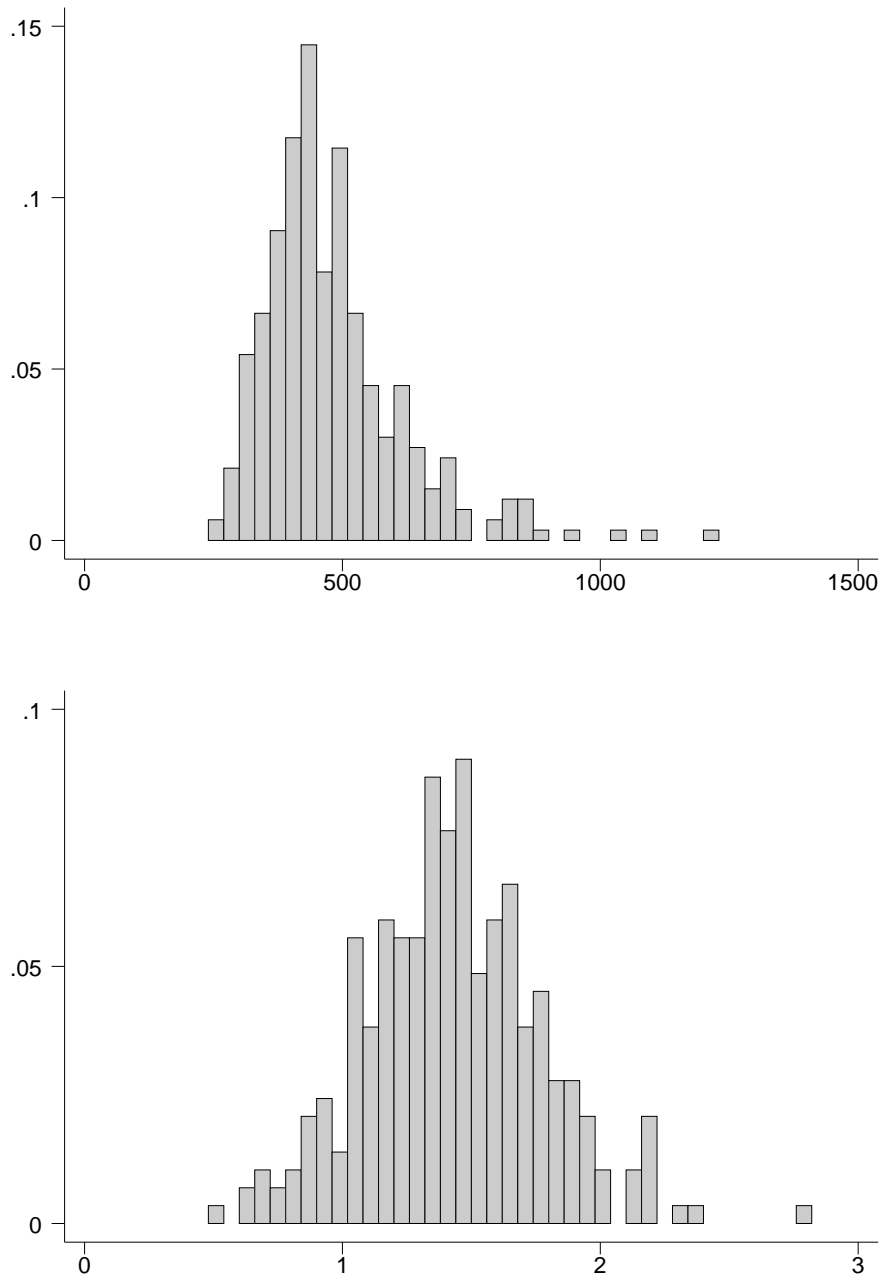
- Changes in the CPI are a weighted average of changes in the price of the goods in a representative consumption basket
- The weights reflect the share of income that the average consumer spend on each good.

Table 2: Relative Importance of Components in the Consumer Price Index

Housing	42.6
Food and Beverages	14.9
Apparel	3.7
Transportation	17.2
Medical Care	6.2
Recreation	5.5
Education and Communication	6.0
Other good and services	3.5

Notes: Entries refer to CPI-U. For more disaggregated categories, see Appendix 4 in Chapter 17 in Bureau of Labor Statistics (2007).

Figure 3: Distribution of Monthly Rents Across Cities in 2000 and 1980-2000 Percent Changes in Monthly Rents



Note: the top panel plots the distribution of monthly rent for a 3 bedroom apartment across all metropolitan areas in year 2000. The bottom panel plots the distribution of percent changes between 1980 and 2000 in monthly rent for a 3 bedroom apartment across all metropolitan areas.

A new consumer price index

- I generalize the BLS methodology to create an index that varies across cities and skill groups
- I use the price of the average three-bedroom apartment for a given city and skill group
- In some models, I also allow the cost of local services to vary

Table 3: Changes in the Cost of Living, by Education Group

	1980	1990	2000	Percent Increase 80-2000
	(1)	(2)	(3)	(4)
<u>Official CPI</u>				
High-School	1	1.53	2.02	102%
College	1	1.53	2.02	102%
Percent Difference	0	0	0	0%
<u>Cost of Housing - Monthly Rent</u>				
High-School	197	327	426	116%
College	264	505	672	154%
Percent Difference	34%	54%	58%	70%
<u>New CPI</u>				
High-School	1	1.47	1.90	90%
College	1.13	1.83	2.41	132%
Percent Difference	13%	25%	27%	113%

Estimates of real return to college

- I estimate the wage difference between college graduates and high school graduates (holding constant potential experience and gender)

- The dependent variable is
 - Model 1: nominal wage

 - Model 2: real wages (housing)

 - Model 3: real wage (housing and local services)

Figure 7: Nominal and Real Returns to College

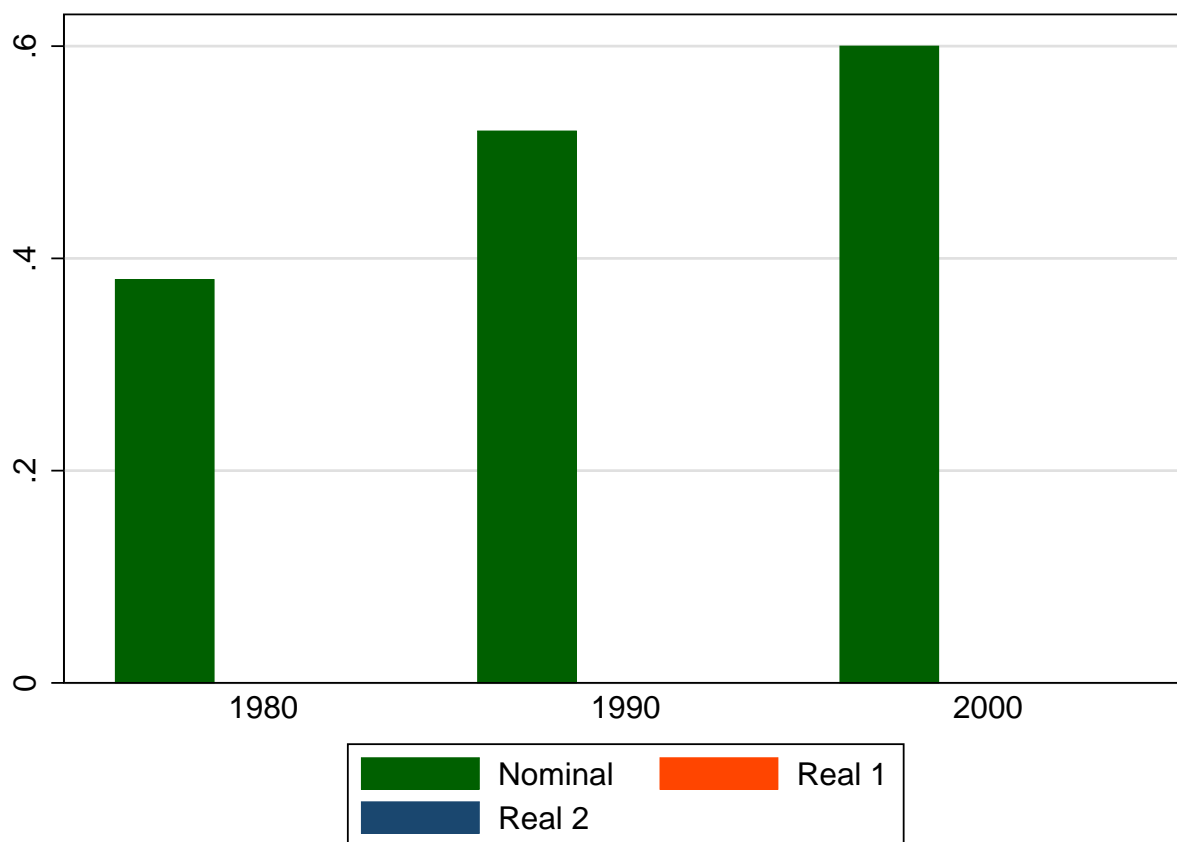


Figure 8: Nominal and Real Returns to College

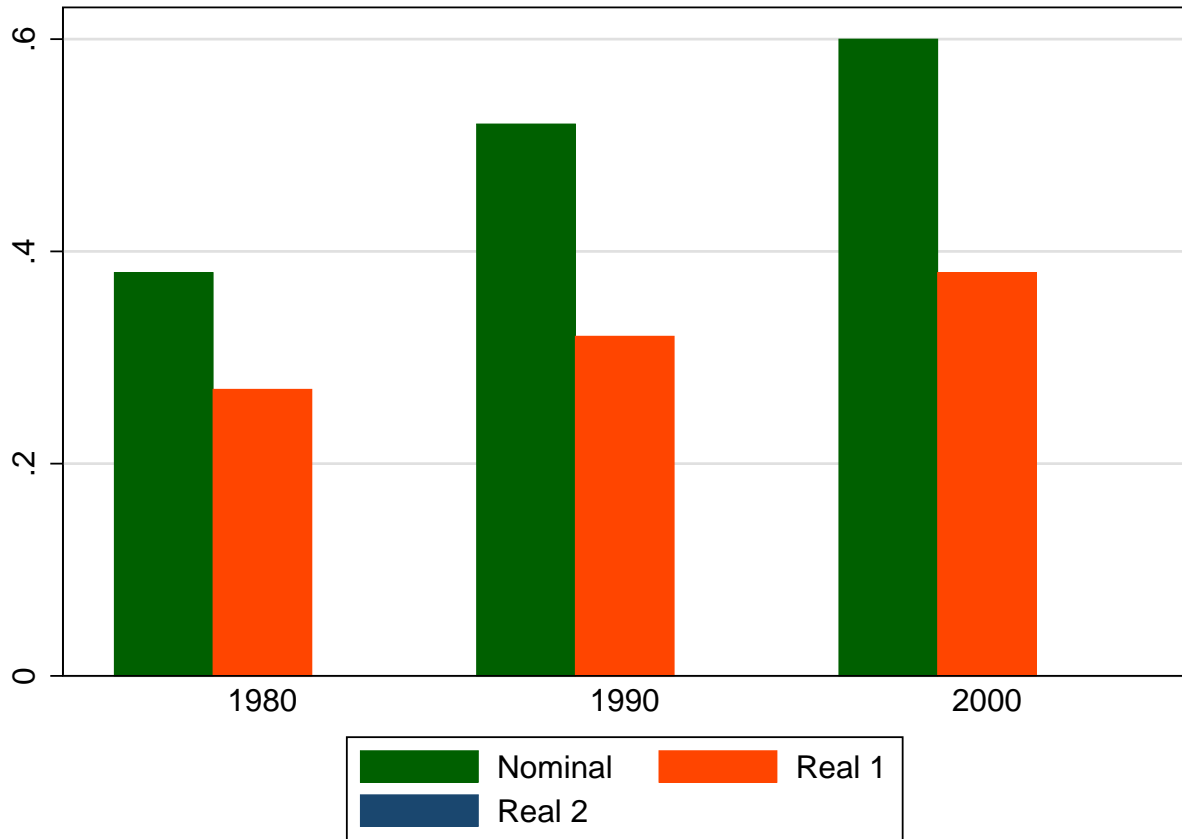


Figure 9: Nominal and Real Returns to College

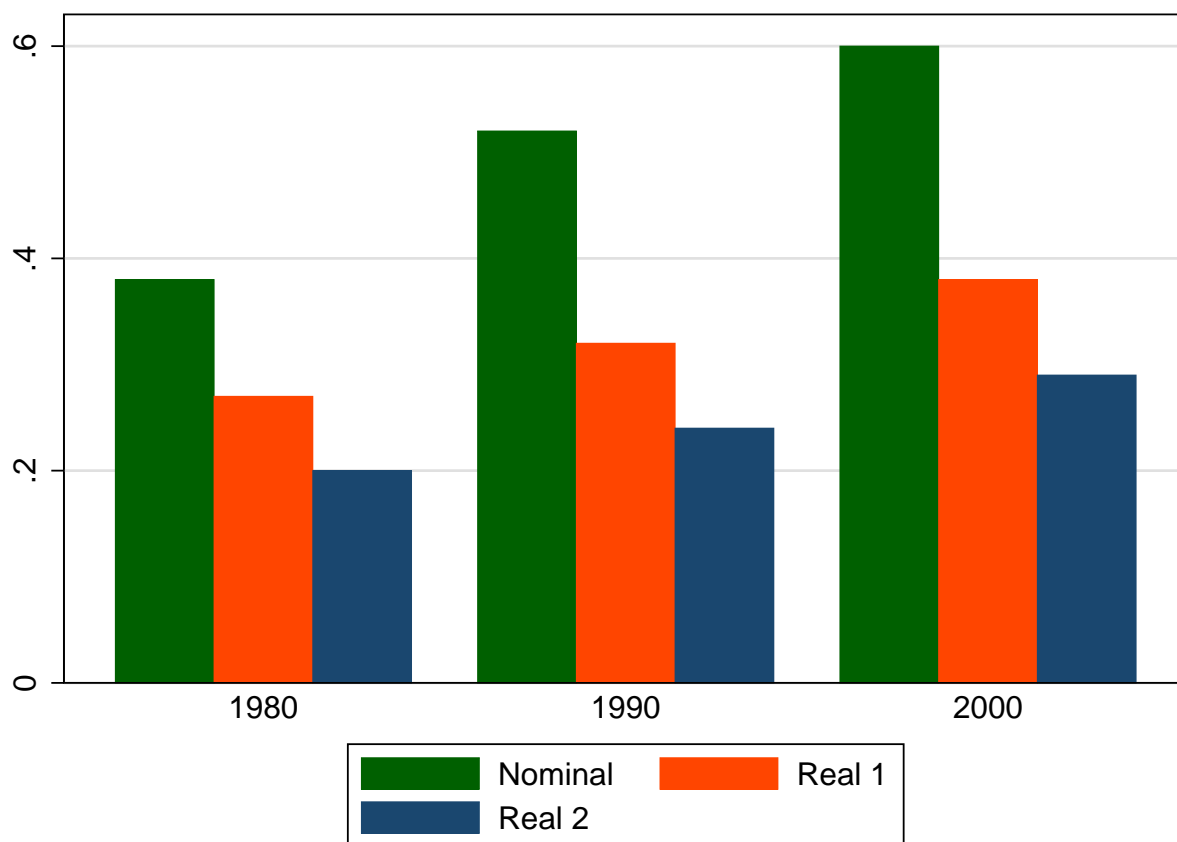


Table 4: Nominal and Real Return to College, by Year

	1980	1990	2000	1980-2000 Increase
	(1)	(2)	(3)	(4)
<u>Model 1</u>				
Nominal Wage	.38 (.001)	.53 (.001)	.60 (.001)	.22
Real Wage	.27 (.001)	.33 (.001)	.38 (.001)	.11
Percent Accounted for by Cost of Living	29%	38%	37%	50%
<u>Model 2</u>				
Real Wage	.20 (.001)	.24 (.001)	.29 (.001)	.09
Percent Accounted for by Cost of Living	47%	54%	52%	60%

Notes: Standard errors in parentheses. The dependent variable in the first row is log of nominal wage. The dependent variable in the second and third row is log of real hourly wage. In model 1, the only component of cost of living that is allowed to vary by city and education group is housing. In model 2, the components of cost of living that are allowed to vary by city and education group are housing and local services. Sample size is 4,716,288.

Interpretation

- Real inequality is lower than nominal inequality and has grown less

- Does this mean that inequality is not a problem?

It depends on the reasons why college graduates sort into expensive cities

Reasons why college graduates sort into expensive cities

1. Demand pull

Relative demand of skilled workers is high in expensive cities because skilled jobs are located there

2. Supply push

Relative supply of skilled workers is high in expensive cities because they have amenities that attract skilled workers

A Simple Model

- Two cities: Detroit (city a) and San Francisco (city b)
- Each city as a competitive economy that produces a single output good y traded on the national market, with price 1
- Cobb-Douglas technology with CRTS
- Two type of workers: skilled workers and unskilled workers

Assumptions

- Workers and firms are perfectly mobile

→ In equilibrium workers need to be indifferent between living in Detroit and San Francisco.

Firms profits need to be equalized across locations.

- Capital is infinitely supplied
- Each worker provides 1 unit of labor
- Labor and housing markets for skilled and unskilled workers within a city are separated

Skilled Workers

- Utility for skilled workers who live in city c is

$$U_c = w_c - r_c + A_c \quad (1)$$

w_c is wage; r_c is cost of housing ; A_c is a local amenity

- In equilibrium

$$U_a = U_b \quad (2)$$

→ Labor supply in San Francisco is infinitely elastic

$$w_b = r_b + w_a - r_a - A_b \quad (3)$$

- I assume that each worker consumes one unit of housing

→ The demand of housing in San Francisco is

$$r_b = w_b - w_a + r_a + A_b \quad (4)$$

- The supply of housing is

$$r_c = z + k_c N_c \quad (5)$$

- k_c is elasticity of supply of housing, and is determined by geography and local land regulations.

Unskilled Workers

Utility and technology for unskilled workers are similar

SCENARIO 1: Demand Pull

- The marginal product of skilled workers increases in San Francisco by D

Productivity of unskilled workers is unchanged.

→ relative demand of skilled workers increases

- For example: The dot com boom experienced by the San Francisco in 1990's

What happens to wages and rents?

- Some skilled workers move from Detroit to San Francisco
- The nominal wage in San Francisco increases

$$w_{b2} - w_{b1} = D \quad (6)$$

- The cost of housing in San Francisco increases

$$r_{b2} - r_{b1} = \frac{k_b}{k_a + k_b} D \quad (7)$$

Increase depends on housing elasticities

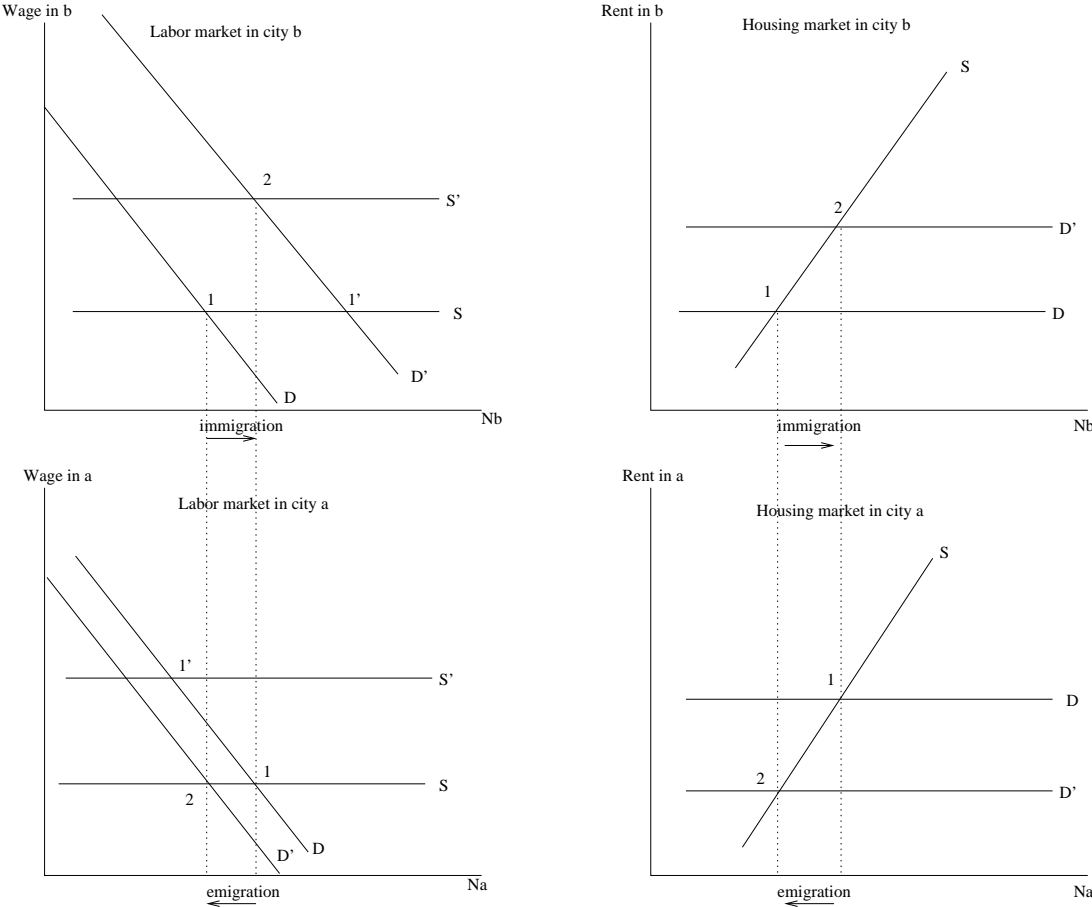
- In Detroit, nominal wages do not change.

(Capital flows exactly off-set the decline in labor supply)

- But the cost of housing declines:

$$r_{a2} - r_{a1} = -\frac{k_a}{k_a + k_b} D \quad (8)$$

Figure 10: Equilibrium in the Labor and Housing Market - Demand Pull



Note:

The benefit of increased productivity is split between workers and landowners

- Workers both in San Francisco and Detroit experience an increase in real wages (and utility) by

$$\frac{k_a}{k_a + k_b} D \quad (9)$$

- Landowners in San Francisco are better off by

$$\frac{k_b}{k_a + k_b} D \quad (10)$$

- Roback (1982) is a special case

Special case 1

- The supply of housing in San Francisco is perfectly inelastic ($k_b = \infty$)
- All the benefit of the productivity increase goes to landowners in San Francisco.
- Housing cost and wages in San Francisco increase by D . Workers in San Francisco are indifferent.
- Nothing happens to wages and rents in Detroit
- Roback (1982)

- Same result if the supply of housing in Detroit is perfectly elastic ($k_a = 0$)

Special case 2

- Elasticity of supply of housing in San Francisco is infinite ($k_b = 0$)
- All the benefit of the productivity increase goes to workers, (in San Francisco and Detroit)
- Real wages grow by D .
- Landowners in San Francisco are indifferent
landowners in Detroit experience a loss

- Same result if the supply of housing in Detroit is fixed ($k_a = \infty$)

SCENARIO 2: Supply Push

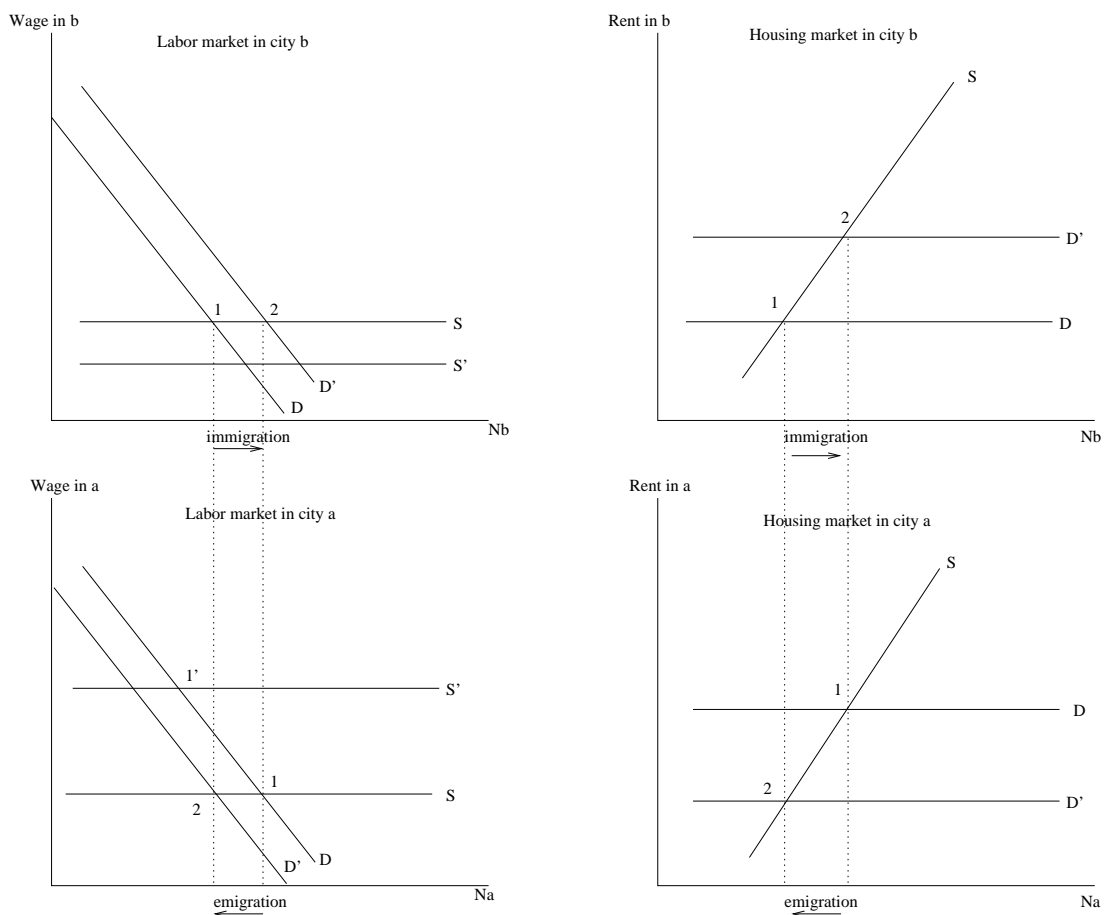
- Productivity is fixed
- But San Francisco becomes more desirable relative to Detroit for skilled workers
- Example: The amenity in the neighborhoods in San Francisco where skilled workers live increases by D

What happens to wages and rents?

- As before, some skilled workers move from Detroit to San Francisco
- Unlike before, the nominal wage of skilled workers in San Francisco remains constant (because of capital flows. Without capital, wage would decline as in Roback, 1982)
- Workers in both cities experience an increase in utility by

$$\frac{k_a}{k_a + k_b} D \quad (11)$$

Figure 11: Equilibrium in the Labor and Housing Market - Supply Push



What is the difference between demand pull and supply push?

- For a given increase in nominal wage gap
 - Demand pull → small increase in inequality in well-being
 - Supply push → larger increase in inequality in well-being

Demand or Supply?

- The nominal wage gap between college graduates and high school graduates
 - increases with demand pull
 - is constant with supply push
- To differentiate between the two, I regress change in college premium on change in college share across cities
 - Demand pull predicts a positive slope
 - Supply push predicts zero slope
- Empirically find a positive slope (Coefficient = 0.3)

Conclusions

- There is less wage inequality than we previously thought
 1. Real inequality is much smaller than nominal inequality
 2. Real inequality has grown much less

- Implications for inequality in well-being depend on why college graduates sort into expensive areas
 - Demand pull → small increase in well-being inequality
 - Supply push → larger increase in well-being inequality
- Empirical evidence more consistent with demand pull
- I conclude that the problem of inequality is less severe than previously thought