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Is the growing skill premium a purely metropolitan issue?☆

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ABSTRACT

This paper documents that virtually all of the growth in the skilled wage premium over the 1980s in the United States was confined to metropolitan areas. Explanations for the growing skilled premium will therefore need to take location into account.

1. Introduction

One literature in economics has documented a growing wage gap between skilled and unskilled workers that emerged during the 1980s. Trade- and labor economists have hotly debated the cause of the widening gap, as the 1980s was a relatively stable decade for the United States' labor market with an increased supply of skilled labor. After long debate, Bound and Johnson (1992) arguably provided a consensus that the primary cause of the rising skilled wage premium was skill-biased technical progress.[1]

A second literature has noted a large, stable wage gap between urban and non-urban workers. Papers by Roback (1982) and Glaeser and Maré (2001) have implied this should be expected because of differences in the cost of living. Roback identifies higher production amenity levels in metropolitan areas as compensating for higher wages and rents there. Glaeser and Maré document that the urban wage premium is large and interacts positively with experience. They interpret this as evidence that urban workers acquire skills more rapidly than non-urban ones, perhaps through greater opportunities in denser settings. Kim (2002) documents that a substantial portion of the urban wage premium remains after controlling for cost of living, suggesting it is related to unobservable differences in the quality of urban and non-urban workers. Thus Glaeser and Maré (2001) and Kim (2002) find that the large urban wage premium is related to skill differentials, whether acquired or innate.

While separate explanations for wage premiums by skill and urban location have been developed, little is known about how they relate. Here we model and estimate both premia jointly to better understand them. Our intuition is that the “skill-biased technical progress” that Bound and Johnson (1992) identify as causing the growing skilled wage gap may actually be “skill- *and urban* biased technical progress.” Workplace computers, for example, might be better used by skilled rather than unskilled labour. But they might also better enhance productivity in urban areas than in non-urban ones, facilitating the denser networks of interactions required there, such as between managers and their workers (Bresnahan (1999)).

We use a spatial model to illustrate the potential effect of location-specific skill-biased technical progress on both skill and urban wage premia. We then test the degree to which the skilled wage premium is location specific, using a difference (skilled vs unskilled) in difference (1980 vs 1990) in difference (urban vs non-urban areas) approach

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[1] For alternative explanations, see a critical review of the consensus by Card and DiNardo (2005).

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Table 1
Log wage difference (in skill level) in difference (in metropolitan status) in difference (in time period) results, CPS 1981 and 1991

		1981	1991	Change (1991–1981)
Skill premium overall	Mean log unskilled hourly wage $\left(\overline{\ln w_{ut}}\right)$	2.3852	2.3155	−.0697
	Mean log skilled hourly wage $\left(\overline{\ln w_{st}}\right)$	2.6477	2.6887	0.0410
	Difference (Skill premium, Δ)	.2625	.3732	.1107
Skill premium in non-metropolitan areas	$\overline{\ln w_{ut}}$	2.2966	2.2104	−.0862
	$\overline{\ln w_{st}}$	2.5333	2.4758	−.0575
	Δ_n	.2367	.2654	.0287
Skill premium in metropolitan areas	$\overline{\ln w_{ut}}$	2.4380	2.3593	−.0787
	$\overline{\ln w_{st}}$	2.6896	2.7378	.0482
	Δ_m	.2516	.3785	.1269
D-D-D	$\Delta_m-\Delta_n$	.0149	.1131	.0982

with data from the United States' Current Population Survey and Census.

2. A spatial equilibrium model

2.1. Labor supply

Consider an economy with a traded good, X_1, and a non-traded good X_2. There are N workers who are i=skilled s or unskilled u. There are also two areas j=metropolitan m, or non-metropolitan, n. While the proportion of skilled workers is exogenous, workers of either skill can choose the area in which they work. Contingent on this choice, a worker maximizes

$$X_1^{\theta}X_2^{1-\theta} \quad \text{subject to } w_{ij}=X_1+P_jX_2. \tag{1}$$

X_1 is the numeraire, P_j is the price of X_2 in area j, w_{ij} is the wage rate for skill i in area j, and individual labor supply is fixed at 1. Because each worker solving Eq. (1) can choose his area, equilibrium across areas requires

$$\ln w_{im}-\ln w_{in}=(1-\theta)(\ln P_m-\ln P_n). \tag{2}$$

That is, the metropolitan wage premium for either skill will adjust to a purchase-weighted fraction of the price premium for the non-traded good.

2.2. Labor demand

We assume constant returns to scale technology, and represent the many price taking firms in an area with an aggregate representative. The area production function for the tradeable good is $X_1=T_jF(K_j, L_j)$, where T_j is total factor productivity, K_j is capital, and L_j is aggregate demand for labor in area j. L_j is composed of both skilled and unskilled workers who differ in their respective efficiency units h_{sj} and h_{uj}, where $h_{sj}>h_{uj}$. The area demand for efficiency units of labour is $L_j=h_{sj}N_{sj}+h_{uj}N_{uj}$.

Firms in the two areas have the same profit function for X_1 and maximize

$$T_jF(K_j,L_j)-w_jL_j-r_jK_j, \tag{3}$$

where r_j is the rental price of capital and w_j is the weighted average of skilled and unskilled wages $\left(\text{or } w_j=\left(\frac{N_{sj}}{N_{sj}+N_{uj}}\right)w_{sj}+\left(\frac{N_{uj}}{N_{sj}+N_{uj}}\right)w_{uj}\right)$. Finally, if each area's production technology is Cobb-Douglas $F(K_j,L_j)=K_j^{\alpha}L_j^{1-\alpha}$ and there is free entry and zero profit in equilibrium, we obtain the following isoprofit conditions across areas:

$$\ln[T_m/T_n]=(1-\alpha)\ln[w_m/w_n]+\alpha\ln[r_m/r_n]. \tag{4}$$

From Eq. (4), higher total factor productivity in the metropolitan area can compensate firms there for higher rental rates and wages.

With competitive labor markets, skilled and non-skilled wages within an area are set to the value of marginal product ($w_{ij}=T_jF_{2j}h_{ij}$) which implies

$$\ln w_{sj}-\ln w_{uj}=\ln h_{sj}-\ln h_{uj}. \tag{5}$$

Skill and urban-biased technical progress could be represented by an increase in h_{sm} alone. From Eq. (5) and the definitions of w_j and w_{ij} we can obtain the comparative statics:

$$\frac{d(\ln w_{sm}-\ln w_{um})}{d\ln h_{sm}}>0,\quad \frac{d(\ln w_{sn}-\ln w_{un})}{d\ln h_{sm}}=0,\quad \frac{d(\ln w_s-\ln w_u)}{d\ln h_{sm}}>0. \tag{6}$$

That is, skill and urban-biased technical progress would raise the economy's overall skilled wage premium, due entirely to an increased skilled wage premium in metropolitan areas.

3. Empirical results

3.1. Data

To estimate the degree to which changes in the skilled wage premium have depended on area, we use cross-sectional data from the CPS for March 1981 and 1991. For all analysis, we restrict our samples to male heads of household who are positive earners between the ages of 18 and 65. Our wage variable is average hourly earnings.

3.2. Difference-in-difference-in-difference results

The rising wage gap between skilled (college educated) and unskilled (no college) workers during the 1980s is evident in our sample, in line with many other studies in the literature. From row 3 in Table 1, the overall wage gap for skill jumped from 30% ($=e^{.2625}-1$) in 1981 to about 45% in 1991.

It is clear, however, that this rising skill premium is observed primarily in urban areas. The last column of Table 1 shows a 13.5% ($=e^{.1269}-1$) increase in the skill premium in metropolitan areas (row 9) but only a 2.9% increase in non-metropolitan areas (row 6). The last row of Table 1 shows that the difference in the skilled wage premium between metro and non-metro areas grew from only 1.5% in 1981 to a puzzling 12.0% in 1991. Thus the rise in the skilled wage

Table 2
Regression adjusted diff-in-diff-in-diff. results, CPS 1981 and 1991

	(1) Premium Trend	(2) (1)+Interaction Trend
Intercept	.5116 (.0303)***	.5175 (.0304)***
North East	.1195 (.0063)***	.1206 (.0063)***
North Central	.0943 (.0060)***	.0949 (.0060)***
West	.0809 (.0062)***	.0826 (.0062)***
Race	.1559 (.0076)***	.1559 (.0076)***
Age	.0714 (.0014)***	.0714 (.0014)***
Age^2	−.0007 (.0000)***	−.0007 (.0000)***
Metro	.1237 (.0068)***	.1123 (.0085)***
Skill (College)	.2395 (.0065)***	.2181 (.0117)***
Time	−.1469 (.0091)***	−.1185 (.0106)***
Time* Skill	.0818 (.0091)***	.0092 (.0177)
Time* Metro	.0719 (.0101)***	.0330 (.0101)***
Metro* Skill	–	.0307 (.0141)**
Time* Metro * Skill	–	.0914 (.0207)***
N	50,180	50,180
Adj-R^2	0.1947	0.1958

***,**, * refer to significance at the 1%,5% and 10% levels. Numbers in parentheses are standard errors. Race is equal to one if white.

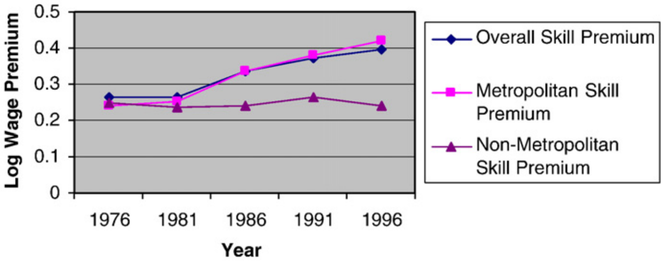

Fig. 1. Skilled wage premia over time.

premium occurred only in metropolitan areas and resulted in a substantial difference in that premium between metro and non-metro areas.

We attempt next to capture this effect using linear regressions. We can then estimate the above difference-in-difference-in-difference result with control over other relevant individual characteristics and can test whether the changes identified are statistically significant. We estimate the following pooled wage specification:

$$\ln w_{it} = \alpha + \beta' \mathbf{Z}_{it} + \delta_1 t + \delta_2 S_{it} + \delta_3 M_{it} + \delta_4 t \times S_{it} + \delta_5 t \times M_{it} + \delta_6 M_{it} \times S_{it} + \delta_7 t \times S_{it} \times M_{it} + \varepsilon_{it}. \quad (7)$$

$\mathbf{Z}_{it}$ is a vector of individual characteristics including age, race and region. S_{it}, M_{it}, and t are skill (college educated = 1), metropolitan, and time (1991 = 1) dummy variables, and ε_{it} is a pure random error. To compare with the previous descriptive results, skill coefficients (δ_2, $\delta_2+\delta_4$) and area coefficients (δ_3, $\delta_3+\delta_5$) represent the skill wage premia and the metropolitan wage premia for 1981 and 1991 respectively when we omit interaction variables between skill and location ($M_{it} \times S_{it}$ and $t \times S_{it} \times M_{it}$). δ_4 and δ_5 represent the change in the skill premium and the change in the metropolitan premium, respectively, during the 1980s. Finally, δ_7 represents the interaction between skill, area and time, or the change in the difference in skilled wage premium between urban and non-urban areas during the 1980s.

Column (1) of Table 2 shows that the skilled premium grew significantly over the 1980s, ($\hat{\delta}_4$ = .0818) as did the metropolitan premium ($\hat{\delta}_5$ = .0719). However, when we include an interaction term for all three dummy variables – *Time*, *Metro* and *Skill* in Column (2), it picks up most of the wage dynamics over the decade so that the interaction term for *Time* and *Skill* $\left(\hat{\delta}_4\right)$ becomes insignificant. This is important because it suggests that the rising skilled premium during the 1980s was limited to metropolitan areas only.

4. Robustness check

To test the robustness of our empirical results, we use more comprehensive Census data to replicate our CPS results. We also extend our CPS sample points from two (1981 and 1991) to five (1976, 1981, 1986, 1991 and 1996).

4.1. Census results

We use the 1980 and 1990 Census One Percent Metropolitan Public Use Microdata Samples. In this sample we also find an upward trend in the 1980s in the skilled wage gap overall and the metropolitan skilled wage gap in particular. Similarly, when we include the interaction terms for all three dummy variables (time, skill and metropolitan status) as in column (2) of Table 2, the metropolitan skilled wage premium increases by about 8%. As before, this picks up most of the wage dynamics over the decade, so that the estimated change in the skill premium in non-metropolitan areas is only 2%.[2]

4.2. A larger time series

To see if our findings result from comparing two idiosyncratic years, we present in Fig. 1 the changes in skilled wage premia by area between 1976 and 1996. Fig. 1 confirms that the skilled premium grew rapidly during the 1980s, due almost entirely to its rapid increase in metropolitan areas. In contrast, the skilled premium in non-metropolitan areas has stayed at about 25% since 1976.

5. Discussion

Clearly, skill-biased technical change alone cannot explain why the rise in the skilled wage gap has been confined to urban areas. While offering no definitive explanation, we noted earlier the possibility that technical progress in the 1980s was both skill *and* urban-biased in the gains to productivity it conferred. A second explanation comes from the positive interaction between skill and metropolitan area in the CPS regressions in Table 2. In the framework of Jovanovic and Rob (1989), skilled workers may better decrease the cost of acquiring knowledge and facilitating communication for urban than non-urban employers. A third explanation might be one of composition. Perhaps skill-intensive industries grew faster inside metropolitan areas than outside them in the 1980s, disproportionately drawing highly educated workers. The higher urban demand for skilled labor would then contribute to the additional premium such workers would enjoy. It would be useful to distinguish between these explanations empirically.

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[2] All of these results are available upon request.