A Test of the Worker Quality Explanation for the Urban/Non-Urban Wage Gap

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We conduct a test to determine whether the observed urban/non-urban wage gap is a return to unobservable ability. A new measure of worker quality is added to wage regressions, and the estimated urban premium is compared with the results from the standard human capital measures. This new measure of unobserved ability refers to workers' literacy as assessed by the International Adult Literacy Survey (IALS). Using data from three countries with different population densities and scope of human capital spillovers, we find that controlling for literacy levels does not reduce the size of the urban wage premium, implying that the wage gap is not due to previously unobserved worker quality. We also test whether literacy affects interaction between the urban wage premium and experience, which may proxy for learning-by-doing, and find similarly insignificant changes in the estimates.

Keywords: Urban/Non-urban wage gap, Worker quality hypothesis

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I. Introduction

In a cross-sectional comparison of workers with the same individual characteristics, such as gender, age, and experience, urban workers receive much higher wages than non-urban workers. For example, when large metropolitan areas with a population of at least one million are compared with non-urban areas, the wage gap is huge at more than 40 percent in some data sets, such as the US Current Population Survey (Kim 2002). This gap is much larger than many other heavily researched wage gaps, such as the gender pay gap or the union/non-union wage gap. However, the urban/non-urban wage gap is rarely investigated in literature on measured wage inequality in the US and other developed countries.

One reason for this apparent lack of research is that the urban/non-urban wage gap is typically considered a compensating wage differential for the higher cost of living in urban areas (*e.g.*, Rauch 1993). If the urban/non-urban wage gap is compensation only for higher living costs, then it also explains the spatial equilibrium, where higher urban wages do not cause all workers to migrate to urban areas. Glaeser and Gottlieb (2008) explain this equilibrium simply: high urban wages are offset by high prices, and high real wages are offset by negative amenities. Yet, whether the urban/non-urban cost-of-living difference is large enough to account for all of the urban wage gap is empirically debatable (Page and Solon 2003), especially because there appears to be a substantial urban/non-urban wage gap even after controlling for the urban/non-urban cost-of-living difference (Kim 2002). It is also puzzling why employers continue hiring in locations where real wages are high rather than move to non-urban areas where real wages are low.[1]

Another form of spatial equilibrium that does not leave a puzzle about employer location choice and that also explains why certain workers are attracted to urban areas where cost of living is high is that urban workers have better abilities than non-urban workers. Johnson (1953) speculates that high urban wages are a return to the higher ability of urban workers. If this were true, then less able non-urban workers would have little incentive to migrate to the cities because, even if they did, their lower ability would not command higher wages and they would still face the higher cost of urban living.

[1] This comparison also assumes that wages matter to firms' location decisions, as they would if labor costs are a high share of total costs.

High-ability workers may choose employment in urban areas because of their comparative advantage in urban employment. In particular, the economic density of urban areas should generate a larger demand for their talent. For example, the best professional sports players or musicians choose big cities that offer the largest audience. On the employer side, the sorting of high-ability workers into urban areas provides a reason for continuing to operate in high-cost urban centers. Profit-seeking firms would not necessarily move out of urban areas if it would mean having to hire less able and hence less productive non-urban workers.

One way to test whether the observed urban/non-urban wage gap is a return to ability (or to other worker-specific characteristics such as motivation) is to determine whether the longitudinal estimates of the wage gap that control for worker "fixed ability effects" are smaller than the cross-sectional estimates that do not (Glaeser and Maré 2001). However, not all countries have longitudinal data sets that they can use, and thus a simpler and more direct approach may also be valuable. In this paper, we propose such an approach based on the idea of seeing what happens to the estimated urban/non-urban wage gap if a new measure of worker quality is introduced into a wage regression.[2] The particular new measure of worker quality (usually unobservable to econometricians) used is the workers' literacy level, as assessed by the International Adult Literacy Survey (IALS).

Moreover, as the IALS is a standardized international survey, we can also check whether the urban/non-urban wage gap, which has been mainly documented in the US, is universal to other countries as well. Finally, because of the large variation in population size and density among the countries that participated in the IALS, we can also test the comparative advantage hypothesis, which states that the greater density of urban markets generates a larger urban demand for highly talented workers and hence a larger urban/non-urban wage gap.

Such tests are useful because if the urban/non-urban wage gap proves to be a consequence of ability differences between urban and non-urban workers, then it also provides a compelling reason for a spatial equilibrium for employers. Urban employers pay higher wages if they are com-

[2] In a similar kind of effort, some papers use an aptitude test (*i.e.*, Armed Forces Qualification Test) score as a proxy for unobservable ability to control for ability bias in estimated returns to schooling. Controlling for an aptitude score has a significant effect on estimated returns to schooling. See, for example, Bronars and Oettinger (2006).

pensated by the greater productivity of their high-ability workers. However, if the urban/non-urban wage gap is not completely explained by ability differences, a spatial equilibrium for employers still requires another mechanism to account for the various cost or productivity advantages that would continue to hold employers in urban areas. Among these possible mechanisms are lower transportation costs (Krugman 1991) and agglomeration economies (Lucas 1988).

Agglomeration economies are the productivity advantages from greater knowledge spillovers in urban areas.[3] New data on previously unobserved skills may also provide some insight into the role of such knowledge spillovers. Glaeser and Maré (2001) argue that if knowledge spillovers operate on individual workers rather than on firms, then urban workers may gradually accumulate more human capital than non-urban workers. Consistent with this hypothesis, they find that the cross-sectional wage gap between urban areas and non-urban areas is greater for more experienced workers. Data on literacy allow a more direct check of this empirical implication by observing what happens when workers' (accumulated) unobservable skills are introduced into a baseline wage regression with interaction variables between experience and urban status. If the reason for the wider cross-sectional wage gap for more experienced workers is due to either the faster accumulation of human capital from learning-by-doing in urban areas or the gradual ability sorting, then the addition of the literacy variable as a proxy for accumulated ability should shift the estimated interaction terms when this positive interaction is due to the faster human capital accumulation in urban areas.

There are also other explanations for the urban/non-urban wage gap that cannot be addressed by the new data we use. Especially for less developed countries, Harris and Todaro (1970) conjecture that the urban/rural wage gap is explained by the urban minimum wage, which is institutionally determined to be higher than that of the free market wage in rural areas. A consequence of this distortion is that out-migration from rural areas increases the urban unemployment rate and that migrants to urban areas are willing to be unemployed while they queue for a job in the high-wage sector. However, this explanation is unlikely to hold in developed countries such as the US because there is little difference in unemployment rates between urban and non-urban areas.[4]

[3] As one of the many subsequent empirical studies, Kim (1992) highlights the role of knowledge spillovers in Korea's rapid economic growth.

The remainder of the paper is arranged as follows. Section II discusses our data. Section III outlines the hypotheses to be tested and their expected empirical patterns, and reports the empirical results. Section IV concludes with a summary of the main findings.

II. Data

The IALS applied a standardized questionnaire to adults in 12 OECD countries starting in 1994. In each country, the survey was based on a probability sample and was designed to be representative of the civilian, non-institutionalized population aged 16-65. Aside from, gathering standard labor market survey data, the IALS also asked respondents to undergo comprehensive tests that assessed their workplace-related literacy skills. These skills have been shown to be essentially cognitive, to relate to problem-solving in the context of daily work activities (Green and Riddell 2003), and to have a large impact on earnings and other labor market outcomes (McIntosh and Vignoles 2001).[5] Thus, although econometricians may not have previously observed these skills, employers may have, making the IALS data useful for testing the labor quality explanation for the urban wage premium.

The survey consisted of a 20-minute questionnaire and a 45-minute test that assessed individuals' literacy levels in their workplace and daily life in terms of prose, document, and numeracy literacy. Prose literacy is the ability to understand and use information from texts, such as fiction and newspapers. Document literacy is the ability to locate and use information from timetables, graphs, charts, and forms. Quantitative or numeracy literacy is the ability to use numbers in conext, such as balancing a checkbook or calculating a tip. Each individual received a score between 0 and 500 for each category, and almost all econometric analyses used the average of these three literacy scores (Gibson and Stillman 2009).

Aside from measured literacy and the other more standard human capital variables collected, the survey also asked about several other potential determinants of wages, such as firm size of the current em-

[4] Recent literature on search-matching models includes a modified Harris-Todaro model, which accounts for the urban wage gap as resulting from greater uncertainties in the urban search-matching process (Lee 2010).

[5] The IALS data have also been used to examine the effect of cross-country differences in skills inequality on earnings inequality (Devroye and Freeman 2001) and on employment (Freeman and Schettkat 2001).

ployer (broken into four categories: 1-19, 20-99, 100-499, and 500+), and whether the respondent lived in an urban area.[6] The distribution of these variables appears to agree well with the information from other sources; for example, the sample proportion who reported living in an urban area for the US is close to the proportion living in metropolitan areas (77.6%) in a 1990 US census. A similar validation exercise for the reported firm size shows good correspondence between the survey estimates and information from industrial statistics (Gibson and Stillman 2009).

We select three countries from among those in the IALS for our analysis, seeking variation in population and geographical area, and also favoring countries where the urban/non-urban wage gap has not previously been extensively discussed (unlike the US). The three countries are Switzerland, Poland, and New Zealand. The variation in the population and geographical area allows us to test the comparative advantage hypothesis, that is, the density of urban markets generates a larger urban demand for highly talented workers. There is an order of magnitude difference in the population density between the three countries, ranging from 15 per km^2 in New Zealand to 181 per km^2 in Switzerland. Thus, if this hypothesis is true, then we would expect to observe the largest urban/non-urban wage gap in Switzerland and the smallest in New Zealand.

We restrict our attention to the sample of wage and salary earners who had a single employer over the past 12 months. This restriction is necessary because the question on firm size refers only to a respondent's main employer over the past year, whereas the available earnings data cover all jobs. After dropping the observations with missing values for the other explanatory variables, our analysis sample has 3,860 observations from the three countries.

Table 1 provides details on the construction of the explanatory and dependent variables. Whereas the explanatory variables are identically

[6] Similar to many surveys, the IALS does not ask about "place of work," and thus it cannot be used to include commuters in the estimates of the urban wage premium. In other words, there may be some measurement error in using an urban residence dummy as a proxy for urban employment. However, as shown in Kim (2002), commuters are only about 1 percent of urban workers; thus, this measurement error may not be much of a consequence for the empirical analysis. Furthermore, the employer's urban status may be partially controlled by including firm size variables (because urban employers are larger) in the wage regressions in our analysis.

TABLE 1
DESCRIPTION OF VARIABLES

	Description of Variables
Earnings	Interval ($n = 19$), annual, after taxes for Switzerland/ Continuous, annual, after taxes for Poland/Interval ($n = 11$), annual, after taxes for New Zealand
Urban	Urban dummy is equal to one if the individual lives in an urban area; otherwise zero
Male	Gender dummy is equal to one if the individual is male; otherwise zero
Married	Marriage dummy is equal to one if the individual is married; otherwise zero
Education	Years of completed education
Firm Size	Large dummy is equal to one if the individual works in a firm with 500+ employees; medium large dummy is equal to one if the individual works in a firm with 100-499 employees; small dummy is equal to one if the individual works in a firm with 20-99 employees
Experience	Potential experience (Age-years of completed education-6, maximum age is 65)
Average Literacy Score	Average of Prose Literacy Scores, Document Literacy Scores, and Quantitative Scores

defined in each country, the dependent variables (annual earnings) show slight differences between the countries, although these should not affect the comparisons of interest, which are mainly within-country (specifically, how the addition of the literacy measures affects the estimated coefficient on the urban dummy variable).

The descriptive statistics on the major variables of interest are reported in Table 2. The following are some of the notable patterns. Consistent with the worker quality explanation for the urban/non-urban wage gap, average years of schooling and average literacy are higher in urban areas. Whereas the gap in school years ranges from 5 percent (Switzerland) to 15 percent (Poland), the gaps in literacy scores are much smaller at 0 percent (Switzerland), 3 percent (New Zealand), and 10 percent (Poland). This suggests that these two variables may capture different dimensions of human capital because the distributions do not shift in parallel between the urban and non-urban sectors.

TABLE 2
SAMPLE STATISTICS

	Total (Means (S.D.))	Urban (Means (S.D.))	Non-Urban (Means (S.D.))
Switzerland	$N=1057$	$N=828$	$N=229$
(Pop. Den. = 181/Sq Km)		(78.3%)	(21.7%)
Annual Earnings	53027(24462)	55297(25079)	46688(21458)
Education	12.178(2.944)	12.328(3.027)	11.755(2.657)
Average literacy	278.691(50.771)	278.672(50.381)	278.745(51.949)
Experience	20.529(13.140)	21.460(13.337)	17.917(12.222)
Male	.558(.497)	.562(.497)	.545(.499)
Married	.981(.138)	.981(.138)	.980(.139)
Firm Size 500+	.344(.475)	.372(.483)	.262(.440)
Poland	$N=1101$	$N=812$	$N=289$
(Pop. Den. = 123/Sq Km)		(73.8%)	(26.2%)
Annual Earnings	43304(33202)	46380(33604)	34735(30515)
Education	11.806(2.893)	12.234(2.839)	10.613(2.706)
Average literacy	243.570(59.148)	249.804(58.250)	226.202(58.255)
Experience	20.761(10.739)	20.992(10.666)	20.115(10.935)
Male	.521(.497)	.507(0.500)	.557(.497)
Married	.839(.367)	.847(.360)	.820(.384)
Firm Size 500+	.267(.442)	.304(.460)	.161(.368)
New Zealand	$N=1722$	$N=1242$	$N=480$
(Pop. Den. = 15/Sq Km)		(72.1%)	(27.9%)
Annual Earnings	28774(20279)	29541(20369)	26513(19860)
Education	12.147(2.944)	12.355(2.934)	11.536(2.281)
Average literacy	285.999(52.075)	288.052(52.269)	279.948(51.075)
Experience	21.508(11.965)	21.101(11.994)	22.689(11.812)
Male	.555(.497)	.546(0.498)	.581(.493)
Married	.742(.437)	.728(.444)	.782(.413)
Firm Size 500+	.323(.468)	.345(.475)	.260(.439)

Note: Annual earnings are expressed in their own currency terms. PPP-adjusted GDP per capita in 2000 is USD 31,218 in Switzerland, USD 10,548 in Poland, and USD 19,848 in New Zealand.

The sample proportions living in urban areas are similar across the countries, but the urban/non-urban wage gap varies. In Switzerland, the proportion living in an urban area is 78.3 percent, and the log point urban/non-urban wage gap is 0.18. The proportion of the sample from an urban area in Poland is 73.8 percent, and the wage gap is much larger at 0.34 log points. Finally, the New Zealand sample shows a

slightly lower proportion (72.2%), but the log point urban/non-urban wage gap is similar to that of Switzerland. Considering that there are only 15 people per km^2 in New Zealand and 181 per km^2 in Switzerland, the similarity in the urban/non-urban wage gap between the two countries does not seem consistent with the comparative advantage hypothesis. Under this hypothesis, the high density in Switzerland should generate a larger urban demand for highly talented workers. However, comparing the wage premium with a country whose density is an order of magnitude lower reveals no difference in the urban/non-urban wage gap between the two countries.

Another implication of ability sorting can be supported by the results in Table 2. Specifically, the variance in earnings in urban areas is greater than that in non-urban areas. This pattern may indicate a larger return to observable or unobservable skills in urban areas. To examine this more closely, we need to turn to regression analysis rather than the comparison of the means. Such analysis can also help deal with potentially confounding factors, such as firm size and schooling, which also vary between sectors, and which may affect the relationship between skills and the estimated urban wage premium.

III. Empirical Strategy and Results

To observe more clearly what happens to the estimated urban/non-urban wage gap if new measures of worker quality are introduced into a wage regression, consider a linear regression model that decomposes the effect on log earnings, y_i, into a part coming from urban status, β, and another part due to unobservable skills, δ:

$$y_i = \alpha + \beta D_i + \delta a_i + u_i \,, \tag{1}$$

where D_i is equal to one if a person lives in an urban area, and zero otherwise; a_i is a measure of worker quality; and u_i is a pure random error. If instead of (1), an empirical study ignores a_i, and regresses y_i on D_i alone, the resulting population regression coefficient β_{yD} will be upwardly biased because of the omission of a_i, as in the standard result from omitted variable bias, $\beta_{yD} = \beta + \delta\{\text{cov}(D_i, a_i)\}/\{\text{var}(D_i)\}$, which is expected to be larger than β because the unobservable skills are assumed to have a positive effect on earnings ($\delta > 0$) and because urban workers are assumed to have higher ability than non-urban workers

($\text{cov}(D_i, a_i) > 0$). Thus, the estimated urban wage premium, $\hat{\beta}$, is predicted to be significantly lower if some reliable measures of worker quality are introduced into a wage regression.

Hence, we use two steps to address the problem of omitted variable bias in the cross sectional analysis and to test the robustness of our results. First, we repeat the baseline analysis using various additional control variables. Second, we extend our baseline analysis to include a measure of unobservable skills for each extended specification. These additional control variables are 1) firm size as a confounding factor for the urban/non-urban wage gap and 2) years of schooling as a standard measure of observable skills.

Beginning with our baseline cross-sectional analysis, we estimate the regressions of the form

$$y_i = X_i'\beta + u_i , \tag{2}$$

where y_i is log earnings; X_i is a vector of individual characteristics such as experience and its square, gender, marriage status, and urban dummy; and while u_i is a random error. This specification is estimated separately for each country, allowing the relationship between all explanatory variables and annual earnings to differ across countries. Table 3 shows the results. The first column shows our baseline estimate of the urban/non-urban wage gap for Switzerland with controls for baseline covariates. The substantial wage gap between urban workers and non-urban workers is evident in our sample for all three countries in accordance with other studies in the US. In columns 1, 3, and 5 in Table 3, the urban/non-urban wage gaps range from 16.7 percent ($=e^{.155}-1$) in Switzerland to about 34 percent in Poland.

The new measures of worker quality are added to Equation (2) to give the extended specification, which is reported in the second column for each country in Table 3. The literacy scores are statistically significant determinants of wages in all three countries. Moreover, these literacy measures are quantitatively important, with a standard deviation increase in average literacy score raising the wages by about 15 percent. However, the addition of the literacy measures has very little effect on the estimated urban wage premium, reducing it by between one and four percentage points. Although not shown in Table 3, tests on the statistical significance of this reduction indicate that we cannot reject the null hypothesis, which indicates that the addition of the literacy

TABLE 3
ESTIMATES OF THE URBAN/NON-URBAN WAGE GAP

	Switzerland		Poland		New Zealand	
	Basic Coef (SE)	Extended Coef (SE)	Basic Coef (SE)	Extended Coef (SE)	Basic Coef (SE)	Extended Coef (SE)
Intercept	9.974 (.090)***	9.086 (.202)***	9.646 (.111)***	9.159 (.157)***	9.111 (.083)***	8.032 (.150)***
Male	.455 (.053)***	.435 (.051)***	.362 (.044)***	.369 (.043)***	.655 (.043)***	.656 (.053)***
Married	.261 (.082)***	.249 (.080)***	.072 (.071)	.063 (.072)	.197 (.066)***	.139 (.059)***
Experience	.029 (.008)***	.032 (.008)***	.065 (.009)***	.065 (.009)***	.050 (.008)***	.047 (.007)***
Experience^2	-.000 (.000)***	-.000 (.000)***	-.001 (.000)***	-.000 (.000)***	-.000 (.000)***	-.000 (.000)***
Urban dummy	.155 (.056)***	.144 (.054)*	.294 (.050)***	.249 (.051)***	.209 (.044)***	.176 (.044)***
Average Literacy Score		.003 (.000)***		.002 (.000)***		.004 (.000)***

Superscripts ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively.

variables has no impact on the estimated urban wage premium.

Next, we repeat the process of adding the new measures of worker quality to the wage regressions, but this time the basic regressions consider potentially confounding variables such as firm size or observable human capital of workers. The aim is to determine whether the control for omitted worker quality has a similar non-impact on the estimated urban/non-urban wage gap in each country, when a slightly different specification than that in Table 3 is used, as in the following form:

$$y_i = X_i'\beta + \theta z_i + u_i\,, \tag{3}$$

where z_i is a confounding factor (either firm size or education).

Table 4 summarizes the estimated coefficients on the urban dummy across the specifications. In the extended specification to the baseline model, we also control for either firm size or education one at a time.

TABLE 4
URBAN/NON-URBAN WAGE GAP WITH DIFFERENT SKILL MEASURES

	Switzerland Coef (SE)	Poland Coef (SE)	New Zealand Coef (SE)
(1) Baseline Model Urban/Non-Urban Wage Gap	.155(.056)**	.294(.050)***	.209(.044)***
(2) = (1) + Firm Size Urban/Non-Urban Wage Gap	.129(.056)**	.239(.051)***	.155(.044)***
(3) = (1) + Years of Schooling Urban/Non-Urban Wage Gap	.095(.054)*	.163(.051)***	.168(.043)***
(4) = (1) + Average Literacy Score Urban/Non-Urban Wage Gap	.144(.054)*	.249(.051)***	.176(.044)***
(5) = (2) + Average Literacy Score Urban/Non-Urban Wage Gap	.121(.053)**	.196(.052)***	.129(.043)***
(6) = (3) + Average Literacy Score Urban/Non-Urban Wage Gap	.101(.053)*	.158(.052)***	.156(.043)***

Superscripts ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively.

Adding these control variables reduces the urban/non-urban wage gap substantially in all three countries. The size of this reduction varies across countries. For example, urban premium is reduced by 44.5 percent in Poland but only by 16.5 percent in New Zealand. However, similar to the results in Table 3, even with the extended baseline with those confounding factors, the regressions that add the average literacy score do not reduce the urban/non-urban wage gap significantly. In summary, additionally controlling for the assessed literacy levels from the IALS does not reduce the size of the urban premium significantly, regardless of whether this comparison is made with or without controls for years of schooling as a measure of observable worker quality. However, controlling for years of schooling reduces the size of the urban premium substantially, and these patterns are consistent across the countries included in this study. That is, substantial urban/non-urban wage gap occurs because urban workers are more skilled in observable skills, such as education, rather than in talent or accumulated skills. The urban/non-urban wage gap also occurs independently of the big-firm premium, and the worker quality explanation does not effectively account for both premiums.

TABLE 5

TEST FOR RAPID HUMAN CAPITAL ACCUMULATION IN URBAN AREAS

	Switzerland		Poland		New Zealand	
	Without Literacy Score Coef (SE)	With Literacy Score Coef (SE)	Without Literacy Score Coef (SE)	With Literacy Score Coef (SE)	Without Literacy Score Coef (SE)	With Literacy Score Coef (SE)
Intercept	8.964 (.158)***	8.641 (.213)***	8.528 (.182)***	8.451 (.192)***	8.122 (.144)***	7.556 (.169)***
Male	.388 (.048)***	.390 (.048)***	.345 (.044)***	.345 (.044)***	.690 (.041)***	.686 (.041)***
Married	.254 (.062)***	.246 (.062)***	.036 (.068)	.036 (.068)	.128 (.062)***	.105 (.059)*
Experience	.030 (.007)***	.031 (.007)***	.061 (.011)***	.061 (.011)***	.061 (.009)***	.058 (.008)***
Experience^2	-.0004 (.000)***	-.0004 (.000)***	-.001 (.000)***	-.001 (.000)***	-.001 (.000)***	-.001 (.000)***
Firm Size, Large (500+)	.238 (.064)***	.225 (.064)***	.307 (.060)***	.307 (.060)***	.244 (.048)***	.231 (.047)***
Firm Size, Med Large (100-499)	.199 (.069)***	.215 (.068)***	.132 (.059)**	.132 (.059)**	.241 (.057)***	.232 (.055)***
Firm Size, Small (20-99)	.266 (.081)***	.277 (.079)***	.030 (.062)	.030 (.062)	.208 (.071)***	.206 (.070)***
Education	.065 (.008)***	.051 (.008)***	.078 (.008)***	.074 (.008)***	.058 (.007)***	.035 (.007)***
Urban Dummy	.197 (.188)	.216 (.187)	.036 (.188)	.020 (.188)	-.020 (.153)	-.077 (.153)
Experience* Urban Dummy	-.014 (.017)	-.015 (.017)	.009 (.017)	.010 (.017)	.0189 (.014)	.025 (.014)
Experience^2* Urban Dummy	.0003 (.0003)	.0003 (.0003)	-.0002 (.0003)	-.0002 (.0003)	-.0005 (.00029)	-.0005 (.00029)
Average Literacy Score		.002 (.000)***		.0005 (.0003)		.003 (.000)***

Superscripts ***, **, and * represent statistical significance at the 1, 5, and 10 percent levels, respectively.

Subsequently, we check the hypothesis of Glaeser and Maré (2001) on knowledge spillovers or learning-by-doing in urban areas, which might cause the gradual accumulation of more human capital by urban workers than non-urban workers. Consistent with this hypothesis, the authors find that the cross-sectional wage gap between urban areas and non-

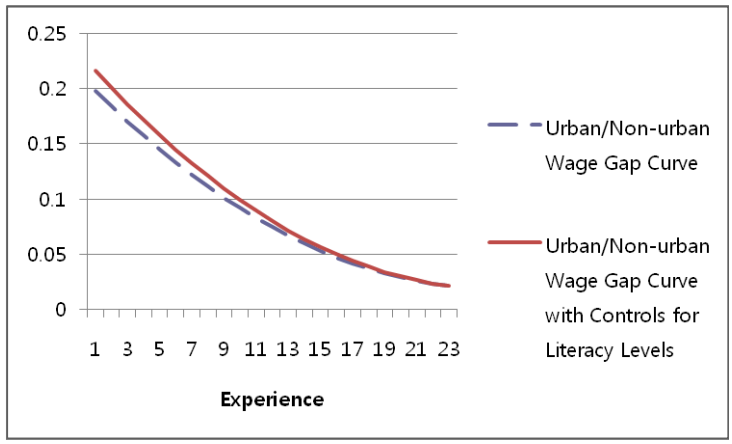

FIGURE 1
INTERACTION BETWEEN EXPERIENCE AND THE URBAN/NON-URBAN WAGE GAP IN SWITZERLAND

urban areas is greater for more experienced workers. Again, we will verify this empirical implication more directly by investigating what happens when workers' (accumulated) unobservable skills are introduced into a baseline wage regression with interaction variables between experience and urban status.

In Table 5, we examine how the urban/non-urban wage gap interacts with experience. In two of the three countries, the urban/non-urban wage gap is greater with higher experience, as shown in Figures 2 and 3. There is a negative interaction of the urban dummy with the experience and experience square variables in Switzerland. There is a positive interaction of the urban dummy with the experience variables in Poland but is not statistically significant in a joint test. A joint test for the hypothesis of zero coefficients for the interaction of the urban dummy with the experience and experience square variables rejects it in New Zealand only. In New Zealand, as shown in Figure 3, the estimated urban coefficient is about 0.2 greater at 20 years of experience than at zero years of experience.

However, in contrast to the rapid unobservable human capital accumulation in urban areas, we also find that this positive interaction between the urban/non-urban wage gap and experience remains the same after controlling for the average literacy score.

Therefore, our analyses of the three countries in comparing the in-

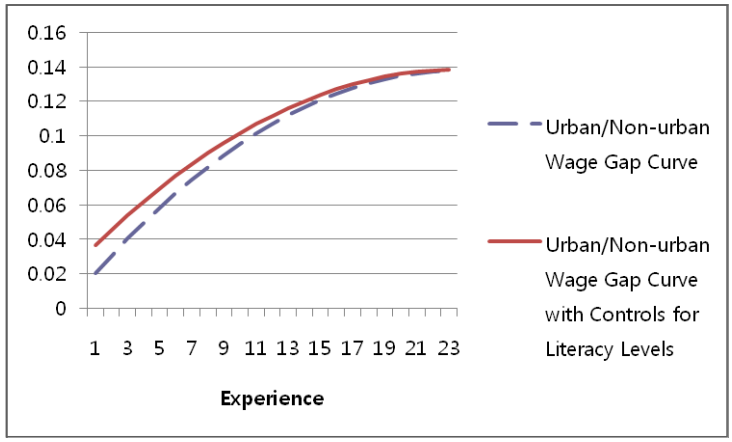

FIGURE 2
INTERACTION BETWEEN EXPERIENCE AND THE URBAN/NON-URBAN WAGE GAP IN POLAND

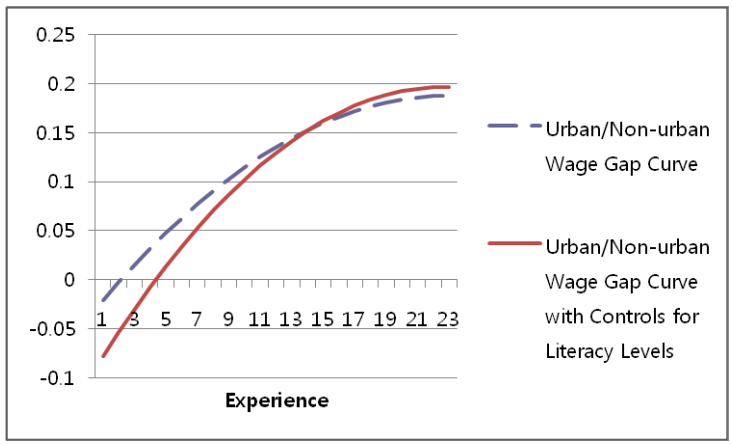

FIGURE 3
INTERACTION BETWEEN EXPERIENCE AND THE URBAN/NON-URBAN WAGE GAP IN NEW ZEALAND

teraction effects of experience and the urban wage premium, with and without controlling for unobservable skills, show that these skills do not alter the basic patterns in any country.

In summary, we do not confirm the findings of Glaeser and Maré of a positive interaction between the urban/non-urban wage gap and ex-

perience in all three countries. Moreover, our results also do not support the hypothesis that more rapid human capital accumulation in urban areas results in the positive interaction between the urban wage gap and experience in Poland and New Zealand.

IV. Conclusion

We conduct a test to determine whether the observed urban/non-urban wage gap is a return to unobservable ability by observing what happens to an estimated urban/non-urban wage gap if new measures of worker quality are introduced into a wage regression. Our measure of worker quality is the workers' literacy levels taken from the IALS. Similarly, we also test the hypothesis of Glaeser and Maré (2001) on knowledge spillovers or learning-by-doing in urban areas by determining what happens when workers' (accumulated) unobservable skills are introduced into a baseline wage regression with interaction variables between experience and urban status. Additionally controlling for the assessed literacy levels from the IALS insignificantly reduces the size of the urban premium, with or without controls for years of schooling as an observable worker quality variable. Thus, our empirical results do not support the explanations on worker quality for the urban/non-urban wage gap.

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References

Bronars, Stephan, and Oettinger, Gerald. "Estimates of the Return to Schooling and Ability: Evidence from Sibling Data." *Labour Economics* 13 (No. 1 2006): 19-34.

Devroye, Dan, and Freeman, Richard. Does Inequality in Skills Explain Inequality in Earnings Across Advanced Countries? Institute for Fiscal Studies Working Paper No. 04/08, 2001.

Freeman, Richard, and Schettkat, Ronald. "Skill Compression, Wage Differentials, and Employment: Germany vs the US." *Oxford Economic Papers* 53 (No. 3 2001): 582-603.

Gibson, John K., and Stillman, Steven. "Why Do Big Firms Pay Higher Wages? Evidence From an International Database." *Review of*

Economics and Statistics 91 (No. 1 2009): 213-8.

Glaeser, Edward L., and Gottlieb, Joshua D. "The Economics of Place-Making Policies." *Brookings Papers on Economic Activity* (No. 1 2008): 155-253.

Glaeser, Edward L., and Maré, David C. "Cities and Skills." *Journal of Labor Economics* 19 (No. 2 2001): 316-42.

Green, David, and Riddell, W. Craig. "Literacy and Earnings: An Investigation of the Interaction of Cognitive and Unobserved Skills in Earnings Generation." *Labor Economics* 10 (No. 2 2003): 165-84.

Harris, John R., and Todaro, Michael P. "Migration, Unemployment and Development: A Two-Sector Analysis." *American Economic Review* 60 (No.1 1970): 126-42.

Johnson, D. Gale. "Comparability of Labor Capacities of Farm and Nonfarm Labor." *American Economic Review* 43 (No. 3 1953): 296-313.

Kim, Bonggeun. *The Wage Gap between Metropolitan and Non-metropolitan Areas.* mimeo, University of Michigan, June, 2002.

Kim, Yong Jin. "A Hierarchy of Human Capital and Economic Growth." *Seoul Journal of Economics* 5 (No. 4 1992): 317-35.

Krugman, Paul. "Increasing Returns and Economic Geography." *Journal of Political Economy* 99 (No. 3 1991): 483-99.

Lee, Chul-In. "Can Search-Matching Models Explain Migration and Wage and Unemployment Gaps in Developing Economies? A Calibration Approach." *Journal of Regional Science* 50 (No. 2 2010): 635-54.

Lucas, Jr., Robert E. "On the Mechanics of Economic Development." *Journal of Monetary Economics* 22 (No. 1 1988): 3-42.

McIntosh, Steven, and Vignoles, Anna. "Measuring and Assessing the Impact of Basic Skills on Labor Market Outcomes." *Oxford Economic Papers* 53 (No. 3 2001): 453-81.

Page, Marianne E., and Solon, Gary. "Correlations between Brothers and Neighboring Boys in Their Adult Earnings: The Importance of Being Urban." *Journal of Labor Economics* 21 (No. 4 2003): 831-55.

Rauch, James. "Productivity Gains from Geographic Concentration of Human Capital: Evidence from the Cities." *Journal of Urban Economics* 34 (No. 3 1993): 3-33.