

The Impact of Education and Urbanization on Productivity

Research Conducted by Michael Baker and Daniel Trefler, University of Toronto

Background

Figure 7 of Working Paper 2 published by the Institute for Competitiveness and Prosperity (<http://www.competeprosper.ca/public/release210802.html>) plots urbanization against productivity for the most populous 16 North American jurisdictions. Its finding of a positive correlation between the degree of urbanization (the percentage of a state's or province's population living in an MSA or CMA with more than 100,000 people) and productivity may simply be a reflection of the fact that cities have more educated workers. The Institute engaged Professors Michael Baker and Daniel Trefler of the University of Toronto to analyze this relationship more closely. They approached this in two ways. First they determined whether or not the observed relationship between productivity and urbanization holds up even after controlling for cities' propensity for having more educated workers. Second they attempted to identify the synergy between city dwelling and the returns to education. Specifically, they analyzed whether or not the returns to an advanced degree (M.A. or more) are higher for those workers who choose to locate in cities.

Summary of Research and Findings

Baker and Trefler examined survey data from the US *Current Population Survey* and Statistics Canada's *Survey of Consumer Finances*. These surveys gather data on earnings, education, place of residence, and age for 65,000 individuals in the US and 39,000 in Canada. Because of the close relationship between earnings and productivity, Baker and Trefler used the former as a proxy for the latter.

First, Baker and Trefler replicated the Institute's productivity-urbanization relationship analysis and extended it by considering personal income (in place of state/province productivity) and by examining 60 North American jurisdictions (in place of 16 jurisdictions). As in the Institute's study, they found a strongly positive and statistically significant relationship. Next, they modified individuals' incomes to hold other factors – education, labour force experience, and sex – constant and re-calculated the relationship between urbanization and “adjusted” income. They found that the relationship based on adjusted income was as strong if not stronger than the relationship based on unadjusted income. This point is illustrated in figures 1 and 2 which show little difference in the relationships of urbanization against unadjusted

income and adjusted income, respectively. This means that the productivity-urbanization relationship among 60 jurisdictions is not driven simply by human capital, labour force experience, or demographics.

Baker and Trebler also found that if one looks just at the 16 jurisdictions considered in Task Force Working Paper 2, the relationship is somewhat altered. Specifically, the relationship between adjusted income and urbanization is not as strong as the relationship between unadjusted income and urbanization.

They conclude that there is a complex synergy between cities and education whose nature requires further investigation. One hypothesis is that much of the high productivity in urban centers is caused by high levels of investment in education. Another hypothesis is that the vitality of urban centers creates a demand for education, thus drawing educated workers into the city. The most likely explanation lies somewhere in between: there is a unique synergy between education and the types of economic and social activity that happens in urban centers.

To investigate this further, Baker and Trebler hypothesized that if urban environments do indeed add value to personal investments in education, then returns to education should be higher in cities than in rural settings. To this end, they calculated the difference between city-dweller and non-city-dweller earnings for various levels of education. If urbanization has no impact on productivity, average earnings for city dwellers with an advanced degree shouldn't differ appreciably from those of non-city dwellers. Baker and Trebler found that individuals with a Master's degree or higher living in cities earned 9.9 percent more than advanced degree holders living in smaller centres. On the opposite end of the spectrum, the returns to education for those with only a high school diploma or less were 9.2 percent lower in urban settings. This means that urban environments offer few synergies for those who have not made big investments in education. Table 1 provides additional details. Baker and Trebler concluded that "there is an important synergy between urbanization and returns to education".

Details of the research and its findings follow.

I. ASSESSING THE URBANIZATION- INCOME RELATIONSHIP

The first analytical challenge is to factor out other drivers of earnings to determine if the urbanization – earnings relationship still hold. First, we explain the mathematical model developed by Baker and Trebler and then discuss the findings and implications.

The Mathematical Model

Let $\ln w_i$ be the earnings of worker i . The worker lives in the state or province r . The worker's educational attainment is s which can be primary school only, high school dropout, high school graduate, post-secondary dropout, post-secondary diploma, B.A., and post-B.A. (M.A., professional, and Ph.D.). More specific detail on definitions of the educational attainment data appear below. The worker's experience in the labour force is represented by Exp_i (it equals age less 16 years), ρ_r is the dummy for region r and α_s is the dummy for attaining education level s .

Baker and Trefler consider the following regression:

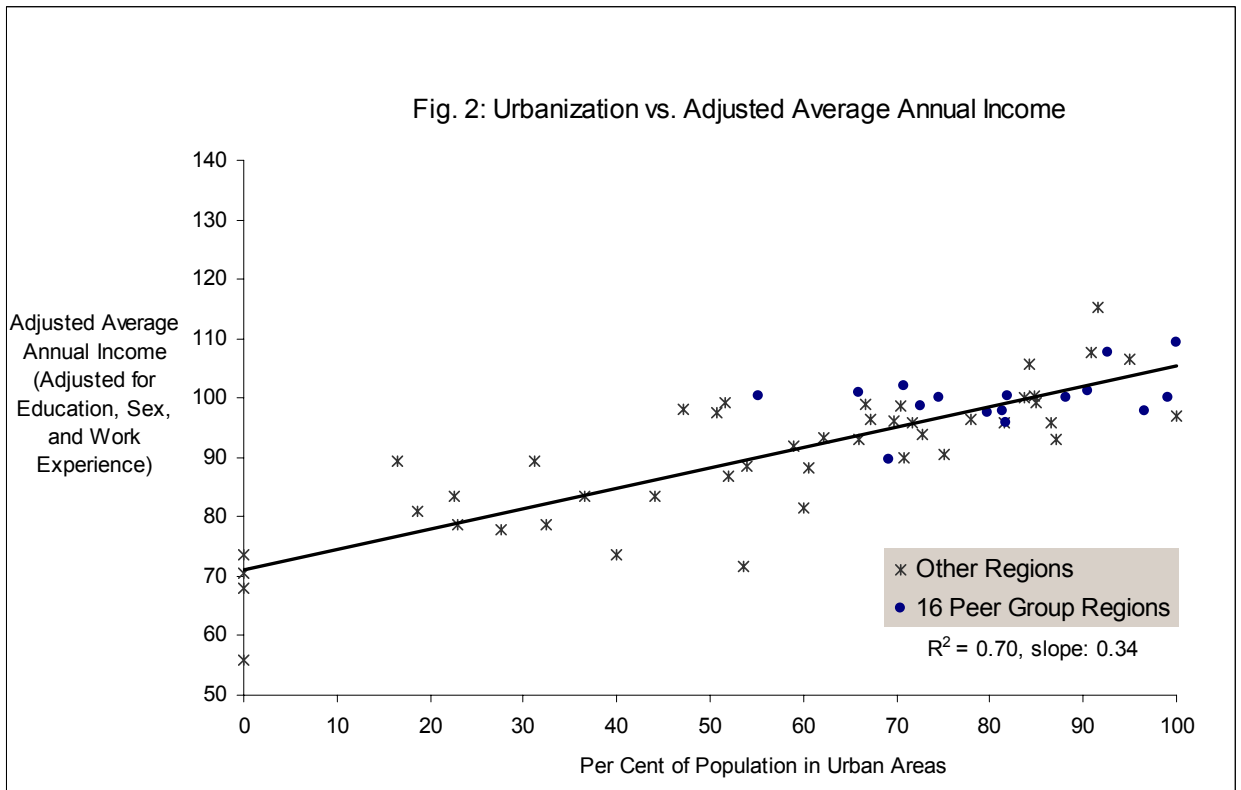
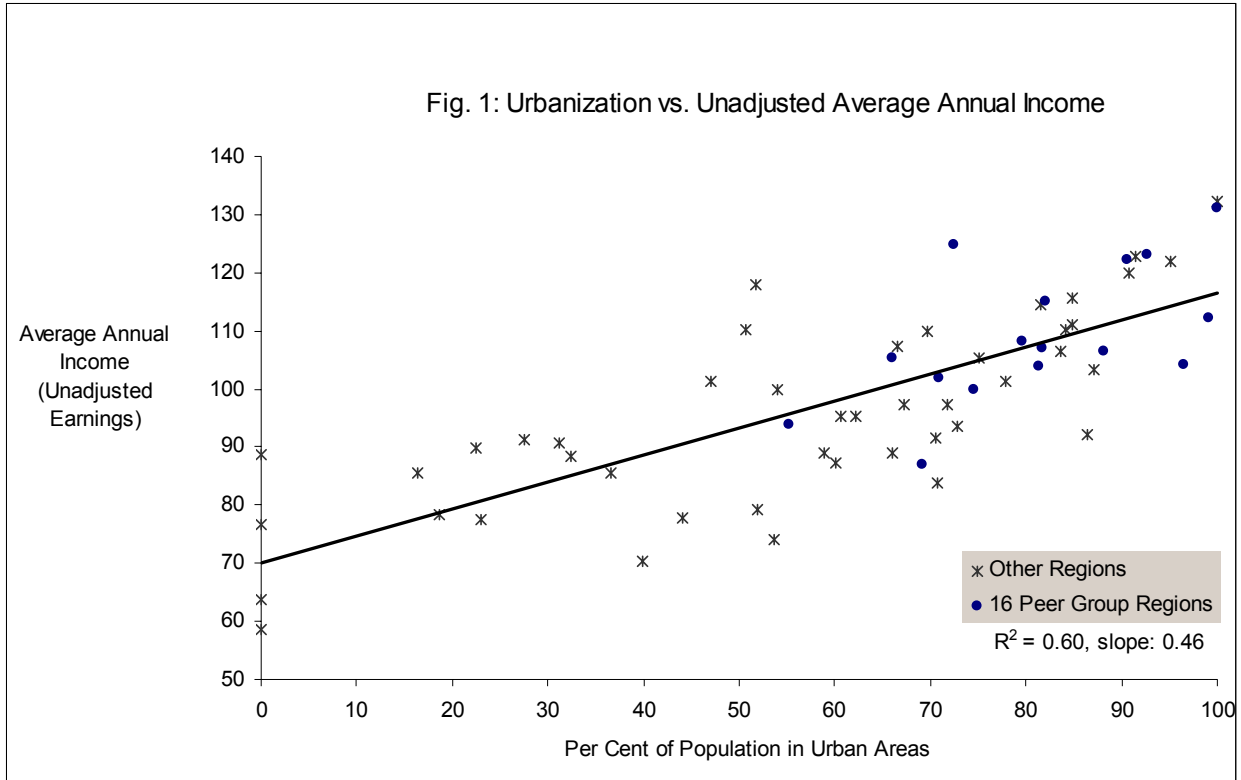
$$\ln w_{ir} = \rho_r + \alpha_s + \beta_{A1}Exp_i + \beta_{A2}Exp_i^2 + \beta_{A3}Exp_i^3 + \gamma SEX_i + \varepsilon_i \quad (1)$$

Why is this interesting? ρ_r is the average earnings in the state or province after controlling for the demographics of the state i.e., educational attainment, workforce experience, and sex.

Findings and Conclusions

Figures 1 and 2 give the key result. They repeat figure 7 from the Institute's Working Paper 2 (Productivity versus Urbanization), but first in Figure 1 the y-axis is changed from Productivity to average earnings (relative to Ontario which is indexed at 100) and then in Figure 2 income is "adjusted" to control for education, work experience, and sex - using ρ_r in place of average earnings (again relative to Ontario which is indexed at 100). The two figures use data from all 60 North American jurisdictions. The slope, after adjusting the earnings data, remains positive and significant. That is, even after controlling for individuals' education, experience, and sex, there is a positive relationship. *In short, it is not just education that is driving the earnings-urbanization relationship.*

When one looks across all provinces and states the slope falls from 0.46 to 0.34. Second, the correlation is much higher when we adjust for education, experience, and sex. It is 0.70 for the adjusted relationship and 0.60 for the raw relationship.



II. SYNERGIES BETWEEN CITIES AND THE RETURNS TO ADVANCED DEGREES

The next approach looks directly for synergies between urbanization and returns to education. Consider running the regression in equation (1), but this time separately for workers in urban areas (population greater than 100,000) and non-urban areas. If there are synergies then urbanized areas should have higher returns to university education than non-urbanized areas. Table 1 reports the results.

Findings and Conclusions

Table 1. The Relationship Between Annual Earnings and the Returns to Education: Urban Versus Rural

		High School Dropout	High School Graduate	Post-Secondary Dropout	Post-Secondary Diploma	B.A.	Masters, Professional, Ph.D.
All Workers	α_s	0.070	0.583	0.670	0.833	1.065	1.354
	(std. err.)	0.019	0.017	0.017	0.019	0.018	0.019
Rural Workers (<100,000)	α_s	0.136	0.591	0.656	0.861	1.025	1.249
	(std. err.)	0.031	0.029	0.030	0.033	0.032	0.036
Urban Workers (>100,000)	α_s	0.045	0.578	0.660	0.817	1.049	1.349
	(std. err.)	0.023	0.021	0.021	0.024	0.022	0.024
Difference: urban - rural		-0.092	-0.013	0.004	-0.045	0.025	0.099

Two results stand out. With regard to returns to education the major differences are in high school dropouts and advanced university degrees. Those with advanced degrees get a much bigger return to their education if they are in cities. They earn 10.4% more – the translation of the 0.099 log-point difference seen in Table 1. Second, high school drop outs earn much more if they locate outside of cities. They earn 8.8% - the translation of the 0.092 log-point difference - more outside of cities. *To conclude, there is an important synergy between urbanization and returns to education.*

DATA SOURCES

The major challenge for this research was in data collection which was addressed by Michael Baker, arguably one of Canada's leading authorities on this topic. He is also the spearhead for the initiative to move the micro-data they used from Ottawa to the University of Toronto.

US Data

1. Source: U.S. Current Population Survey, March and September 1998 (which asks questions retrospectively back to 1997).

2. Size: About 65,000 individuals.

3. Annual earnings data are defined as income from wages and salary, including pay for overtime, tips and commissions. All data are before deductions. Weekly earnings data are annual earnings divided by the number of weeks worked (including paid vacation and sick leave). All workers are included except those who work without pay and those self-employed who are either unincorporated or are farmers. (These workers can be included, but experience shows that their reported income and weeks data are unreliable.)

4. Education data are coded as follows (raw classification in brackets):

- Primary (grades 1-8)
- High School Dropout (grades 9-12, but did not complete grade 12)
- High School Graduate (High school graduate - High school diploma or equivalent)
- Post-Secondary Dropout (Some college but no degree)
- Post-Secondary Diploma (Associate's degree in college - occupational/vocational OR Associate's degree in college - academic)
- B.A. (Bachelor's degree e.g., BA, BS, AB)
- Masters, Professional, and Ph.D: Master's degree (e.g., MA, MS, MEng,

- MEd, MSW, MBA) or Professional school degree (e.g. MD, DDS, DVM, LLB, JD) or Doctorate degree (e.g., PhD, EdD)

Canadian Data

1. Source: Survey of Consumer Finances, 1998 (which asks about 1997 income)
2. Size: About 39,000 individuals.
3. The earnings data are identical to the U.S. definitions. This was the hard part. It turns out that 1997 was the last year for which the definitions were the same in both countries.
4. Education data are coded as follows (raw classification in brackets).
 - Primary (grades 1-8)
 - High School Dropout (grades 9-13, but did not complete high school)
 - High School Graduate (grades 11-13, graduated from high school)
 - Post-Secondary Dropout (Some post-secondary education, no degree certificate or diploma)
 - Post-Secondary Diploma (Trades certificate or diploma from a vocational school or apprenticeship training; Non-university certificate or diploma from a community college, CEGEP, school of nursing, etc.; University certificate below bachelor's level)
 - B.A. (Bachelor's degree)
 - Masters, Professional, and Ph.D. (University degree or certificate above bachelor's level)

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