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Social Returns to Human Capital

Enrico Moretti*

My research focuses on different areas in applied microeconomics. One of these areas is the economics of education. My work on this area centers on the issue of social returns to human capital. After 40 years of research on the relationship between education and earnings, economists now have a solid understanding of the private benefits of schooling. But much

less is known about the social returns to education, even though economists have speculated about the possibility of human capital externalities for at least a century. Theory predicts that increases in the overall level of education can benefit society in ways that are not fully reflected in the wages of educated workers. Human capital spillovers may increase productivity over and above the direct effect of education on individual productivity. Furthermore, increases in education also may reduce criminal participation and improve voters' political behavior.

The possibility that the social return to human capital differs from its

private return has tremendous practical importance. For example, the magnitude of the social return to education is a crucial tool for assessing the efficiency of public investment in education, since state and local governments subsidize almost all direct operating costs of primary and secondary educational institutions. In fact, much of the argument for public education is based on the recognition that education not only rewards the educated individual, but also creates a variety of benefits that are shared by society at large.

Despite the significant policy implications and a large theoretical literature that assumes the existence of

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spillovers from education, empirical evidence on the magnitude of these spillovers is limited. My papers in this area try to fill this gap.

Education, Productivity, and Wages

In three related papers, I focus on the effect of changes in the overall level of human capital on productivity and wages. A large body of *theoretical* literature in macroeconomics and urban economics has argued that productivity spillovers are important determinants of economic growth. These spillovers arise if the presence of educated workers makes other workers more productive. In this case, an increase in aggregate human capital will have an effect on aggregate productivity that is quite different from the effect of an increase in individual education on individual productivity.

Using a unique firm-worker matched dataset, obtained by combining the Census of Manufacturers with the Census of Population, I assess the magnitude of productivity spillovers from education in U.S. cities by estimating plant-level production functions.¹ While other studies have attempted to measure spillovers by looking at cross-city differences in wages, this is the first study to measure spillovers by directly focusing on firms' productivity. I find that the output of plants located in cities that experience large increases in the share of college graduates rises more than the output of similar plants located in cities that experience small increases in the share of college graduates. Furthermore, I find that spillovers between industries that are in the same city and economically (or technologically) close are larger than spillovers between industries in the same city but economically (or technologically) distant. For example, I find that aggregate human capital in the high-tech sector of the city matters more for high-tech plants than aggregate human capital in the low-tech sector of the city; and aggregate human capital in the low-tech sector matters more for low-tech plants than aggregate human capital in high-tech plants. Notably, this result generalizes when I use three alternative measures of economic and technolog-

ical distance: input-output flows, technological specialization as measured by distribution of patents across technologies, and frequency of patent citation. Importantly, the estimated productivity differences between cities with high and low levels of human capital appear to match differences in labor costs between cities with high and low levels of human capital remarkably well. Consistent with a model that includes both standard general equilibrium forces and spillovers, the productivity gains generated by human capital spillovers are offset by increased labor costs.

In a related paper,² I estimate productivity spillovers from college education by comparing wages for otherwise similar individuals who work in cities with different shares of college graduates in the labor force. This is one of the first studies (together with Acemoglu and Angrist, 2000) to account for the non-random distribution of human capital across cities in estimating human capital spillovers. I use longitudinal data to estimate a model of non-random selection of workers among cities and account for unobservable city-specific demand shocks using an instrumental variable strategy. I find that a percentage point increase in the supply of college graduates raises high school drop-outs' wages by 1.9 percent, high school graduates' wages by 1.6 percent, and college graduates' wages by 0.4 percent. The effect is larger for less educated groups, as predicted by a conventional demand and supply model. But even for college graduates, an increase in the supply of college graduates increases wages, as predicted by a model that includes conventional demand and supply factors as well as spillovers.

In a third paper,³ I try to present a unified equilibrium framework with productivity spillovers. The framework indicates that geographically local productivity spillovers can be identified either directly — by comparing the productivity of firms in cities with different overall levels of human capital, holding constant firms' individual characteristics — or indirectly, using factor prices (wages and land prices). My framework also clarifies the relationship between the estimates

obtained from these two empirical strategies. I use this framework to interpret and evaluate the existing literature on human capital spillovers.

Education and Crime

Economists have long hypothesized that education may reduce the probability that an individual will engage in activities that generate negative externalities. Crime is one such negative externality with enormous social costs. If education reduces crime, then schooling will have social benefits that are not taken into account by individuals. In this case, the social return to education may exceed the private return. Given the large social costs of crime, even small reductions in crime associated with education may be economically important. Despite many theoretical reasons to expect a causal link between education and crime, the empirical research to date is far from conclusive, since previous studies have failed to account for the potential endogeneity of schooling.

Lance Lochner and I analyze the effect of schooling on incarceration using changes in state compulsory attendance laws as an instrument for schooling.⁴ Changes in these laws have a significant effect on educational attainment, and we reject tests for reverse causality. We find that schooling significantly reduces the probability of incarceration. Differences in educational attainment between black and white men explain 23 percent of the black-white gap in incarceration rates. We corroborate our findings on incarceration using FBI data on arrests. We find that education has a larger impact on murder, assault, and motor vehicle theft than on other types of criminal activity. We also examine the effect of schooling on self-reported crime in the National Longitudinal Survey of Youth and find that our estimates for imprisonment and arrest are caused by changes in criminal behavior and not educational differences in the probability of arrest or incarceration conditional on crime.

Calculating the social savings from the crime reduction associated with high school graduation is crucial for deriving policy implications. We estimate the savings to be about

\$1,170-\$2,100 per additional high school graduate, or 14-26 percent of the private return. This suggests that a significant part of the social return to completing high school comes in the form of externalities from crime reduction. A single percent increase in the high school completion rate of all men ages 20-60 would save the United States as much as \$1.4 billion per year in reduced costs from crime incurred by victims and society at large.

Education and Health

Higher levels of education may also result in better health for educated individuals and their children. If parental education indeed improves child health, then conventional estimates of the returns to education that focus only on wages may understate the total benefits of human capital accumulation. Moreover, to the extent that healthier children go on to be more productive and more educated adults, there will be important inter-generational spillovers that analyses of wage effects alone will not capture.

Janet Currie and I examine the effect of maternal education on birth outcomes for children in the United States.⁵ We also assess the importance of four channels through which maternal education may improve birth outcomes: use of prenatal care, smoking, marriage, and fertility. We use unique self-collected data on college openings to build an instrument for maternal education. We find that higher maternal education improves infant health. It also raises the probability that a new mother is married, reduces fertility, increases her use of prenatal care, and reduces the chances that she smokes. Hence, our results add to the growing body of literature that suggests that estimates of the returns to education focusing only on increases in wages may significantly understate the total return.

We are continuing to examine issues related to the inter-generational

transmission of human capital in current research, using matched mother-child vital statistics records from California. In a new series of projects, we use confidential information on mother's name and child date of birth to link mothers across deliveries and with their own birth certificate. The result is one of the first large-scale multigenerational, longitudinal samples of women. We are currently using this dataset for three projects on the inter-generational effects of improvements in women's health.

Education and Voting

Educators and politicians often argue that a more educated electorate enhances the quality of the democratic process. If this is true, then education has social benefits over and above the private return, and Pigouvian subsidies for education may produce more efficient human capital acquisition decisions. Interestingly, this argument is raised not only by those who support a larger role for the government. The same argument resonates with noted advocates of a limited role for government. For example, Adam Smith and Milton Friedman have argued for public subsidies to education on the grounds that a better-educated electorate makes better decisions on policy issues affecting the economy. Yet, the existing empirical evidence on education and citizenship is generally not very informative, as it ignores the potential endogeneity of schooling.

Kevin Milligan, Philip Oreopoulos, and I test whether schooling improves civic participation in the United States and the United Kingdom, as measured by the probability of voting, accounting for the endogeneity of schooling.⁶ We also test whether more educated voters have better information on candidates and campaigns. More informed voters are arguably better voters. We find a strong effect of education on voting in the United States. The effect appears to be largely attributable to differences in

voting registration across education groups. Results from the United Kingdom, where people are legally obligated to vote and are actively assisted in registering, show little effect of education on voting. We also find strong and persistent effects of education on civic behavior in both the United States and the United Kingdom. Notably, better-educated adults are more likely to follow election campaigns in the media, be aware of candidates' platforms, discuss politics with others, and associate with a political group.

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