



Estimating the education-earnings equation using geographic variation



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ARTICLE INFO

Article history:

Received 9 July 2015
Revised 10 March 2016
Accepted 21 March 2016
Available online 22 April 2016

Keywords:

Postsecondary education
Economic returns
Geospatial variation
Instrumental variables
Community college
Human capital

ABSTRACT

We expand on the literature on the causal impact of postsecondary education on earnings by introducing a richer set of location-based measures as instruments for years of education. Utilizing data from the National Longitudinal Study of Youth, 1997, we implement six different sets of instruments based on geographic variation: presence of a four-year or two-year college in the county, inverse log distance to in-state two-year colleges, distance-weighted tuition and distance-weighted enrollment at in-state two-year colleges, and inverse log distance to all colleges. We find that these alternative measures yield differing estimates of the impact of educational attainment on earnings. Using our preferred measure of geographic variation, one additional year of postsecondary attainment results in a 9.7% increase in yearly earnings. We find a larger impact of postsecondary attainment for women, and no measurable impact of postsecondary attainment for men.

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1. Introduction

It is a truth widely acknowledged that the best way to earn a better living is to pursue more education. The vast majority of college students now say that being able to get a better job is a very important reason to go to college (Eagan, Lozano, Hurtado, & Case, 2014). The goal of much state and federal policy in the area of higher education is to increase both student access and success in order to improve the quality of the workforce (Carnevale, Smith, & Strohl, 2010). During the period of the late 2000s and into the second decade of the 21st century, serious concerns began to be raised about the value of a college degree (Oreopoulos & Petronijevic, 2013). The key question for policymakers and individuals alike is: to what extent does obtaining more education result in higher earnings?

Identification of the causal impact of education on earnings is known to be difficult in that individuals who pursue more education may be more likely to have a variety of both observable and unobservable characteristics that would lead them to have higher earnings (Card, 1999). This means that in standard regressions of earnings on education, the covariate for education would be correlated with the error term, biasing the results. One common identification strategy has been to use the presence or absence of a college in an individual's local area as an instrument for the number of years of education (Card, 1993; Carneiro & Heckman, 2002; Carneiro, Heckman, & Vytlačil, 2011; Kane & Rouse, 1995). Other location-based instruments that have been used include characteristics of colleges, such as the average tuition at public colleges in the student's local area (Carneiro & Heckman, 2002).

We expand on this literature in three ways. First, we use a richer set of instruments than in previous estimations. These instruments allow us to test whether the link between the location of colleges and years of education completed remains strong. In addition, this approach

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allows us to observe variation in local average treatment effects when different instrumental variables are used. Second, we provide estimates from the National Longitudinal Survey of Youth, 1997, (NLSY97) cohort between 2007 and 2010, when the youngest members of the cohort were between 23 and 26 and the oldest members of the cohort were between 27 and 30 (Moore, Pedlow, Krishnamurty, & Wolter, 2000). This was a tumultuous time in labor markets, during which many questioned whether education still had substantial returns. Last, we provide separate estimates for men and women. In many previous studies, the primary sample was males. During this time period, the proportion of women attending and graduating from college exceeded the proportion of men by substantial amounts (Doyle, 2010). We estimate the extent to which higher levels of education has differential payoffs for men and women.

We report both first- and second-stage estimates from two-stage least squares regression (Angrist & Krueger, 1999; Angrist & Pischke, 2008). We find in the first stage that the density of college opportunity has a statistically significant impact on the number of months of education attained, with particularly long-lasting effects for community colleges. We find in the second-stage estimates that the impact of education on earnings, even during the turbulent economic times of the late 2000s remains strong. The results for women show a larger impact of postsecondary attainment on earnings than for the sample as a whole, while the results for men show no observable relationship between postsecondary attainment and earnings.

The outline of this paper is as follows: we provide a brief background, describing previous studies in this area and their findings; we then describe our model and our identification strategy; next we provide a description of the data and our results, followed by a series of specification checks and sensitivity analyses; we conclude by discussing what we have learned from our analysis.

2. Background

We begin by describing the literature on the impact of education on earnings, with a focus on previous studies that have used instrumental variables approaches to estimate this relationship. We then turn to the role of geographic variation in predicting postsecondary attainment.

2.1. Link between education and earnings

Establishing the link between education and earnings has been a very large topic in labor economics over the last 30 years. The observed link between education and earnings in the population as a whole has been well-known for some time. The degree to which this link can be said to be causal has been the focus of most research and theory in this field (Card, 1999).

In their recent review of the returns to education (Oreopoulos & Petronijevic, 2013) find substantial evidence that education increases earnings, although recent studies have pointed to substantial heterogeneity in results. They also cite the ongoing debate in policy circles and in the popular media regarding whether college is “worth it.” This

debate is essentially about whether the observed relationship between higher earnings and education is actually a causal relationship. Analysts cite two primary reasons for doubting that the observed association between earnings and education is causal. The first reason is self-selection. The second is signaling (Oreopoulos & Petronijevic, 2013).

Self-selection occurs when those who will likely earn the most also choose to obtain the highest levels of education. Individuals may do this because they know that these investments will pay off more, or simply because they enjoy education more and choose to consume more of it (Card, 1999; 2001; Oreopoulos & Petronijevic, 2013). Analysts can overcome the problem of self-selection either by experimentally altering the amount of education available to one group or by seeking out natural experiments that more-or-less randomly assign some people to more education. The latter is the path that we take in our study, using the impact of geographic variation in college opportunity on educational attainment to mitigate the effects of self-selection.

Signaling is a more subtle problem. Signaling involves using overt behavior to signal private knowledge about an individual (Card, 2001). In the case at hand, individuals would go to college to signal employers that they are productive workers. Employers would respond to this signal by paying college-educated workers more. The impact of this signal, however, should fade over time as employers learn directly about workers. Under this scenario, individuals who go to college do not gain new skills during that time, but rather only signal to future employers the attributes that they already possess (Oreopoulos & Petronijevic, 2013). We do not directly address the signaling debate in our study, but work by Lange (2007) suggests that much of the earnings premium is due to education, as employers learn quickly which employees are productive. Lange estimates that the contribution of signaling to the returns to education are no more than 25% (Lange, 2007).

Many previous studies have attempted to identify the causal impact of schooling on earnings, excluding the effect of self-selection. One of the first analyses to use geographic variation as the basis for an instrumental variable to identify the education earnings equation was Card (1995). Using data from the Young Men Cohort of the National Longitudinal Survey (NLSYM), Card (1995) estimates the impact of educational attainment on earnings for young males. To identify the relationship, Card uses the presence or absence of an accredited four-year institution of higher education in the county where the young person lived at age 17. Card estimates the impact of an additional year of education on earnings as being about 7% using ordinary least squares (OLS), about 13% using geographic proximity of colleges as an instrument, and about 10% when interacting proximity with family background characteristics.

In his 1999 summary of the research on education and earnings, Card surveys the body of evidence that an additional year of education is tied to an increase of earnings on the order of 5–10%. Card concludes that the available evidence suggests that “the average (or average marginal) return to education in a given population is not much below the estimate that emerges from a simple

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