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Effects of quantity of education on health: A regression discontinuity design approach based on the Chinese Cultural Revolution

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ABSTRACT

In this paper, we exploit the negative educational shock caused by the Chinese Cultural Revolution to apply a regression discontinuity method in identifying the causal effects of education on health. While we find that better education reduces the probability of having poor self-assessed health and disabilities, we do not find statistically significant effects of education on the probability of having poor physical functioning status or uncomfortable body pains in the previous four weeks. Moreover, we find an interesting result that better education increases the probability of having chronic diseases. While most existing studies only identify the effect of education at a particular level, one contribution of our paper is that it provides estimates much closer to the population average effect. Moreover, our results imply that the underlying mechanism behind the effect of education on health might be different in developing countries from that in developed countries.

1. Introduction

Education is commonly recognized as fundamental to human development. A huge body of literature on the economic returns to education has been developed in the past several decades. Recently, the non-monetary returns to education have received increasing attention from economists. A large and persistent association between education and health has been documented extensively in the literature of both economics and other disciplines. In many countries and time periods, the better educated have been found to enjoy better health irrespective of whether it is measured by morbidity, disability, or mortality.[1] This is commonly referred as the education–health gradient.

It has been argued that policymakers may use educational policies to promote population health. On the other hand, reducing socioeconomic-related health inequalities is now on the policy agenda in many countries (Cutler & Lleras-Muney, 2008). To achieve either policy goal, we need to know more about the underlying mechanisms that are responsible for the association between education and health. In a very broad sense, there are three possible reasons for the observed education–health gradient. The first possibility is that there is a causal effect of education on health. More educated people may have higher income, better access to health care, better health behaviors, greater productivity in health, and higher self-esteem. All of those factors may result in positive contributions to health (Cutler & Lleras-Muney, 2008; Grossman, 1972). The second possibility is that health may affect an individual's educational achievement (Currie, 2009). Finally, there may be third factors that affect both schooling and health. For example, some parents may invest more in children's health and education than others.

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[1] For detailed reviews on this association, please refer to Cutler and Lleras-Muney (2008, 2012).

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Studying the mechanism that is responsible for the association between education and health is important to develop appropriate policy responses. In recent years, there has been a burgeoning literature on the causal effects of education on health and health behaviors. Generally speaking, it appears that the existence of a causal effect of education on health or health behaviors is not as clearly established as the association between education and health or health behaviors. While some studies find that education has causal impacts on the health measures or health behaviors examined (e.g., De Walque, 2007, 2010; Lleras-Muney, 2005; Oreopoulos, 2006, 2007), some other studies do not find such causalities (e.g., Arendt, 2005; Albouy & Lequien, 2009; Auld & Sidhu, 2005; Braakmann, 2011; Reinhold & Jurges, 2010). Also, some researchers find mixed evidence, i.e., causality exists for some but not all of the health measures examined, or only for some particular population groups (e.g., Adams, 2002; Groot & Maassen van den Brink, 2007; Kemptner, Jurges, & Reinhold, 2011; Kenkel, Lillard, & Mathios, 2006; Webbink, Martin, & Visscher, 2010).[2]

The purpose of our paper is to identify whether there is a causal effect of education on health using Chinese data. The 10 years of the Chinese Cultural Revolution (1966–1976) involved devastating social turmoil that had a large adverse impact on the education of Chinese youth in that period (Deng & Treiman, 1997; Giles, Park, & Wang, 2008; Meng & Gregory, 2002; Zhang, Liu, & Yung, 2007). The disruption of education in this period provides us with an opportunity to apply the regression discontinuity (RD) design approach to identify the causal effects of education on various measures of health.

Our study contributes to the existing literature in several ways. First, most existing studies on the causal effect of education on health implement an instrumental variable (IV) approach that relies on policy parameters, especially changes in compulsory education laws. Consequently, they identify the effect of education at a particular level of the education system, i.e., the effect of one more year of secondary schooling in the case of compulsory schooling laws used as the IV, or the effect of one more year of college education in the case of college proximity or draft avoidance used as the IV.[3] The effect of education on health could be heterogeneous across different levels of education (Cutler & Lleras-Muney, 2008). While local average effects certainly have their own importance, sometimes policymakers may have an interest in determining the average effect of education across all levels of education. The social turmoil in the Chinese Cultural Revolution had a large adverse impact on a significant proportion of the Chinese population at all levels of the education system. The first contribution of our study is to use this new source of educational shock to identify the effect of education on health, which might be much closer to the average population effect compared to previous studies.

Second, while some studies have focused on the association between education and health in developing countries, few have formally investigated the causal effect of education on health in such settings. There is some evidence that the association between education and health might vary at different levels of development. For example, Cutler and Lleras-Muney (2012) show that in richer countries the more educated have a lower body mass index (BMI), whereas in poor countries the more educated have a higher BMI. This may suggest that the causal effect of education on health also varies at different levels of development. Our paper is an early attempt to address this issue in the context of a developing country and our results confirm this point.

Third, from a methodological point of view, our paper adopts an approach—a regression discontinuity (RD) design—that requires much weaker assumptions than the IV approach.[4] Compared to the two other studies on the causal effect of education on health that adopt the RD design approach (Albouy & Lequien, 2009; Oreopoulos, 2006), our study pays extra attention to the sensitivity issues within the RD design framework.[5]

The rest of the paper is organized as follows. Section 2 provides the background to our study. Section 3 describes the estimation method. Section 4 presents the data and key variables, and provides a descriptive analysis. The empirical results are reported in Section 5. Section 6 concludes the paper.

2. Background

In May 1966, Mao Zedong, chairman of the Central Committee of the Chinese Communist Party, initiated a 10-year long "great proletarian Cultural Revolution" in China, which was one of the most tumultuous political upheavals in human history. The Cultural Revolution had a large adverse impact on the education of the Chinese youth in that period. During this 10-year period, the education system in urban China was thrown into chaos.

The main aim of the Cultural Revolution was to eradicate the emerging bureaucratic class (called "capitalist roaders") and the elite privileges they enjoyed, considered a threat to the socialist revolution by Mao (Deng & Treiman, 1997). It was a campaign that relied heavily upon the mobilization of mass support, particularly among the youth of China. In the initial stages of the

[2] References here are incomplete. For systematic reviews, please refer to Albouy and Lequien (2009) and Cutler and Lleras-Muney (2012).

[3] This argument also holds for the studies that do not use IV approach. For example, Albouy and Lequien (2009) adopt a regression discontinuity (RD) approach to examine the effect of a change in the compulsory schooling law in France. The estimated effect of education on health is still just relevant for the level of education and population groups affected.

[4] One view is that a fuzzy RD design is equivalent to the IV method (Angrist & Pischke, 2009). This view is not commonly accepted. Even Angrist and Pischke (2009) acknowledge that this view is arguable (footnote 4 in Chapter 6.2). Lee and Lemieux (2010) provide very detailed discussions concerning the differences between fuzzy RD and the IV approach. In recent years, most empirical studies using the RD method have adopted the view of Lee and Lemieux (2010). Therefore, we follow the majority of the literature by taking fuzzy RD as an approach that is different from the IV method in this paper.

[5] The RD design can be estimated either by means of a non-parametric method or a series polynomial method. Each method has its own strengths and weaknesses. However, as shown by Van der Klaauw (2002), Imbens and Lemieux (2008), and Lee and Lemieux (2010), the results of the non-parametric approach are highly sensitive to the bandwidth selection, and the results of the series polynomial approach are extremely sensitive to the order of the polynomial. The order of the polynomial in Oreopoulos (2006) and the bandwidth for the nonparametric estimation in Albouy and Lequien (2009) are arbitrarily chosen. In our study, we pay extra attention to this issue by using one class of the generalized cross-validation method recommended by Lee and Lemieux (2010) to select the optimal order of the polynomial.