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Changes in compulsory schooling and the causal effect of education on health: Evidence from Germany

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ABSTRACT

In this paper we investigate the causal effect of years of schooling on health and health-related behavior in West Germany. We apply an instrumental variables approach using as natural experiments several changes in compulsory schooling laws between 1949 and 1969. These law changes generate exogenous variation in years of schooling both across states and over time. We find evidence for a strong and significant causal effect of years of schooling on long-term illness for men but not for women. Moreover, we provide somewhat weaker evidence of a causal effect of education on the likelihood of having weight problems for both sexes. On the other hand, we find little evidence for a causal effect of education on smoking behavior. Overall, our estimates suggest significant non-monetary returns to education with respect to health outcomes but not necessarily with respect to health-related behavior.

1. Introduction

One of the most robust findings in both the economic and medical literature is the positive association between education and health (e.g. see the survey articles by Cutler and Lleras-Muney, 2008 or Grossman, 2006). This relationship can be found in many countries, at different education levels and for various indicators of health. In fact, the relationship between education or socio-economic status in a wider sense and health is so ubiquitous that is often simply referred to as "the" gradient (Deaton, 2003). However, the association between education and health behavior does not necessarily reflect a causal effect of education on health and there is now a lively debate, especially in the economics literature, whether this association (or how much of it) is causal.

This discussion is highly policy-relevant because, among the components of socio-economic status (education, income, and occupation), education seems to be the one that – in the long run – appears to be most amenable to public policy interventions. Moreover, as noted by Deaton (2002), it is important to frame social policy in terms of health and wealth simultaneously. Improving one at the expense of the other involves a difficult and probably unnecessary trade-off. One possible policy instrument for improving health and wealth simultaneously is education. If education improves both wealth and health, giving people access to more and better education will – in the long run – be a more successful policy than redistributing income or expanding public health care expenditures.

The question is thus: does education improve health? One *theoretical* explanation why more education might causally lead to better health is that education raises an individual's efficiency in health production, i.e. education raises the marginal productivity of inputs into health production (Grossman, 1972). Just like more educated people are more productive in labor market activities they are likely to be more productive in non-market activities, which include the production of their own health (or the health of their children). Better educated people would thus be healthier even if inputs were held fixed.

Another (complementary) theoretical explanation is that education changes the inputs into health production (through information) and thereby increases allocative efficiency. Most prominently, education might change health behaviors such as

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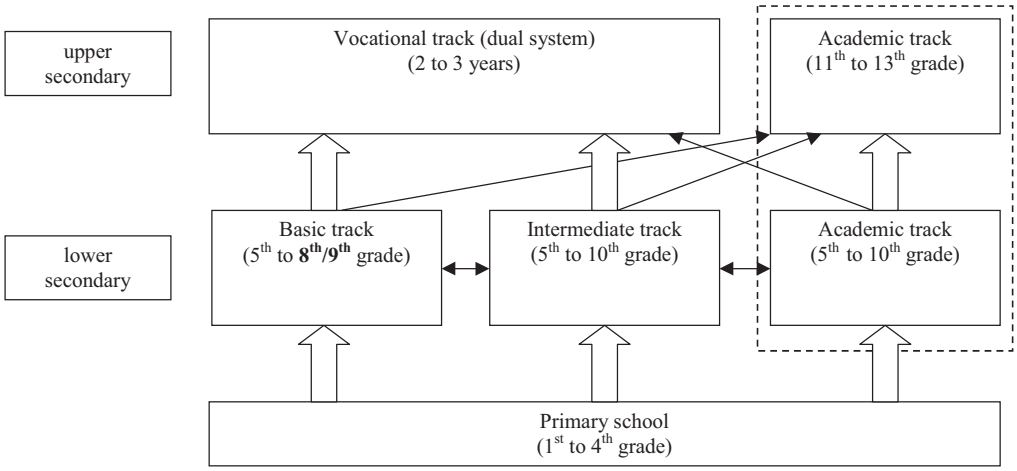

Fig. 1. Stylized description of the German school system at the time of the reforms.

smoking or bad nutrition habits (Rosenzweig and Schulz, 1981; Cutler and Lleras-Muney, 2010). It has been shown that education is associated with substantially reduced smoking and obesity rates, two important causes of premature deaths (Mokdad et al., 2004). For example, smoking rates in Germany are 48% among less educated men, as opposed to 20% among men with college degrees (Deutsches Krebsforschungszentrum, 2004). Education might improve health behaviors for several reasons. First, better educated people might be better informed about negative health consequences of smoking and overeating, either because they learned about these consequences in school, or because better educated people find it easier to obtain and evaluate such information (Kenkel, 1991; Nayga, 2000; De Walque, 2007). Second, education could also influence health behavior through higher income, different social environments, a different sense of control, or an impact of education on time preferences, e.g. because schooling focuses students' attention on the future (Fuchs, 1982; Becker and Mulligan, 1997).

Despite many convincing arguments why there should be a causal effect of formal education on health, concerns about an interpretation of correlations as causal relationships remain. Most importantly, unobserved heterogeneity could drive both educational attainment at younger ages and health outcomes at older ages. For instance, Carneiro et al. (2007) find strong correlations between cognitive and non-cognitive skills measured at age 11 and measures of educational success such as having continued school beyond age 16 – reported at age 23 – or the highest educational qualification obtained – measured at age 43. Moreover, they find strong correlations between cognitive and non-cognitive skills measured at age 11 and the probability of smoking at age 16 (measured at age 16), and self-assessed health, depression and mental health problems in adulthood (all measured at age 42). This is evidence for the presence of – usually unobserved – variables driving the relationship between education and health.

The aim of the present paper is to estimate the causal effect of schooling on health exploiting variations in compulsory schooling laws in Western Germany. We follow the approach of Pischke and von Wachter (2005, 2008) who have used changes in years of compulsory schooling to estimate the causal effect of education on earnings. The authors found zero returns to schooling on wages. However, when estimating a reduced form regression of body mass index on the change in compulsory schooling laws they found a significant effect. Our objective is to take this line of research further and assess the non-monetary returns of education by considering other health outcomes and also important dimensions of health-related behavior such as smoking. There is now a number of papers exploiting reforms in mandatory schooling laws across different countries, for instance the United States (Lleras-Muney, 2005), the United Kingdom (Oreopoulos, 2006; Silles, 2009; Clark and Royer, 2010), or France (Albouy and Lequien, 2009). The results of these studies are mixed, showing negative effects of education on mortality (i.e. positive effects on health) in the US (Lleras-Muney, 2005) but not in France (Albouy and Lequien, 2009) or in the UK (Clark and Royer, 2010). In contrast, strong positive effects on self-rated health in the UK are found by Silles (2009).[1] Yet further studies for the UK, assessing the effect of compulsory schooling on morbidity using objective health measures such as blood pressure, BMI, or levels of inflammatory blood markers (Clark and Royer, 2010; Jürges et al., 2009a) find no effects, while Powdthavee (2010) finds negative effects on hypertension.

Our study extends the existing literature by analyzing compulsory schooling laws in Germany to assess the causal effect of education in yet another economic environment where the *economic* returns to education at the margin of the educational reform were shown to be pretty low. In addition, our paper complements earlier work on the health effect of education in (Western) Germany, which used the abolition of fees in academic track schools and academic track school constructions as different sources of exogenous variation in schooling (Jürges et al., 2009b; Reinhold and Jürges, 2009, 2010).

The paper is structured as follows. In the next section we will describe the German school system and the changes in compulsory schooling laws as our institutional background. Section 3 explains which data we use and shows descriptive statistics. Section 4 describes our identification strategy and its assumptions. Section 5 shows the results. Various robustness checks are reported in Section 6 and Section 7 gives a summary and discussion.

2. Institutional background

In Germany, the federal states are responsible for educational policy. Still, the educational systems in all German states are very similar and thus share many common features (see Fig. 1). Children generally enter primary school at the age of six. After (normally 4 years) in primary school, students attend one of three secondary

[1] Oreopoulos (2006) reports strong positive effect on self-rated health. However, a re-analysis of the data has basically reduced this effect to zero (see revised Table 5 posted on the AER website).