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Universities as engines for regional growth? Using the synthetic control method to analyze the effects of research universities

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ABSTRACT

Are research universities important for regional growth and development? We study the impact on the regional economy of granting research university status to three former university colleges in three different regions in Sweden. We analyze the development in the treated regions compared to a set of control regions that are created using the synthetic control method. We find small or no effects on the regional economy. Our findings cast doubt on the effectiveness of research universities in fostering regional growth and development. We contribute to the existing research by using a more credible identification strategy in assessing the effects of universities on the regional economy compared to what has usually been used in previous studies.

1. Introduction

Is a research university an important and significant engine for regional innovation, growth, and development? Among policymakers and to some degree in the university community there is a strong tendency to consider universities as essential in fostering regional innovation and growth. This hypothesized link is frequently used in context to attract and motivate increases in public and private grants and expenditure on research universities (cf. Drucker and Goldstein, 2007; Power and Malmberg, 2008). Among economists, regional economic development has attracted substantial interest following the seminal work by Krugman (1991). One active area of research in this theme has concerned the effects of universities on the local and regional economy (see Drucker and Goldstein, 2007, for an overview). In the present paper, we investigate the effects on the regional economy of granting research university privileges to three Swedish University Colleges in 1999, using the synthetic control method (SCM).

Universities play a central role for knowledge accumulation, not only as producers of basic research, but also by creating human capital in the form of highly skilled labor. Locally and regionally universities may influence the economy via a number of mechanisms, which are not mutually exclusive. Drucker and Goldstein (2007) summarized these activities and mechanisms in: (1) creation of knowledge, (2) human-capital creation, (3), transfer of existing know-how, (4) technological innovation, (5) capital investment, (6) regional leadership, (7) knowledge infrastructure production, and (8) influence on regional milieu.

For example, knowledge spillovers and human capital development may be important locational attractors for private sector research and development and high technology production. Specifically, some research findings may be difficult to transfer to industry without frequent face-to-face contact between university and industry. This aspect of knowledge transfer encourages commercial startups to locate in the vicinity of university research centers. Additionally, there is a tendency for graduates with advanced degrees to remain and work in the local area, which is a potential important mechanism for increasing local and regional human capital. Scientists and engineers who stay in the area help to transfer university research findings to local firms, or they may work in industrial labs. But while universities contribute to innovation, it is less clear if they contribute specifically to regional innovation. As pointed out by Power and Malmberg (2008), there are few reasons to assume that innovation in one region will make that same region the site for economic exploitation of the innovation. Furthermore, standard models of spatial equilibrium suggest that mobile workers and firms will arbitrage the benefits associated with local policies and we should thus not expect large effects of local policy (Rosen 1979, Roback 1982).

Empirically, recent models of local multipliers suggest that there may be positive effects of, for example, firm placement on the local economy, indicating important regional economic effects of universities (Moretti 2010, 2011). However, there are a number of conflicting results in the literature. Anselin et al. (1997) find a link between university research and innovative activity in the US using cross-sectional data from 1982. Woodward et al. (2006) find a small positive relationship between university research and plant localization using US data from 1997 to 2000. Goldstein and Renault (2004) find no support for a relationship between universities and regional economic development in the US (1969–1998). For the period 1986–1998 they do,

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however, find that average earnings tend to increase somewhat more in areas where a research university is located. Using a similar approach, Drucker (2015) studied the relationship of US higher education activities and regional economic performance 2001–2011, finding a weak relationship to regional economic development. Using German panel data, Schubert and Kroll (2014) study the effects of higher education institutions in 2000–2011 using fixed effects as well as spatial lags, and find very large effects on regional GDP per capita and unemployment. Using instrumental variables and fixed effects estimations, Andersson et al. (2004, 2009) find that increases in the number of employed researchers in a region increased regional output in Sweden, 1985–1998. In a review of the literature, including case studies, studies based on knowledge production functions, and cross sectional studies, Drucker and Goldstein (2007) find that the evidence is mixed, but that there may be some evidence that regional economic development is improved by higher education institutions, even though the strength of the evidence-base is not particularly high. A general empirical challenge in the above cited studies concerns issues of endogeneity, specifically that there are unobservable characteristics that influence both regional economic development and the establishment of new research universities and/or substantial increases in research funding.

The aim in our paper is thus to use the synthetic control method (SCM) to address the issue of endogeneity and attempt to estimate the causal effect on regional economic effects of universities and other higher education institutions. To our knowledge, the only existing study using credible techniques for causal inference is Liu (2015). Using the SCM and event study methods, Liu (2015) find negligible effects of US universities on local output in 10 years, but clear increases in productivity over an 80-year period. Our goal here is to estimate the effects of three Swedish universities, which were granted university rights in 1999, on the regional economy. Thus, while Liu (2015) studies the effects of historical interventions, our study provides a new perspective on university spillovers by investigating the effects of modern day changes.

Sweden is subdivided into 21 central executive administrative divisions (we will refer to these as regions for the remainder of the paper). Exploiting this regional division will allow us to study the regional effects of the 1999 university reform intervention by comparing treated regions (where new research universities were established) to unaffected control regions. To credibly identify the effects of the research universities, we use the SCM developed by Abadie et al. (2010), which presents a way to systematically choose comparable comparison units in comparative studies. For unbiased effect estimation, conventional panel data estimators require strong assumptions of either time invariant confounding or common trends in the outcome of interest between treated regions and their comparison units. Finding a single comparison unit or a set of controls that are not in violation of these assumptions can be difficult, especially in small samples. In contrast, SCM allows for the relaxation of the assumption of time invariant confounding, and by the construction of a synthetic control region from a set of potential controls, it also increases the probability that the common trends assumption holds. This is achieved by selecting a donor pool of potential controls and constructing the synthetic control region based on its (weighted average) comparability to the treated region in terms of pre-intervention outcome trajectory and covariates.

Our main objective is to study the effects on regional economic development. To do this we first study the effects of gaining university status on intermediate university-related outcomes such as region-specific awarded doctoral degrees and number of professors. We consider these intermediate outcomes as potential causal mechanisms from the intervention to the end-point effects on the regional economy. We find robust evidence that the transition to research university status increased the number of awarded doctoral degrees and the number of professors in the regions. Following the arguments in Drucker and Goldstein (2007) we thus find support for two of the factors argued to be important for the regional economy: (1) creation of knowledge and (2) human-capital creation. This suggests that the university status had an actual effect on the research possibilities in the treated regions. We also studied whether giving the three university colleges research university status had an effect on intermediate entrepreneurial outcomes that could affect the regional economy (local patent applications and firm startups). Here we find no or very minor evidence of an effect on these outcomes. Thus, in terms of the mechanisms suggested Drucker and Goldstein (2007) we find no effects on (4) technological innovation. Lastly, we move on to investigating the primary outcome measures, regional GDP per capita and compensation of employees, where we find no robust evidence of an effect of the three interventions during the 13-year follow-up period.

To some extent, these findings contradict previous research that has generally found small but positive effects of research universities on regional economic growth and development. One reason for this discrepancy might be that we, by using the synthetic control method, are able to control for confounding factors that previous studies have not been able to eliminate. Another possibility is that while we study the effect of being granted research university status and the consequent influx of research competence, previous studies have often focused on the influx of students in the local area. Thus, while there may be an effect on the local economy of an influx of students, we find no effect of an influx of research competence, at least not in the time period studied here.

In the next section we describe the Swedish university system in general and the universities in the focus of our study in more detail. In Section 3 we describe the synthetic control method, the data that we use, and how we implement the method. In Section 5 we present the results of our analysis, and Section 6 concludes the paper with a discussion of our findings.

2. The intervention: the Swedish 1999 university reform

The Nordic countries, including Sweden, spend a relatively large amount on higher education and the cost per student at the university level was estimated at around 21,000 USD in year 2011. This can be compared to the OECD average of 14,000 USD and the top figures in the US at 26,000 USD (UKÄ, 2015). Higher education in Sweden is conducted at 16 public universities and 19 university colleges as well as another set of art and theological institutions. Formally, the main difference between a research university and a university college is that the former have formal rights to award two-year master's degrees and PhDs, whereas the latter may be allowed to do this for a restricted number of subjects and only after a specific application and review by the Swedish Higher Education Authority. The oldest university in Sweden is Uppsala University, which was founded in 1477; the youngest universities include those of Karlstad, Örebro, and Linneaus (given university rights in 1999) and Mid Sweden (founded in 2005). A small fraction of the universities and university colleges are organized as private foundations, although these are similar to other universities in that they still operate under the same laws, are publicly tax-funded, and have no tuition fees for domestic students or students from the European Union.

This paper focuses primarily on the regional economic effects of being granted research university status using the 1999 university reform as a natural experiment. In the 1999 university reform the government awarded university rights to the colleges in Karlstad, Örebro, and Växjö. The university in Karlstad, situated in the city of Karlstad, which is the regional capital of the Värmland region with a total population of around 312,000, was founded as a university college in 1977. Today, the university has about 8000 full-time-equivalent students and 1000 full-time-equivalent employees. Örebro University is slightly larger with approximately 9000 full-time-equivalent students, and is situated in the city of Örebro, which is the regional capital of the Örebro region with a total population of around 290,000. The former Örebro University College was founded in 1977. Växjö University is situated in Växjö, the regional capital of Kronoberg, with a total population of about 191,000.