

Regional Spillovers in the Context of Universities and Business Incubators

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Knowledge spillovers can stimulate regional entrepreneurship (D. B. Audretsch & Lehmann, 2005). In this context, universities and research institutions are understood as primary knowledge producing entities. Business incubators maintain ties to these entities also across district borders. They therefore bear the potential to act as vehicle transporting knowledge to districts beyond the reach of spatially bound spillovers. Existing literature is primarily focused on finding and explaining effects that universities and research institutes or the industry itself have on the regional innovation and entrepreneurial activities. Using fixed effects panel regressions, the effect of business incubators to support knowledge diffusion within regions that inhabit universities and research institutes is analyzed. Additionally controlling for spillovers through spatial regressions, we try to grasp the potential for business incubators to transport knowledge generated by higher education and research institutions across district borders to also stimulate supra-regional entrepreneurship.

1 Introduction

Entrepreneurship in general is associated with innovation, regional economic growth and job creation. The stimulation of business formation, therefore, is an ongoing political objective. The literature on entrepreneurial universities differentiates the support for growing business formations at the university level into the three channels of (1) research (2) education and (3) technology transfer (Guerrero, Cunningham, & Urbano, 2015). Universities and research facilities are known to generate important knowledge spillovers (Robbiano, 2021; D. Audretsch, Dohse, & Niebuhr, 2010; D. B. Audretsch & Lehmann, 2005) providing the first two channels of the entrepreneurial university concept. Intending to offer the third channel of commercializing research results and innovation, especially universities maintain close ties to business incubators.

While the individual effect of universities as well as business incubators on entrepreneurship is well researched (Tartari & Stern, 2021; Trequattrini, Lombardi, Lardo, & Cuzzo, 2018; D. Audretsch et al., 2010; Corrente, Greco, Nicotra, Romano, & Schillaci, 2019), there is little known on the effects of their co-location on business formations within a region or across district borders.

We want to explore which institution contributes best to academic, digital and overall business formations. Additionally, we want to understand how the complementary nature of the institutions might further increase the effect on a spatial perspective.

Universities, public & private research institutes are the primary source of knowledge production (Godin & Gingras, 2000) as well as knowledge spillovers for firms (Robbiano, 2021; D. Audretsch et al., 2010). Such knowledge influences regional innovation as shown by Audretsch (2012), who evaluated the influence of research intensive universities. Looking at how knowledge flows from universities influence innovation of firms, Díez-Vial and Montoro-Sánchez (2016) show the importance of formal and informal ties based on firms located at the Madrid Science Park. Other research shows how innovation success is positively affected by the interaction with research institutions (Fudickar & Hottenrott, 2019). Additional to the influence of knowledge on innovation, previous studies show that most higher education institutions are empirically known to support business formations especially in innovative industries (Fritsch & Aamoucke, 2013; Robbiano, 2021). Whether incubators located within the same region might additionally contribute to commercializing knowledge generated by research and education is yet to be answered.

This article aims at exploring this gap by looking at each channels' ability to contribute to social and economic development. Attributing each channel as one core-activity to different institutions, we try to evaluate their effects on business formation within and across regions in Bavaria. We analyze this using a fixed effects panel OLS and Spatial Durbin model, where overall, academic and digital business formations are our dependent

variables. The main variables of interest are hereby the number of universities, research facilities and incubators within a district, while controlling for determinants known to influence regional business formation (Wyrwich, 2019; D. B. Audretsch, Heger, & Veith, 2015; Piontek & Wyrwich, 2017).

While universities and their interplay with business incubators are an internationally observable phenomenon, Germany delivers a unique setting to investigate this research question. In the recent past, there have been several approaches to bring entrepreneurial potential to rural regions in order to stimulate business formation. Within the last three decades, especially the county of Bavaria has invested a large amount of capital to establish geographically separate research institutes, which yet institutionally belong to existing higher education institutes. Such "satellite campuses" were meant to better connect research and universities with local firms. Furthermore, besides relying on the natural incubator function of universities, the establishment of rural business incubators was pursued. Today, about 80 research institutes and universities as well as more than 60 business incubators are located throughout Bavaria. They provide an excellent opportunity to evaluate the question if universities should always be complemented by business incubators to support the channel of technology transfer and how urbanized a regions should be so that it is able to grasp the offered research impact (Malecki, 2018). Differentiating between urban and rural areas in the context of entrepreneurship and its supporting infrastructure is necessary, since previous research revealed that there are large differences in the ability between metropolitan and rural areas to foster business formation rates (Florida, Adler, & Mellander, 2017; Fritsch, 1997).

2 Data & Method

To better understand the effect research institutes and universities have on business formation rates and how this effect might be supported by external business incubators within the same or neighboring region of observation, we use a combination of registry data on business formations from the Mannheim Enterprise Panel (MUP) and manually gathered information on the location of universities (including all higher education facilities such as universities of applied sciences), research institutions (private and public) and business incubators in Bavaria. This data is further supplemented by registry data on regional factors such as GDP, net migration and other control variables. Aggregated on a district and year level for the years 2003 to 2019 we end up with 96 districts over a period of 17 years, leading to 1632 unique observations.

Following a standardized preparation process (Bersch, Gottschalk, Müller, & Niefert, 2014), the MUP accounts for all economically active firms in Germany since 1995. Here, the number of businesses founded within year t in region i provides the baseline dependent

variable *BusinessFormation*. Using the information on firms as well as those involved in the firm, we identify founders with and without academic degrees. To qualify as a founder the individual has to be a majority owner of the firm with leadership claim when the business was founded. Using the information on the share of businesses founded within a district that have at least one founder holding an academic degree, we calculate the total number of academic business formation.

Additionally, we use the definition by Calvino et. al. (2018) to divide sectors into four levels of digital intensity. The resulting four variables each represent the district wide business formation rates by level of digitization.

In a first step we quantify our research using a Fixed Effects model which allows us to exploit the panel structure within our data.

$$BusinessFormation_{it} = \beta_0 + \beta_1 * Incubator_{it} + \beta_2 * Research_{it} + \beta_3 * Education_{it} + \beta_4 * Interaction_{it} + X_{it} * \beta_5 + \varepsilon_{it} \quad (1)$$

Our main variables of interest are the number of business incubators (*Incubator*), universities (*Education*), and research institutes (*Research*) within a region i at time t as well as different interactions between these main variables (*Interaction*). We use the number of *incubators* in a district by applying either a two-years lagged or a five-years lagged variable to account for the time an incubator needs to become effective in terms of fostering business formation. We include these two sets of lagged variables expecting a certain path dependency with regards to the 2-year-lagged variable, since incubators are used as political tool to foster regions experiencing low economic activity. *Education* includes all institutions where academic education is the main priority, yet research is still conducted. Since these institutions in Germany and also Bavaria are in general rather old (in 2019 their median age was 48) differentiation with lagged variables is not necessary. *Research* refers to institutions where the main priority is to gather new knowledge and no students are educated on-site. Because many research institutions are of similar age as incubators and they presumably take longer to generate measurable economic impact, a lagged variable of 5-years and 10-years was included.

For the final panel data set, we have 32 universities, where 3 universities were built between the years 2003 - 2019. We find 52 research institutes, where 25 were added during the observation period. Moreover, we can include 60 business incubators of which 25 were built within our period of interest. Over the years in 28 of 96 regions new *incubators*, respectively *research* or *education* were built.

Following the literature on important regional determinants for business formation, we include a set of control variables X (Wyrwich, 2019; D. B. Audretsch et al., 2015; Piontek

& Wyrwich, 2017; D. B. Audretsch & Fritsch, 2002).

In order to understand whether the effects observed are driven solely by local institutions or get influenced by spillover effects from institutions based in neighboring regions, we apply a fixed effects Spatial Autoregressive Model for panel data, in literature well known as Spatial Durbin Model (LeSage & Pace, 2009).

$$\begin{aligned}
BusinessFormation_{it} = & \rho W * BusinessFormation_{it} + \beta_1 * Incubator_{it} + \beta_2 * Research_{it} \\
& + \beta_3 * Education_{it} + \beta_4 * Interaction_{it} + X_{it} * \beta_5 \\
& + \theta W * Incubator_{it} + \theta W * Research_{it} + \theta W * Education_{it} + \varepsilon_{it}
\end{aligned}
\tag{2}$$

The spatial weight matrix (W) includes regions based on queen contiguity. ρ shows the effects that are based on spatial dependence with the neighboring regions dependent variables. θ defines how much the observed effect is influenced by spillovers from independent variables (Incubator, Research, Education) of neighboring regions, as defined by W .

3 First Results & Outlook

Previous literature stresses the influence of research and education on entrepreneurship (D. B. Audretsch & Lehmann, 2005). Yet research also shows that this is mainly true for business formations in innovative sectors (Fritsch & Aamoucke, 2013). Additionally Fudickar & Hottenrott (2019) explain, that such interaction is profitable for businesses with and without internal RD ambitions where the effect is moderated by being an academic or non-academic start-up. Building on the importance for academic business formation to benefit from technology transfer, we can empirically show that business formations involving at least one academic founder is positively associated with co-located universities, research institutions and incubators. Current results thereby suggest that incubators complement universities and research institutions since the effect of incubators themselves is absorbed by the interaction term. With regards to the type of business formations, we understand the effects observed to be driven by the ambition of each institution to primarily foster academic business formations.

Knowing the limited capabilities of building new higher education and research institutions, the potential of generating regional spillovers to neighboring districts through business incubators is of importance to policy makers. Being able to prolong the influence of research institutions into regions further away is a possibility to foster entrepreneurship in regions out of the normal reach of universities.

The full paper will further address this question by comparing digital, academic and

overall business formations in more detail. Furthermore, the regional influence of the institutions and the potential of business incubators to enlarge the spatial diffusion of knowledge will be included by using the Spatial Durbin Model.

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