



NATIONAL RESEARCH UNIVERSITY  
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*Michael Fritsch, Alina Sorgner, Michael Wyrwich,  
Evguenii Zazdravnykh*

# **HISTORICAL SHOCKS AND PERSISTENCE OF ECONOMIC ACTIVITY: EVIDENCE FROM A UNIQUE NATURAL EXPERIMENT**

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*Michael Fritsch<sup>1</sup>, Alina Sorgner<sup>2</sup>, Michael Wyrwich<sup>3</sup> and Evgenii Zazdravnykh<sup>4</sup>*

## **HISTORICAL SHOCKS AND PERSISTENCE OF ECONOMIC ACTIVITY: EVIDENCE FROM A UNIQUE NATURAL EXPERIMENT**

This paper investigates the persistence of entrepreneurship in the region of Kaliningrad between 1925 and 2010. During this time period the area experienced a number of extremely disruptive shocks including; devastation caused by World War II, a nearly complete replacement of the native German population by Soviets, and 45 years under an anti-entrepreneurial socialist economic regime followed by a shock-type transition to a market economy. Nevertheless, we find a surprisingly high level of persistence of industry-specific self-employment rates in the districts of the Kaliningrad region. Our analysis suggests that persistence of entrepreneurship is higher in regions with a history of successful entrepreneurship. That is, in regions where a specific industry was particularly efficient and entrepreneurial activity was especially pronounced.

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<sup>1</sup> Friedrich Schiller University Jena (Jena, Germany). Chair of Business Dynamics, Innovation, and Economic Change. The Head; German Institute for Economic Research (DIW Berlin). Research Professor; E-mail: m.fritsch@uni-jena.de

<sup>2</sup> Friedrich Schiller University Jena (Jena, Germany). Chair of Business Dynamics, Innovation, and Economic Change. Research Associate; E-mail: alina.sorgner@uni-jena.de

<sup>3</sup> Friedrich Schiller University Jena (Jena, Germany). Chair of Business Dynamics, Innovation, and Economic Change. Research Associate; E-mail: michael.wyrwich@uni-jena.de

<sup>4</sup> National Research University Higher School of Economics (Saint-Petersburg, Russia). Research Associate; E-mail: ezazdravnykh@hse.ru

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# 1. Introduction

Recent research has documented patterns of a strong persistence of regional levels of entrepreneurial activity over time in countries such as Germany, Sweden and the UK e.g., [Andersson and Koster, 2011], [Fotopoulos, 2014], [Fotopoulos and Storey, 2016], [Fritsch and Wyrwich, 2014]. The reasons for this strong persistence of regional entrepreneurship activity and the resulting policy implications are, however, still not well understood. Moreover, evidence for other countries is still missing. Studying the persistence of entrepreneurship faces the empirical challenge of disentangling competing explanations for persistence. Is this persistence simply a reflection of economic structures? Does it represent regional differences in the legal framework or in informal institutions such as an entrepreneurial culture? Can such persistence exist even with pronounced changes to economic structures, institutional framework conditions, or cultural realities? Since entrepreneurship and start-up activities in particular can be an important source of regional economic growth e.g., [Glaeser, et al. 2015], [Fritsch and Wyrwich, 2016], it is important to understand the long-term formation of spatial differences of entrepreneurship rates.

This paper adds to the empirical evidence of the regional persistence of entrepreneurship by analyzing the unique case of the Kaliningrad exclave (*Kaliningradskaya oblast*), which today is part of the Russian Federation. What makes this case particularly interesting is that the Kaliningrad exclave has been exposed to a significant number of very intense disruptive shocks in its recent history. This fact makes it unlikely that sources of a potential persistence of entrepreneurship are related to persistence of economic structures, institutions, or an entrepreneurial culture. Thus, the case of Kaliningrad provides us with a unique natural experiment for investigating persistence of entrepreneurship. It allow us to assess whether there can be a persistence of entrepreneurship even if the most prominent explanations for persistence do not apply.

Before the Second World War (hereafter WW II) this region constituted the northern part of East Prussia (German Reich) with its capital in the city of Königsberg, home of philosopher Immanuel Kant (1724-1804). At the end of WW II a systematic destruction of the physical infrastructure took place as the region was absorbed by the Soviet Union and occupied by the Red Army. In the following few

years, the Soviet government more or less completely exchanged the region's native German population with Soviet citizens predominantly coming from Russia, Belarus and the Ukraine. For nearly 45 years after this exchange, the region was administered by an anti-entrepreneurial socialist regime that completely banned private entrepreneurship. This changed dramatically after the breakdown of the Soviet Union in 1991, when individuals could legally operate private businesses. Following a significant wave of privatization in the early 1990s the region experienced a high level of firm turnover with many entries and exits.

This study draws on historical data to compare the regional distribution of entrepreneurship in the Kaliningrad region in the year 1925 and 2010 (after experiencing several major external shocks). We find quite astonishing long-term persistence of entrepreneurship across regions and industries, which is robust to a number of robustness checks. Self-employment rates in the year 1925 (the period of German administration) are significantly positively related to the entrepreneurship rates in the year 2010, after the area had been under the rule of Russia and the Soviet Union for 65 years.

Several studies have already documented a confounding level of persistence of regional economic activity after severe and disruptive changes. For instance, Davis and Weinstein (2002, 2008) show that even after the immense external shock of the Allied bombing of Japan during WW II, there was a marked tendency for cities and specific industries that existed prior to the shock to return to their pre-War importance. Glocker and Sturm (2014) study the population development in former German cities that became a part of post-WW II Poland. The authors of the aforementioned studies arrive at the conclusion that cities recovered from the war-time shock at a high speed despite significant destruction of the infrastructure and the dispersal of the entire population. Glocker and Sturm (2014) explain their finding by the persistence of valuable surviving structures that were rebuilt from ruins. Davis and Weinstein (2002), in turn, arrive at the conclusion that the distribution and persistence of regional population densities may be explained by locational fundamentals and increasing returns theory. It is, however, unclear whether this mechanism could also explain persistence in entrepreneurship rates.

Fritsch and Wyrwich (2014) study entrepreneurial persistence in East German regions over space and time, and demonstrate that this persistence can exist for a

time period as long as eighty years despite heavy war-time destruction and 40 years of a socialist regime that was hostile to entrepreneurship. By focusing on the Kaliningrad region, our study goes beyond this evidence. Here we study a unique natural experiment, in which *several* exogenous shocks took place that allow us to rule out a number of possible sources of persistence that cannot be excluded in the case of East Germany.

Among the possible driving forces behind the persistence of regional entrepreneurship one might first examine the persistence (or lack of persistence) of basic infrastructures that support entrepreneurial activity. For instance, Grosfeld and Zhuravskaya (2015) demonstrate that regional differences in railroad infrastructure built in Poland at the time of industrialization when Poland was divided among Russia, Austria-Hungary, and Prussia do still exist. While the Kaliningrad region experienced heavy damages in the last year of WW II that also significantly affected the railway system,<sup>5</sup> the railroad network has been largely reconstructed by Soviets and it still shows strong similarities with the structure that existed before WW II [Romanova et al., 2015]. However, some parts of the railroads that connected the Kaliningrad region with the area that became part of Poland after WW II have been demolished as they were redundant. Therefore, it is not entirely clear whether persistence of infrastructure can explain persistence of regional entrepreneurship in the Kaliningrad region. The outflow of the population and evacuation of capital became particularly obvious when the Red Army invaded the region. Integration of the area into the spatial planning system of the Soviet Union required reconstruction plans that often followed a socialist ideology that denied any expression of capitalist values. Even obvious symbols of specific cultural values such as monuments, architectural styles, etc., were largely eliminated and/or replaced by the Soviets who were intent on propagating socialist rather than entrepreneurial values.<sup>6</sup> Hence, even if persistence of entrepreneurship due to durability of the physical infrastructure cannot be completely ruled out, one can expect only a moderate effect. Moreover, since our analysis is performed at the industry-region level, our result cannot be

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<sup>5</sup> Ninety percent of downtown Königsberg was destroyed and 60 percent of the suburbs. The second biggest city in the region, Tilsit (later *Sovetsk*), was damaged up to 60 percent, Insterburg to more than 90 percent. Out of 360 manufacturing firms that existed in the region before WW II, 182 (about 50 percent) were completely destroyed. The destruction of the remaining firms amounted to 50-60 percent [Egorova and Shadrina, 2006].

<sup>6</sup> For instance, a typical roof slope in East Prussia was 45 degrees which was considered to make the buildings look too capitalistic by the Soviet authorities. The angle has been reduced considerably during reconstruction works, which was partly a political decision [GAKO, f. 522, op. 1, d. 14].

explained by persistence of regional industry structures and inter-industry differences in firm size distributions.

We can completely rule out the stability of any formal institutions as an explanation for long-time regional persistence of entrepreneurial activity because after WW II the existing legal system was replaced by Soviet rule that endured for more than 40 years. In contrast to socialist East Germany, where private sector entrepreneurship was allowed to a certain extent see [Wyrwich, 2012], [Fritsch et al., 2014], the Soviets prosecuted any type of private entrepreneurship. After WW II, the native German population that still remained in the region was promptly expelled and replaced by Soviet citizens who by that time had already experienced more than two decades of socialist regime. Hence, informal institutions such as pro-entrepreneurial attitudes of the regional population can hardly explain the persistence of entrepreneurship that we find. Furthermore, there has been no restitution of expropriated property after the breakdown of the Soviet Union. Our results suggest that locational fundamentals that make a region naturally attractive for economic activity and that remain constant over time, such as a favorable sea coast location, are less likely to explain persistence of entrepreneurial activity. The results do not support the hypothesis about the existence of a “natural” rate of self-employment that is driven by a more or less stable demand for products and services that is not susceptible to changes in formal and informal institutions.

So what drives the persistence of entrepreneurial activity in the Kaliningrad region? We argue that the most likely reason for persistence of entrepreneurship in the region that has been shaken by massive disruptive shocks during its recent history is what we refer to as *historical experience*, a factor that has largely been neglected in the previous literature. Historical experience refers to the shaping of the economic structure of the area during German times, regional traditions and existing brands that could have been absorbed by the new population even in the absence of direct transmission mechanisms, such as role models or alternative knowledge transfer mechanisms. This mechanism appears advantageous if one considers the uncertainty associated with a creation of completely new economic structures. Relying on existing and successful brands created during the prosperous German times could ensure the functionality of economic order under the new regime. Our empirical analysis provides some considerable support for such an explanation.

The contribution of our study to the existing literature is that we find not only that economic activity persists despite severe ruptures with the past, but that there is also continuity with respect to whether such economic activity is organized rather in many small or few large firms. The novelty of the present study is that it uncovers a driver of persistence of regional economic activity over time that is beyond those usually discussed in the literature, namely, historical experience.

The remainder of the paper is organized as follows. Section 2 provides a brief description of the history of the Kaliningrad region. Section 3 discusses possible sources of persistence of entrepreneurship in the region between the years 1925 and 2010. In section 4 and 5, we present our data and the results of our empirical analysis. Finally, we summarize our findings, draw conclusions and identify questions for further research in section 6.

## **2. A brief history of the Kaliningrad region**

The area of the Kaliningrad exclave comprises the northern part of the former German region of East Prussia (*Ostpreußen*) with the capital Kaliningrad (formerly named *Königsberg*). Historically, the area of East Prussia was shaped by German settlers since the 13<sup>th</sup> century, who soon became the dominant ethnic group. Later on, when the region became part of the Kingdom of Prussia and finally a Prussian province in the German Empire.<sup>7</sup> Culturally and historically, the region had close ties with its neighbor Lithuania.<sup>8</sup> According to an agreement reached at the Potsdam conference in August 1945, the northern third of East Prussia was placed under the administration of the USSR. Shortly afterwards, the region became part of the Russian Soviet Federative Socialist Republic (RSFSR), the name of its capital changed Kaliningrad, and the region became known as *Kaliningradskaya oblast*.

During WW II the population in the region sharply declined from 1,165,000 people in May 1939 to only 139,600 by September 1945 [Levchenkov, 2007]. Other estimations e.g. [Kostyashov, 2009] arrive at an even lower figure of about 100,000 indicating a decline during the war of more than 90 percent. The major exodus of the

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<sup>7</sup> For details on the history of East Prussia, see [Koch, 1984].

<sup>8</sup> This part of East Prussia had a significant proportion of Germanized Lithuanians. Shortly before the breakout of WW II about 61,000 inhabitants of the region spoke Lithuanian [Misiunas and Taagepera 1993, p. 336].

German population occurred before the Red Army invaded the region [Misiunas and Taagepera, 1993, p. 342]. Most of the remaining Germans left the region in 1948. Some highly qualified (and probably indispensable) Germans were retained until 1951 [Hoppe, 2000, p. 31]. In order to fill the vacuum caused by exodus of the German settlers, recruiting campaigns<sup>9</sup> were conducted for voluntary immigration of Soviets from the mainland of the Soviet Union. As a result, almost 183,000 Soviet citizens (mostly from Western and Central Russia, Belarus and the Ukraine) were relocated to the Kaliningrad region during the years of 1946-1950, with an additional 25,000 citizens during the next five years [Kostyashov, 2009]. The current population is still considerably below the pre-war level [Oldberg, 2000] with more than 77% living in cities.<sup>10</sup> This tendency of a significant concentration of the population in cities largely occurred after WW II. In addition, during the Soviet era a significant number of smaller settlements were abandoned, land use has declined and the structure of its usage has been somewhat changed [Levchenkov, 2016].

Under the Soviet government the region became an important strategic location and was heavily militarized. For example, it became the home base of the Soviet Baltic Sea fleet. The military sector was one of the main employers and a considerable part of the civil economy was tailored to military needs [Oldberg, 2000]. Non-military industries appeared to be based on pre-war facilities and mainly focused on fishing and seafood, paper and cellulose, manufacture of railway cars, as well as amber mining.

After the collapse of the Soviet Union, the region became an exclave that is today surrounded by two EU member states, Poland and Lithuania. The dependence of the local economy on military activity led the region into decay in the 1990s when the Russian government radically cut military spending. Eventually, consumer prices became higher than in the rest of Russia, while wages were about 20 percent below the level in other Russian regions [Wellman, 1996]. For development purposes a Special Economic Zone (*Osobaya Ekonomicheskaya Zona*) was created in 1991 that granted various tax privileges to its residents, customs-free trade with other countries and regions and further incentives for potential investors (for instance, simplified

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<sup>9</sup> Decree of the Council of Ministers of the USSR №1522, 1946

<sup>10</sup> According to the Census of the Russian State Statistical Office for 2010, the total population in *Kaliningradskaya oblast* (total area of 15,125 km<sup>2</sup>) constituted 941,873 residents, of whom 730,778 lived in cities (431,902 persons resided in the city of Kaliningrad).



procedures for issuing visas for potential investors or partners). Moreover, agreements for visa-free travel between the Kaliningrad region, Poland and Lithuania were signed. As a result of these developments, the westernization of the Kaliningrad region was faster than in other parts of Russia.

### **3. Possible sources of persistence of entrepreneurship in the Kaliningrad region**

There may be many reasons for a persistent level of entrepreneurial activities in a region. For instance, determinants of self-employment, such as legal framework conditions and public policy towards self-employment tend to persist over time [Fotopoulos, 2014]. In the case of the Kaliningrad region, however, all the formal German institutions were replaced by those of the Soviet Union. Soviet rules prohibited any kind of private entrepreneurship until the breakdown of the Soviet Union in 1991. Due to this strong hostility towards entrepreneurship intergenerational transfer of entrepreneurial abilities and demonstration effects of successful entrepreneurs are largely irrelevant for explaining persistence of entrepreneurship in the case under study.

Recent psychological research has shown that regions differ with regard to personality profiles of their residents, which may explain regional differences in economic outcomes such as regional entrepreneurship rates, labor force participation, social capital, political values, religious orientation, and crime [Rentfrow, Gosling and Potter, 2008], [Obschonka et al., 2015]. The sharing of certain cultural values that are relevant for self-employment (e.g., striving for independence and self-realization, acceptance of inequality based on economic performance) by a large part of the regional population over time, might also explain regional variation of entrepreneurship. However, neither a persistence of region-specific personality profiles nor persistence of cultural values can be applied to the case of the Kaliningrad region since after WW II, there was a dramatic change of the entire regional population by people originating from completely different cultural contexts.<sup>11</sup>

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<sup>11</sup> It can be expected, however, that the immigration process was not completely random, as not everyone was willing to move to the devastated region. In order to make Kaliningrad more attractive for newcomers from the

It should be noted, however, that the deportation of the German population by Soviet authorities did not occur over night. Germans and Russians coexisted for up to 5 years after the end of the war.<sup>12</sup> In fact, the Soviets profited from the qualifications of the German population who remained in the work force and helped with the reconstruction of the region and partly transmitted their experience to the newcomers.<sup>13</sup> It is, however, rather unlikely that the Germans could have transferred their cultural values to Russians during this short period of coexistence, since this would have required a certain willingness to participate in such an exchange, which both sides lacked as a natural result of a recent war. In addition, targeted propaganda lectures took place in the region that heavily criticized the capitalistic values of the native German population [Kostyashov, 2008], [Kostyashov and Matthes, 2003, pp. 58-62].

Hence, the history of the Kaliningrad region gives us many reasons to *not* expect any persistence in the level of entrepreneurship there. However, entrepreneurship may persist because of other factors that drive entrepreneurial activity and that remained unchanged in the Kaliningrad region. First of all, these factors may be natural conditions such as climate and geographic location. The Kaliningrad region has a strategic position with access to the Baltic Sea which is conducive to economic activities in fishing and logistics, as well as for military purposes. Moreover, the fundamentals of the basic infrastructure that remained after the devastation caused by WW II may have been conducive for the revival of economic activity. Indeed, the process of rebuilding the infrastructure after the war frequently followed the pre-war design because of cost advantages (according to the adage: “build out of stones that are already there”). The desire to quickly recover from post-war destruction did not allow time for developing a completely new structure [Fyodorova and Kretinin, 2010], [Levchenkov and Gumenyuk, 2015]. However, certain adjustments were made. For instance, the reconstruction of the

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mainland certain advantages have been offered to them, for instance, a free journey, a certain amount of money, and for those settling rural areas property of a house with a piece of land that they could farm was offered. In fact, the structure of the population that came to the Kaliningrad region differed from the population in other Russian regions: there were about 1.5 times more women than men and 66% of the newcomers were 18-39 years old.

<sup>12</sup> According to different sources, there was no evident intention of the Soviets with regard to an expulsion of the German population from the region immediately after the war [Hoppe 2000, p. 29].

<sup>13</sup> It is documented that directly after the end of the war, Germans partly worked in leading positions and earned loans that were comparable to those of Russians. In the course of time, however, they were removed from higher positions. After an organized massive deportation of Germans in 1948, a small number of high-skilled German employees were retained until 1951 [Hoppe 2000, p. 33].

railroad network took into account the need for it to be integrated into the existing Soviet railroad network, including adjustment of the track gauge to Russian standards and removing parts of the railroad network that connected the Kaliningrad region with those parts of former East Prussia that became part of Poland after the war. Hence, the railroad network was limited to main communication routes and most of the light rail (*Kleinbahn*), which was typical of East Prussia, was disassembled.<sup>14</sup>

More importantly, with respect to entrepreneurship is the persistence of the industry structure. Many production facilities had been severely damaged during the war and many of those that remained fairly intact after the bombings, were intentionally destroyed or taken away by the withdrawing German troops so that the Soviets would not have access to them. It may, however, have appeared obvious in many cases to reconstruct these facilities for related purposes, particularly for production of the same kind of goods. Moreover, historic experience may have suggested that an industry that was successful in this region before the war may also be well suited for that location after the war. Hence, one might expect persistence of the industry structure for reasons that are ‘in the air’ and relevant even if the population had been more or less completely replaced.

Indeed, different sources of documentation of post-war reconstruction in the first years after the war reveal a strong orientation towards rebuilding former German production facilities [Kostyashov, 2008]. This orientation can be observed in almost all industries that are present in the region today. The following examples vividly demonstrate this type of continuity. A historical *Steinfurt* machine construction factory was founded in 1830 close to Königsberg. By 1865 the factory specialized in producing railroad carriages and since 1929 in producing tram carriages. Despite the fact that war damages of buildings, production and communication facilities as well as basic infrastructure were significant, the Soviets decided to reconstruct the factory for the very same purpose. The production of railroad, tram and goods carriages continued until 1998 when the factory closed down because of bankruptcy. Similarly,

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<sup>14</sup> Despite war time destruction and massive reconstruction afterwards *Kaliningradskaya oblast'* is still characterized by the oldest infrastructure when compared to other Russian regions. According to the 2002 Census, more than 30 percent of regional population lived in buildings that had been built before 1945. For comparison, the average figure for all Russian regions was about 5 percent.

the German *Schichau* shipyard in Pillau, close to Königsberg, is still a shipyard renamed *Yantar*.

Another major historical industry of the region that was reconstructed and absorbed by the Soviets is the production of cellulose and paper in the cities of Königsberg, Tilsit, Ragnit and Wehlau. Amber mining has been an important source of income for this region since the 14th century. Amber quarries that were operational before the war were flooded by the Germans during the troop withdrawal. Today, amber mining is once again flourishing. The amber in the region constitutes 80 percent of the world's amber reserves. Even the food processing industry is centered in pre-war facilities.<sup>15</sup> Remarkably, traditions and established brands that constitute part of the regional historical experience that we refer to continue their existence in entrepreneurship today. One example demonstrating this is the breeding of Trakehner horses originally developed in the early 18<sup>th</sup> century in the East Prussian town of Trakehnen (today *Yasnaya polyana*). In the last decade several historical studs have been restored and the private breeding farms use the historical brand for marketing purposes.<sup>16</sup>

These examples demonstrate that despite massive relocation of population and war-time destruction, there is some persistence in the industrial structure of the region that partly survives today. It should be noted, however, that the breakdown of the Soviet Union has induced major changes in this industrial structure. Many factories that survived war-time destruction and the Soviet planned economic system were privatized in the early 1990s only to be closed down due to bankruptcy without ever being revived. Hence, our investigation of persistence of entrepreneurship over time is particularly interesting, because it explores data that were collected in the first decade of the 21st century, that is, after the wave of bankruptcy cases. It should be further noted that continuity of certain industries does not necessarily explain persistence of self-employment (e.g., share of small firms) within these industries. However, if there is also persistence in firm size distribution within industries this

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<sup>15</sup> For instance, three German beer factories in former Königsberg, Tilsit, and Labiau as well as a distillery in Königsberg were put into operation in 1947. Four other breweries that were heavily damaged were put into operation at the end of 1948. Similarly, a fish processing plant in Peyse (*Svetliy*) was retained [GAKO, f. 225, op. 7, d. 1b].

<sup>16</sup> Examples of breeding farms are the stud of Georgenburg and Weedern.

would be evidence that new structures were built predominantly from the ruins of already existing facilities.

In summary, potential reasons for the persistence of entrepreneurship in the Kaliningrad area is unlikely to be due to continuity of economic structures since these were mostly destroyed in WW II. A persistence of informal institutions such as an entrepreneurship culture is also not a plausible explanation due to the complete exchange of the resident population. Since the region became part of the communist Soviet Union after 1945 and adapted its legal framework, stability of formal institutions cannot be a source of persistence in entrepreneurship either, particularly because private sector self-employment was illegal under these rules. It was further argued that persistence in physical infrastructure and location fundamentals can be neglected to a large degree as well. Thus, the main explanation for persistence of self-employment is historical experience that could have been preserved in the ruins of war. These ruins may have been reconstructed according to the economic traditions and then used in a similar way until today.

## **4. Data, empirical strategy and descriptive statistics**

### **4.1 Historical German data**

The historical German data is based on the full population and occupation censuses (*Volks- und Berufszählungen*) conducted on June 16, 1925 [Statistik des Deutschen Reichs, 1927]. The entire German population was surveyed and the census wave comprises an industry-occupation stratification that provides information on the number of employees by gender, by 26 industries, and the “social status” on the level of smaller districts (*kleinere Verwaltungsbezirke*).

The information on the social status allows distinguishing whether individuals are either working in the domestic sphere (home workers and helping family members) or outside their homes. Non-domestic employment is stratified by blue collar workers, white collar employees, and self-employed persons. The data allow calculating different self-employment rates for the year 1925 across districts. In the analysis we make use of alternative definitions of the self-employment rate (for details, see Section 4.4).

## 4.2 Russian data

Data for the contemporary *Kaliningradskaya oblast* come from various sources. First, we employ data on the total number of enterprises in districts (*rayons*) in the year 2010 from the Spark-Interfax database, which is provided by the Interfax Group, one of the largest information services agencies in Russia. Spark-Interfax data cover all records on corporations and sole proprietorship in Russia, the Ukraine and Kazakhstan. Its sources are the Russian Federal Statistic Service (*Rosstat*) database on business activity (financial reports, records on new corporations, shareholders and etc), List of Company Registers (*Ediniy gosudarstvenniy reestr yuridicheskikh liz*) and companies' obligatory accounting reports. This data source contains the total number of firms by industry and employment size. From the large amount of collected data<sup>17</sup>, we use only the data specifically referring to private operating enterprises that have no more than 25 percent of their equity shares held by the state, public organizations, or large firms.

Second, we employ the number of small and micro firms<sup>18</sup> at the districts level distinguished by industry from the census of small and medium enterprises that was conducted by Rosstat in 2010.<sup>19</sup> Legal forms of corporations and sole proprietorships (*individual'nyj predprinimatel'*)<sup>20</sup> have been considered. We then construct an entrepreneurship rate by industry, which is defined as the number of small and micro firms over the total number of firms in a particular industry. For robustness checks we also use the self-employment rate measured as the number of self-employed people in a particular industry and region over the number of employees in a particular industry and region.<sup>21</sup>

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<sup>17</sup> Operating enterprises are defined as those that did not report any intention to give up their activity in the next 12 months in financial accounts.

<sup>18</sup> According to Federal Law №239-FZ dated 24.07.2008 "On small business development in the Russian Federation" medium sized firms are defined as having 101-250 employees and a revenue (without VAT) of no more than 1,000 billion of rubles; small firms have 16-100 employees with a revenue of no more 400 billion of rubles, and micro-firms have 1-15 employees with a maximum revenue of 60 billion of rubles.

<sup>19</sup> The data come from the study of Rosstat "Results of full-scale federal statistical observation on activities of subjects of small and medium entrepreneurship in 2010".

<sup>20</sup> Sole proprietorship is a type of business entity that is owned and run by a natural person who is permitted to hire employees. There is no legal distinction between the owner and the business.

<sup>21</sup> This alternative self-employment rate is constructed in a very similar way to the historical self-employment rate and is based on the official census data from 2010. Since the variable of industrial affiliation contains many missing values which cannot be imputed with the data at hand, we use this information only for robustness checks. Our results remain robust when using this alternative self-employment rate.

Moreover, the Spark-Interfax database is employed in order to identify firms that can be traced back to German times. In a first step, we focused only on the large firms operating in the region, because it is most likely that small firms did not survive the collectivization of the Soviet period. In a next step, we excluded all firms that could not have been preserved because the industry in which they operate did not exist in pre-war times.<sup>22</sup> In a next step, we studied historical documentation for all firms remaining in the restricted sample with regard to establishment and reconstruction records. This was done for firms that still operated in 2010. We did not consider firms that were closed in the 1990s due to bankruptcy.

Third, we employ a number of control variables that are taken from two recent censuses of population conducted by Rosstat in 2002 and 2010 covering the entire population in the region. Table A1 in the Appendix gives an overview on the definition of variables and data sources.

### 4.3 Data adjustment procedures

In the early 20<sup>th</sup> century the northern area of East Prussia that eventually became the Kaliningrad exclave comprised 19 districts.<sup>23</sup> Today the *Kaliningradskaya oblast* consists of 22 municipal units (15 districts and 7 city districts, see Figure 1). Since the historical borders of districts are much different than those of the current districts, a data adjustment was necessary. In order to arrive at consistent spatial units we overlaid a digitized map of the districts in 1925 with one including the boundaries of the current Russian districts using Geographical Information Systems software (ArcGIS). The historical districts are split in parts along the border lines of the current districts. The raw data of 1925 are then multiplied by the resulting share of the split areas (in terms of the historical districts

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<sup>22</sup> These industries are, for instance, automobile manufacturing, ICT, and software programming that has only developed in the region in the last decades.

<sup>23</sup> The districts include: Darkehmen, Königsberg (city + county), Fischhausen, Friedland, Gerdauen, Goldap, Gumbinnen, Heiligenbeil, Insterburg (city + county), Labiau, Niederung, Pillkallen, Preußisch Eylau, Stallupönen, Tilsit-Ragnit (city + county), and Wehlau. Parts of some of the more southern districts became Polish territory after 1945.

size) and assigned to the current regions. In order to yield reliable results we had to aggregate the number of municipal units to 14.<sup>24</sup>



**Figure 1. Location map of Kaliningradskaya oblast and its districts**

After adjusting for different regional boundaries, we had to make the industrial sector classification comparable. The historical classification was much different than the one used for Russia in 2010. The procedure aimed at assigning the 26 historical German industries to the 14 industries we have information on for the Kaliningrad area in 2010. Applying these procedures, we were able to garner information for 12 industries in 14 regions that is used in the empirical analysis.<sup>25</sup>

#### 4.4 Empirical strategy

We run our analysis at the region-industry level. Accordingly, we have 168 industry-region observations for the cross-section in 2010. In order to detect how the historical level of self-employment affects the current level of entrepreneurship across regions and industries, we make use of historical self-employment measures. This is the number of self-employed people in 1925 in relation to the total number of

<sup>24</sup> For assigning historical to current counties we made use of the shape files as provided by the Max Planck-Institute for Demographic Research and GADM database for Global Administrative Areas. The procedure for adjusting the census data to spatially consistent areas can be illustrated by an example. If 35 percent of the historical county H is today partially located in the current counties C1 whereas the remaining 65 percent are part of the current county C2 then the raw census numbers of H are multiplied by the respective numbers and assigned to either C1 or C2. For a similar approach, see Fritsch and Wyrwich (2016).

<sup>25</sup> The 14 industries are “Agriculture, Hunting and Forestry”, “Fishing”, “Mining and Quarrying”; “Manufacturing”, “Electricity, Gas and Water Supply”, “Construction”, “Wholesale and Retail Trade”, “Hotels and restaurants”, “Transport, Storage and Communication”, “Finance and Insurance”, “Real Estate, Renting and Business Activities”, “Education”, “Health and Social work”, “Other Community, Social and Personal Services.” The industries “Finance and insurance” and “Real Estate, Renting and Business Activities” had to be aggregated to one industry since the historical data could not be assigned separately to these industries. The same holds for “Education” and “Other Community, Social and Personal Services.” A table on how the different German industries are assigned to these categories can be obtained upon request.



employees (including home workers and helping family members) in a certain industry. This industry-specific historical self-employment rate is our main independent variable of interest. We apply an OLS regression approach to determine how the historical self-employment rate affects current entrepreneurship levels. The latter is measured by the number of small firms and those in sole proprietorship in relation to the total number of firms. The basic model specification is

$$Eship_{ri}^{2010} = \beta * Eship_{ri}^{1925} + Z_r + \varepsilon_{ri} , \quad (1)$$

where  $Z_r$  denotes a vector of control variables in a region  $r$ . These are current regional conditions that might play a role in the level of entrepreneurship across regions. Population density in 2010 is used as a “catch-all“ variable that is correlated with several other regional characteristics that might have an effect on the level of entrepreneurship. In particular, it measures all kinds of agglomeration effects. We account for long-run regional development by including the population change between 1925 and 2010. Regions with above average growth might have more entrepreneurial opportunities.

The regional stock of knowledge might also play a role for the availability and exploitation of entrepreneurial opportunities. In this respect, the knowledge spillover theory of entrepreneurship argues that knowledge, particularly the regional “sticky” knowledge base, is an important conduit for start-ups. According to this theory, new firms are a crucial channel for commercializing spillovers from regional institutions of knowledge production such as universities or innovative private firms e.g., [Acs et al., 2009]. In line with this theory, empirical evidence indicates that the regional stock of knowledge has a significantly positive effect on the regional level of start-up activity e.g., [Armington and Acs, 2002], [Fritsch and Wyrwich, 2014]. Against this background, we control for the share of people with a university degree in 2010 in our analysis.

Regional entrepreneurship might be also affected by the local unemployment rate. On the one hand, individuals may be pushed into self-employment due to unemployment. This would suggest a positive relationship between entry and unemployment. On the other hand, there may be a “demand pull” effect when economic conditions are favorable and unemployment is low. According to this argument, low unemployment should be positively correlated with entrepreneurship.

Therefore, the net effect of regional unemployment is unclear (see [Parker, 2009] for a more detailed discussion). We control for the regional unemployment rate which is calculated as the number of unemployed people over the sum of unemployed and employed people (workforce).

Apart from these control variables that are more or less standard in the analysis of regional levels of entrepreneurship, we included further controls in alternative model specifications. These variables are introduced in Sections 5.3-5.5 where we present the results of robustness checks. All regression models are estimated with robust standard errors in order to account for potential heteroskedasticity.

## **5. Results**

### **5.1 Descriptive statistics**

In the year 1925 there was a rather pronounced variation of the industry-specific self-employment rates across the regions of what is the Kaliningrad enclave today. The highest rate of around 52 percent was found in the real estate, renting and business service sector in the *Ozerskiy rayon* area. The lowest rate of 0.65 percent can be observed for the electricity, gas and water supply industry in the *Bagrationovski rayon*.

The entrepreneurship rate in 2010 assumes values between 0 and 1. These extreme values exist because we have to rely on information at the level of firms for self-employment in the year 2010 rather than on the available employment data for 1925. If there is no small firm in an industry in the year 2010 the value of the self-employment rate is zero. In the 1925 employment data, the business owners of large firms would have been counted as self-employed. Thus, the self-employment rate would always be above zero even if all of the firms of a specific industry in a certain region were large. The extremely high entrepreneurship rate of 1 indicates that all firms in an industry are small. In the 1925 employment data the rate would have been below 1 if the number of employees exceeds the number of self-employed.

The self-employment rate in the year 2010 has the value of 1 in 3 industries of 5 regions. These industries are fishing, hotels and restaurants, as well as mining

and quarrying. The rate is zero for 22 industry-region observations. Most of the zero rates pertain to fishing industries and mining and quarrying. In one case the zero rate is in electricity, gas and water supply. Among the 22 zero-rated observations there are 8 cases with positive employment in 1925 but where no firm was registered in 2010.<sup>26</sup>

Additional summary statistics and a correlation matrix, including the main variables included in the analysis, are shown in Tables A2 and A3 in the Appendix. Since there is high correlation among the regional variables, we include them stepwise into the regression in order to rule out the possibility that multicollinearity drives the result for our main variable of interest.

## **5.2 The impact of the historical self-employment rate on the current entrepreneurship rate**

Table 1 presents the results of our main regression models on the determinants of variations in self-employment rates in 2010 across regions and industries. Our results demonstrate that the historical German industry-specific self-employment rates have a positive and significant effect on current Russian self-employment rates across industries. Regional conditions such as population density, long-term population change and the share of highly educated people do not explain differences in entrepreneurship in any significant way.<sup>27</sup> We find, however, that regional unemployment rates are significantly and negatively associated with the current level of entrepreneurship in a region (Table 1, column V). In column VI we exclude the city of Kaliningrad and its surroundings in order to ensure that the results are not driven by a strong concentration of economic activity in the capital of the region. The effect of the historical self-employment rate remains unchanged, whereas the effect of the unemployment rate becomes nonsignificant.

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<sup>26</sup> Excluding these cases from the analysis does not change the results in any substantial way.

<sup>27</sup> Running the analysis with regional fixed effects without specific regional proxies yields results similar to model I.

**Table 1. Determinants of differences in entrepreneurship rates in 2010 across regions and industries**

	Entrepreneurship rate 2010					
	I	II	III	IV	V	VI
Self-employment rate 1925	0.740*** (0.159)	0.741*** (0.160)	0.740*** (0.160)	0.739*** (0.161)	0.728*** (0.159)	0.737*** (0.166)
Population density 2010		0.00217 (0.020)	-0.00289 (0.023)	0.0208 (0.068)	0.0134 (0.069)	0.00868 (0.0705)
Population growth 1925-2010			0.00905 (0.029)	0.0131 (0.032)	0.00124 (0.034)	0.0122 (0.0436)
Share of population holding a tertiary degree 2010				-0.433 (1.110)	-1.039 (1.107)	-1.651 (1.633)
Unemployment rate 2010					-1.492* (0.853)	-1.826 (1.144)
Number of observations	168	168	168	168	168	156
R-squared	0.138	0.138	0.143	0.144	0.155	0.155

*Notes:* The dependent variable is defined as the number of small firms and sole proprietorships over the total number of firms in a certain region and industry. Robust standard errors in parentheses. \*\*\*: statistically significant at the 1 percent level; \*\*: statistically significant at the 5 percent level, \*: statistically significant at the 10 percent level. Constants are not shown for brevity.

The results are robust to using alternative definitions of the historical self-employment rates. One such alternative definition is to relate the number of self-employed to the number of employees in the non-domestic sphere only (i.e., excluding home workers and helping family members from the denominator). The results are also robust with regard to inclusion of the number of home workers in the nominator of the self-employment rate.<sup>28</sup> Using alternative definitions of the current and historical self-employment rates, such as the share of self-employed people in the overall number of employed people in 2010 or the share of enterprises in the total workforce in 1925, does not change our main result (see Appendix, Tables A4 and A5).

<sup>28</sup> Results can be obtained upon request. Home workers were a hybrid occupational status falling midway between a “fully” self-employed person and a dependent employee.

### **5.3 What can explain the persistence of entrepreneurship over time?**

In different models, we introduced additional control variables in order to shed light on the sources of persistence of entrepreneurship in the Kaliningrad region over more than 80 years (Table 2).

Despite the almost complete turnover of the native population in the region during the first years after the end of WW II, it is possible that there has been some transmission of entrepreneurial values, that is, persistence in informal institutions. This could be the case, for instance, if individuals from the native German population remained in the region and preserved their values through several generations. In this respect, we consider German legacy in the regions by controlling for the share of Germans that live across the districts of the Kaliningrad regions in 2010 (Table 2, column I). We do not find any significant relationship, however, which can be explained by demographic development that occurred directly after the breakdown of the Soviet Union. The idea of resettlement to the Kaliningrad region of Soviet Germans whose antecedents came in the 18<sup>th</sup> century from Germany to the Volga region and were deported to Central Asia during the war, has become attractive and initiated a wave of in-migration. Hence, the effect of the share of German population can hardly be attributed to East Prussian legacy, but rather to the distinctiveness of Soviet Germans' culture. Similarly, North-East Prussia had a significant share of Lithuanians some of whom could have remained in the region when both East Prussia and the neighboring Lithuania became part of the Soviet Union. Hence, we include the share of Lithuanians who lived in the Kaliningrad region in 2010 (Table 2, column II). As in the case of the share of German population, the effect is non-significant.

It is also possible that the entrepreneurial values of the native German population could have been transmitted to the newcomers from Russian regions during the relatively short period of their coexistence directly after WW II. Older people living nowadays in the region are more likely to have had personal contact with the native German population. To control for such

**Table 2. Robustness checks: Determinants of differences in self-employment rates in 2010 across regions and industries**

	I	II	III	IV	V	VI	VII	IIIX	IX	X	XI	XII
Self-employment rate 1925	0.728*** (0.160)	0.736*** (0.157)	0.739*** (0.156)	0.714*** (0.156)	0.739*** (0.156)	0.775*** (0.249)	0.738*** (0.156)	0.742*** (0.156)	0.712*** (0.157)	0.708*** (0.158)	0.716*** (0.159)	0.715*** (0.160)
<i>Baseline explanatory variables:</i>												
Population density (2010)	0.021 (0.071)	-0.0252 (0.076)	-0.00737 (0.070)	-0.00728 (0.070)	-0.0105 (0.075)	-0.0104 (0.075)	-0.0176 (0.071)	-0.0122 (0.072)	-0.0284 (0.088)	-0.00526 (0.094)	0.0304 (0.107)	0.0575 (0.164)
Population growth 1925-2010	0.00757 (0.043)	-0.0449 (0.046)	-0.0335 (0.035)	-0.0298 (0.035)	-0.0336 (0.035)	-0.0336 (0.035)	-0.0337 (0.035)	-0.0305 (0.037)	-0.0335 (0.035)	-0.0245 (0.039)	-0.0275 (0.039)	-0.0276 (0.039)
Share of population holding tertiary degree (2010)	-1.082 (1.102)	-0.445 (1.212)	-1.359 (1.135)	-1.266 (1.139)	-1.282 (1.335)	-1.277 (1.340)	-2.062 (1.334)	-1.196 (1.335)	-1.361 (2.234)	-1.936 (2.403)	-2.442 (2.458)	-2.956 (3.494)
Unemployment rate (2010)	-1.515* (0.865)	-1.636* (0.863)	-2.427** (1.000)	-2.137** (1.013)	-2.375** (1.132)	-2.376** (1.138)	-3.080** (1.245)	-2.258* (1.217)	-2.614* (1.513)	-2.876* (1.612)	-2.756* (1.631)	-2.962 (1.925)
<i>Persistence in informal institutions:</i>												
Share of Germans (2010)	1.993 (7.951)											
Share of Lithuanians (2010)		2.244 (1.736)										
Share of population older than 55 years old (2002)			3.828** (1.894)	3.603* (1.892)	3.734* (2.119)	3.714* (2.129)	4.882** (2.330)	3.645* (2.095)	4.003 (3.069)	4.878 (3.324)	6.349* (3.572)	6.667* (4.002)
<i>Persistence in infrastructure:</i>												
Share of preserved German firm				-0.361*** (0.120)					-0.349*** (0.112)	-0.349*** (0.115)	-0.367*** (0.115)	-0.371*** (0.115)
Deconstructed railways					-0.0021 (0.023)	0.00204 (0.031)			-0.00047 (0.023)	0.0175 (0.040)	0.0385 (0.048)	0.0379 (0.048)
Self-employment rate 1925 x Deconstructed railways								-0.0244 (0.131)				

Table 2 (cont.)

Share of population in houses built before 1945 (2002)													-0.443 (0.496)		-0.258 (0.594)	-0.459 (0.666)	-0.469 (0.666)	-0.435 (0.662)		
Share of population in houses built before 1920 (2002)														0.389 (1.415)						
<i>Persistence in natural conditions:</i>																				
Location at coastline																-0.025 (0.061)	0.0347 (0.117)	0.102 (0.145)	0.0898 (0.150)	
Location with sea port																	-0.076 (0.134)	-0.172 (0.180)	-0.139 (0.215)	
<i>Military presence:</i>																				
Share of armed forces (2002)																		9.163 (10.390)	9.443 (10.520)	
<i>Cultural diversity:</i>																				
Share of foreigners (2010)																				-0.552 (2.195)
Constant	0.546*	0.611***	0.0563	0.0611	0.074	0.0708	0.193	0.0539	0.227	0.103	-0.336	-0.393								
	(0.281)	(0.220)	(0.323)	(0.323)	(0.368)	(0.367)	(0.344)	(0.323)	(0.405)	(0.430)	(0.689)	(0.752)								
Number of observations	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168	168
R-squared	0.156	0.165	0.175	0.187	0.175	0.175	0.179	0.175	0.191	0.193	0.196	0.197								

*Notes:* The dependent variable is the number of small firms and those in sole proprietorship over the total number of firms in a certain region and industry. Robust standard errors in parentheses. \*\*\*: statistically significant at the 1 percent level; \*\*: statistically significant at the 5 percent level, \*: statistically significant at the 10 percent level. The number of observations in model (13) is lower, because the data on region of origin for newcomers, which underlies the diversity index, was not available for the region of *Sov'yetsk*.

an effect, we include the share of population aged 55 years and older in 2002 as a control variable (column III of Table 2). This means that the youngest person in this part of the population was born in 1947, that is, shortly after the end of the WW II. We find a positive and statistically significant effect of the share of older population on the current level of entrepreneurship activities which indicates that a direct transmission of cultural values from native German population to the population of newcomers might indeed have taken place. An alternative explanation might be a relatively higher willingness to take risks among the older population who were courageous enough to leave their home for the Kaliningrad region. This higher aptitude for risk-taking might have led this population group to opt for self-employed.

Yet another reason for persistence may be a continuity of the basic infrastructure and production facilities despite the massive destruction during WW II. To address this possible effect, we include the share of firms that were in existence during the German era (pre-1945) that were reconstructed by the Soviets with basically the same product spectrum ultimately undergoing a process of privatization in the early 1990s (column IV of Table 2). We find a significant negative effect of the share of preserved German firms. This can be interpreted as indication that there is less scope for entrepreneurial behavior to reshape economic structures in regions where traditional structures were kept. Moreover, preserved firms tend to be rather large, which may impede market entry in regions where they are located.

In order to control for persistence in fundamental infrastructure, two further indicators are employed. First, we construct an indicator for deconstructed railway lines. The Soviets maintained a large part of the East Prussian railway network. However, several redundant railway lines were at least partly deconstructed in a number of regions, mostly in the southern regions of the oblast close to the Polish border. We include in the model a variable that measures the level of persistence in railways network that equals 0 if no deconstruction occurred and a value of 4 if deconstruction was significant (column V of Table 2). The effect is negative, as expected, but not statistically significant. Additionally, we include in the model an interaction term between the indicator for deconstructed railways and the historical self-employment rate in order to test for differences in the level of persistence of entrepreneurship in regions with different level of continuity of the basic



infrastructure (column VI of Table 2). The interaction term does not produce a significant difference. We also control for the share of the population that live in houses built before 1945 or before 1920, that is, during the period of German administration (Table 2, columns XII and IIX). This can be regarded as an indicator for the level of preserved basic infrastructure. We find no statistically significant effect.

In a next step, we add control variables that aim to capture the persistence of entrepreneurship caused by natural conditions. This would include a location that is favorable for entrepreneurship more or less independently of prevailing institutions. We do this by including a dummy variable which equals 1 if a region is situated at a coastline and equals 0 otherwise (Table 2, column IX). To strengthen our proposition that location at the seaside may be advantageous for entrepreneurship in such industries as, for instance, fishing and logistics, we include a dummy variable that signals whether a region possesses a sea port (Table 2, column X). Neither effect proved to be statistically significant.

Another driving force of regional entrepreneurial activity may be the presence of armed forces in the region. A military presence may create additional demand for services in the region. Military personnel are also more likely to possess higher levels of human capital including managerial abilities necessary to set up a business. After retirement, former military servants may be more likely to become entrepreneurs. A further robustness check includes a share of employees in military service in the regional population (Table 2, column XI). The effect of the presence of a military sector on entrepreneurship rate is positive, but not statistically significant.

Next, we perform a robustness check regarding the level of cultural diversity in a region, which may also be associated with the regional level of entrepreneurship. To this end, we include the share of foreigners in the sub-regions of the Kaliningrad area in the year 2010 (Table 2, column XII). This proxy is insignificant.

Altogether, different regional conditions with regard to location, persistence of infrastructure and production facilities as well as ethnical structure of the population just to name a few, seem to play no meaningful role for spatial differences in entrepreneurship in the Kaliningrad exclave. The historical self-employment rate is significant in every model specification. This means that we cannot attribute this

significant historical self-employment rate to a persistence of an entrepreneurial culture or laws and regulations that encourage entrepreneurship. So what then drives the mechanism that creates these results? The following section aims at shedding some more light on the mechanism behind this effect.

#### **5.4 Persistence or natural rate of entrepreneurship?**

Given the extreme disruptions in both formal and informal institutions that the Kaliningrad region witnessed in the last 80 years, there is a legitimate concern whether one can speak about *persistence* of entrepreneurship in that region. One could argue in favor of the existence of some *natural rate of entrepreneurship* that is independent of the factors just described and analyzed. Such a natural rate of entrepreneurship may be driven by a more or less stable production technology that causes a relatively constant minimum efficient firm size. Clearly, such a natural rate of entrepreneurship is more likely to be observed in the service sector than in manufacturing. One may think of retail stores or hairdressers whose services are consumed rather independently of any external shocks. Hence, we test whether persistence of regional entrepreneurship activity is more pronounced in services as compared to manufacturing by repeating our baseline analysis for the two large economic sectors (Table 3).

We find a positive and statistically significant effect of historical self-employment rates on current entrepreneurship rates only in manufacturing industries but not in the service sector. This argues against the existence of a

**Table 3. Determinants of differences in regional entrepreneurship rates in 2010 in agriculture, manufacturing and services**

	I	II
	Manufacturing	Services
Self-employment rate 1925	1.209*** (0.279)	0.259 (0.172)
Population density 2010	0.0552 (0.102)	0.0778 (0.0857)
Population growth 1925-2010	-0.0535 (0.0440)	0.0413 (0.0263)
Share of highly educated people (university degree)	-1.294 (1.500)	-1.783 (1.333)
Unemployment rate	-2.646* (1.475)	-0.209 (1.114)
Constant	0.537 (0.393)	0.462* (0.262)
Number of observations	56	84
R-squared	0.302	0.064

*Notes:* The dependent variable is the number of small firms and those in sole proprietorship over the total number of firms in a certain region and industry. Robust standard errors in parentheses. \*\*\*: statistically significant at the 1 percent level; \*: statistically significant at the 10 percent level.

natural rate of entrepreneurship as the mechanism driving the results. Moreover, this finding suggests that the role of historical experience is stronger in manufacturing than in services.

## **5.5 The role of successful historical experience of entrepreneurship**

In previous sections we provided some anecdotal evidence of the role of historical experience for reoccurrence of regional entrepreneurship in spite of dramatic changes in the institutional environment (see, e.g., section 3). In this section we shed more light on the nature of this historical experience and the channels through which it may influence the current level of entrepreneurship activities. To this end we use historical data on the extent of electric motor power used per enterprise in a certain

region and industry in the year 1925.<sup>29</sup> This can be regarded an indicator of how advanced a regional industry was in terms of mechanized production facilities. We assume that the impact of region-industry-specific experience for persistence of entrepreneurship is more pronounced if production facilities in small firms have been mechanized. Table 4 shows the results of this analysis.

**Table 4. Power of production facilities and entrepreneurship**

	I	II
Self-employment rate 1925	0.621*** (0.191)	0.617*** (0.192)
Power of electric motors (in h.p.) per enterprise	-0.000599 (0.000735)	-0.00161*** (0.000452)
Self-employment rate 1925 x Power of electric motors (in h.p.) per enterprise	-	0.0570*** (0.0196)
Population density 2010	0.0514 (0.0799)	0.0301 (0.0815)
Population growth 1925-2010	-0.000567 (0.0342)	-0.0114 (0.0349)
Share of highly educated people (university degree)	-1.474 (1.273)	-1.062 (1.296)
Unemployment rate 2010	-1.347 (1.013)	-1.396 (1.027)
Constant	0.547** (0.253)	0.578** (0.257)
Number of observations	128	128
R-squared	0.137	0.153

*Notes:* The dependent variable is the number of small firms and those in sole proprietorship over the total number of firms in a certain region and industry. Robust standard errors in parentheses. \*\*\*: statistically significant at the 1 percent level; \*\*: statistically significant at the 5 percent level, \*: statistically significant at the 10 percent level. The number of observations is lower than in the baseline model, because data was not available for all industry-region units.

We find that the extent of electric motor power used per enterprise in a certain region and industry in the year 1925 is not related to the current level of entrepreneurship in that region per se. Interacting this variable with the historical level of entrepreneurship reveals whether persistence of entrepreneurship is stronger

<sup>29</sup> The data stems from the Establishment Census (*Gewerbliche Betriebszählung*) conducted on June 16, 1925 (Statistik des Deutschen Reichs 1929).

if the regional industry was advanced in terms of mechanized production facilities. We observe a significant and positive effect of this interaction suggesting, that persistence of entrepreneurship is higher in regions with high levels of entrepreneurship in the past.

## **6. Tell me why: Conclusions and questions**

This paper investigated spatial differences in the persistence of entrepreneurship rates in the Kaliningrad region. Before WW II, this region was the northern part of East Prussia, but became part of the Soviet Union after WWII, and today is part of the Russian Federation. The region experienced several major external shocks; massive destruction during WW II, the expulsion of the entire native population and subsequent repopulation by Russian citizens during the years immediately after the war, almost 45 years of rule by a socialist regime, and perturbation after the dissolution of the Soviet Union. Despite these changes, our results suggest that there is a strong correlation between the historical pre-war self-employment rate in the year 1925 and entrepreneurship activity in the modern Kaliningrad region in the year 2010.

This persistence cannot be explained by fundamentals that make a region naturally attractive for economic activity, such as a favorable sea coast location. Nor can it be explained by the share of enterprises that were established during the pre-WW II German era. The most likely explanation for this persistence is the historical experience that might have been preserved in spite of the ruins of war and absorbed by the new population even in the absence of direct transmission mechanisms, such as role models or other knowledge transfer mechanisms. We show that not only economic activity as such persists but also the way economic activity is conducted namely whether economic activity is rather organized in small or large companies. Our results show that regional differences in entrepreneurship can be persistent even though every previous place-specific path of economic, institutional, and cultural development is severely affected by historical shocks. Another important implication of our findings is that a correlation of entrepreneurship rates over time does not necessarily indicate deeply grounded regional cultural values in favor of

entrepreneurship given that one is also able to find persistence where culture, as source of persistence, can be entirely ruled out.

One of the main findings of our study is the role of successful historical experience of entrepreneurship for the resurrection of entrepreneurship. Historical level of entrepreneurial activities concentrated in regions where industry was particularly efficient seems to be a strong predictor of current level of entrepreneurship despite external shocks that affected both the formal and informal institutional environment. There are further examples of historical experience being a driver of entrepreneurship in regions that have been exposed to fundamental changes of institutional environment. For instance, the town of Glashuette which is located in Saxony in the former GDR has a worldwide reputation for a tradition of manufacturing mechanical luxury watches that goes back to 1845. The East German government expropriated watchmaking firms located in the region after the WW II. After the reunification of Germany several prestigious watchmaking brands have been re-established in Glashuette, among them the world-famous *Nomos*, *Glashuette Original* and *A. Lange & Söhne* [Der Spiegel, 2016]. Compared to the case of Kaliningrad region, there was no comparable out-migration of population in the GDR, and the manufacturing of watches has never been interrupted in Glashuette. Not surprisingly, the success of firms located in Glashuette after the reunification of Germany is more pronounced. Nevertheless, our study provides evidence that a region's historical experience of successful entrepreneurial activities is a critical factor for fostering regional entrepreneurship and growth.

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## Appendix

**Table A1. Definition of variables**

<i>Variable</i>	<i>Operational definition</i>	<i>Data source</i>
Entrepreneurship rate 2010	Number of small firms and those in sole proprietorship over the total number of firms in a certain region and industry.	Russian Federal Statistics Service, Results of full-scale federal statistical observation on activities of subjects of small and medium entrepreneurship in 2010, total number of firms is from SPARK-Interfax database
Self-employment rate 1925	Number of self-employed people in relation to the total number of employees (incl. home workers and helping family members)	German employment census
Population density	Regional population per squared kilometer (log)	All-Russia population census in 2010, Russian Federal Statistics Service
Population change 1925-2010	Change in the number of population between 1925 and 2010	German employment census / All-Russia population census in 2010, Russian Federal Statistics Service
Share of people holding tertiary degree	Number of people with a university degree or a PhD degree within the total population	All-Russia population census in 2010, Russian Federal Statistics Service
Unemployment rate	Number of unemployed people <sup>30</sup> in relation to the sum of employed and unemployed people	All-Russia population census in 2010, Russian Federal Statistics Service
Share of Germans	Share of Germans in total population	All-Russia population census in 2010, Russian Federal Statistics Service
Share of Lithuanians	Number of Lithuanians per hundred of total population	All-Russia population census in 2010, Russian Federal Statistics Service
Share of population older than 55 years old	Share of population aged 55 years old and more in the total population	All-Russia population census in 2002, Russian Federal Statistics Service
Share of preserved German firms	Number of firms that already existed before 1945 within the total number of firms per industry	Archives and open sources, companies' web-sites
Deconstructed railways	Level of deconstruction of East Prussian railway network on a 5-point scale (0=totally preserved; 4=significantly deconstructed)	Own calculations

<sup>30</sup> According to the census, someone is regarded as being unemployed if he or she is available for work and is actively seeking employment; found a job during two weeks after the week when census survey was conducted; found a job and waited for job offer no more than one month; entrepreneurs had unemployed status until the registration of an firm; students and retired people were assigned the unemployed status if they were available for a job and actively searched for employment. Thus the definition of the unemployment status is quite close to the definition given by the International Labour Organization (<http://laborsta.ilo.org/applv8/data/c3e.html>).

Share of population in houses built before 1945	Share of population that lives in houses that have been built before 1945 in the total population	All-Russia population census in 2002, Russian Federal Statistics Service
Share of population in houses built before 1920	Share of population that lives in houses that have been built before 1920 in the total population	All-Russia population census in 2002, Russian Federal Statistics Service
Location at coastline	Dummy variable: 1=districts is located at the Baltic coast line	
Location with sea port	Dummy variable: 1=districts has a sea port	
Share of armed forces	Share of employed in military sector in the total population	All-Russia population census in 2002, Russian Federal Statistics Service
Share of foreigners	Share of foreigners in total population	All-Russia population census in 2010, Russian Federal Statistics Service
Power of electric motors (in h.p.) per enterprise	Total power of electric motors in a region and industry (in h.p.) over the total number of enterprises in this region and industry	German census of establishments

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**Table A2. Summary statistics**

	Number of observations	Mean	Standard Deviation	Minimum	Maximum
Entrepreneurship rate 2010	168	0.46	0.28	0	1
Self-employment rate 1925	168	0.17	0.14	0.01	0.52
Population density 2010	168	3.45	0.82	2.31	5.72
Population growth 1925-2010	168	0.89	0.86	0.24	3.19
Share of people holding tertiary degree	168	0.12	0.05	0.07	0.27
Unemployment rate	168	0.12	0.04	0.07	0.2
Share of Germans 2010	168	0.01	0.01	0	0.02
Share of Lithuanians 2010	168	0.05	0.02	0.02	0.1
Share of population older than 55 years old	168	0.21	0.01	0.18	0.24
Share of preserved German firms	168	0.01	0.09	0	1
Deconstructed railways	168	1.36	1.23	0	4
Share of population in houses built before 1945	168	0.35	0.07	0.21	0.44
Share of population in houses built before 1920	168	0.03	0.02	0.01	0.06
Location at coastline	168	0.5	0.5	0	1
Location with sea port	168	0.36	0.48	0	1
Share of armed forces	168	0	0	0	0.01
Share of foreigners	168	0.06	0.03	0.02	0.11
Power of electric motors (in h.p.) per enterprise	128	6.22	25.98	0	252.63

**Table A3. Correlation matrix**

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Entrepreneurship rate 2010	1															
2 Self-employment rate 1925	0.3712*	1														
3 Population density 2010	-0.0237	-0.081	1													
4 Population growth 1925-2010	0.0175	-0.017	0.5312*	1												
5 Share of people holding tertiary degree	-0.029	-0.078	0.9351*	0.6065*	1											
6 Unemployment rate	-0.0731	0.0299	-0.727*	-0.578*	-0.770*	1										
7 Share of Germans 2010	0.0025	0.0405	-0.731*	-0.753*	-0.721*	0.6511*	1									
8 Share of Lithuanians 2010	0.057	-0.039	0.4363*	0.7649*	0.4067*	-0.366*	-0.512*	1								
9 Share of population older than 55 years old	0.033	-0.069	0.4289*	0.5361*	0.4420*	-0.1339	-0.539*	0.6215*	1							
10 Share of preserved German firms	-0.179*	-0.107	-0.0876	-0.0573	-0.0867	0.1814*	0.1301	-0.0544	-0.0153	1						
11 Deconstructed railways	-0.1128	-0.018	-0.315*	-0.323*	-0.190*	0.3615*	0.5944*	-0.238*	-0.362*	0.1131	1					
12 Share of population in houses built before 1945	0.0792	0.0539	-0.609*	-0.158*	-0.629*	0.2575*	0.3361*	-0.0266	-0.0648	0.0039	-0.0741	1				
13 Share of population in houses built before 1920	0.0908	-0.059	0.0584	-0.0862	-0.0457	-0.233*	0.013	0.1667*	-0.0031	-0.082	-0.0109	0.2578*	1			
14 Location at coastline	-0.0603	-0.035	0.2291*	0.0789	0.3652*	-0.415*	-0.261*	-0.274*	-0.158*	-0.026	0.058	0.0068	0.0605	1		
15 Location with sea port	-0.1201	-0.087	0.4306*	0.2521*	0.5694*	-0.400*	-0.330*	0.0603	0.0187	0.0063	0.3892*	-0.343*	0.0356	0.7454*	1	
16 Share of armed forces	-0.0175	-0.063	0.3638*	0.3855*	0.4390*	-0.511*	-0.338*	0.2798*	-0.1216	-0.016	-0.0194	-0.408*	0.2045*	0.2408*	0.4973*	1
17 Share of foreigners	-0.0278	-0.095	0.6278*	0.4142*	0.5241*	-0.530*	-0.589*	0.4869*	0.2986*	-0.083	-0.0988	-0.162*	0.5070*	0.2469*	0.5490*	0.4172*

Notes: \* statistically significant at the 5 percent level.

**Table A4. Determinants of differences in self-employment rates in 2010 across regions and industries**

	I	II	III	IV	V
	Self-employment rate 2010				
Self-employment rate 1925	0.104*** (0.036)	0.109*** (0.036)	0.107*** (0.035)	0.106*** (0.035)	0.106*** (0.035)
Population density 2010		0.00863* (0.005)	0.00054 (0.006)	0.012 (0.018)	0.012 (0.018)
Population growth 1925-2010			0.0145 (0.010)	0.0165 (0.011)	0.0164 (0.011)
Share of highly educated people (university degree)				-0.209 (0.304)	-0.21 (0.307)
Unemployment rate					-0.00089 (0.182)
Constant	0.0265*** (0.005)	-0.00427 (0.018)	0.011 (0.019)	-0.00466 (0.031)	-0.00448 (0.046)
Number of observations	165	165	165	165	165
R-squared	0.054	0.067	0.097	0.1	0.1

*Notes:* The dependent variable is the number of self-employed people in the overall number of employed people in 2010. Robust standard errors in parentheses. \*\*\*: statistically significant at the 1 percent level; \*\*: statistically significant at the 5 percent level, \*: statistically significant at the 10 percent level.

**Table A5. Determinants of differences in self-employment rates in 2010 across regions and industries**

	I	II	III	IV	V
	Entrepreneurship rate 2010				
Share of enterprises in total workforce in 1925	0.464*** (0.148)	0.471*** (0.156)	0.471*** (0.156)	0.488*** (0.159)	0.469*** (0.163)
Population density 2010		0.00895 (0.0241)	0.0107 (0.0271)	0.0949 (0.0828)	0.0885 (0.0840)
Population growth 1925-2010			-0.0032 (0.0299)	0.0113 (0.0328)	0.00311 (0.0349)
Share of highly educated people (university degree)				-1.514 (1.299)	-1.865 (1.310)
Unemployment rate					-0.946 (1.033)
Constant	0.371*** (0.0465)	0.338*** (0.117)	0.335*** (0.118)	0.213 (0.173)	0.405 (0.273)
Number of observations	128	128	128	128	128
R-squared	0.088	0.088	0.088	0.098	0.104

*Notes:* The dependent variable is the share of enterprises in the total workforce in 1925. Robust standard errors in parentheses. \*\*\*: statistically significant at the 1 percent level; \*\*: statistically significant at the 5 percent level, \*: statistically significant at the 10 percent level.

**Table A6. List of East Prussian firms that have been preserved until our days**

ID	District	Modern name (in Russia)	Original name (in East Prussia)
583	Gvardejskij rayon, Kaliningradskiy rayon	Yantar shipyards; Kaliningrad carriage works	Schihau shipyards; Koenigsberg carriage works
593	Svetlogorsk, Zelenogradskij rayon, Baltijskij city rayon, Pionérskij city rayon, Jantarnyj city rayon, Svetlovskij city rayon	Svetlovsk water power plant; Kaliningrad amber plant	Pajze-2; Königsberg amber plant
592	Sovetsk	Soversk pulp and paper plant	Tilzit pulp and paper plant
590	Pravdinskiy rayon	Pravdinsk water power plant;	Water power plant (no name);
589	Polesskiy rayon	Polesskiy fish canning plant	Zarkay
588	Ozerskiy rayon	Ozersk water power plant	Darkehmen water power plant
586	Nemanskiy rayon	Neman pulp and paper plant	Zellstoffabrik Ragnit AG
577	Bagrationovskij rayon (including, Ladushkinskij rayon, Mamonovskij city rayon)	Mamonovskij fish canning combine	Fish receiving unit facilities
584	Krasnoznamenskiy rayon	Krasnoznamensk cheese-making factory; Prinemansk brickyard	Milkplant; brickyard



**Table A7. Development of the share of German population in Kaliningrad region over time**

	1959	1970	1979	1989	2002	2010
Total population	610,885	731,936	807,985	871,159	955,281	941,873
Russians	473,861	564,469	632,717	683,563	786,885	772,534
Germans	648	1,068	1,218	1,307	8,340	7,349
Share of Russians (%)	77.57	77.12	78.31	78.47	82.37	82.02
Share of Germans (%)	0.11	0.15	0.15	0.15	0.87	0.78

*Notes:* Data for the years 1959-1989 are from Demoscope Weekly, Institute of Demography, National Research University Higher School of Economics. Data for the years 2002-2010 are from the population census of Rosstat.

Authors:

1. Michael Fritsch, Friedrich Schiller University Jena (Jena, Germany). Chair of Business Dynamics, Innovation, and Economic Change; German Institute for Economic Research (DIW Berlin). Research Professor; E-mail: [m.fritsch@uni-jena.de](mailto:m.fritsch@uni-jena.de)
2. Alina Sorgner, Friedrich Schiller University Jena (Jena, Germany). Chair of Business Dynamics, Innovation, and Economic Change; E-mail: [alina.sorgner@uni-jena.de](mailto:alina.sorgner@uni-jena.de)
3. Michael Wyrwich, Friedrich Schiller University Jena (Jena, Germany). Chair of Business Dynamics, Innovation, and Economic Change.; E-mail: [michael.wyrwich@uni-jena.de](mailto:michael.wyrwich@uni-jena.de)
4. Evgenii Zazdravnykh, National Research University Higher School of Economics (Saint-Petersburg, Russia); E-mail: [ezazdravnykh@hse.ru](mailto:ezazdravnykh@hse.ru)

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