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From Russia with Love:

The Impact of Relocated Firms on Incumbent Survival

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Abstract

Identifying the impact of local firm concentration on individual firm performance is likely to produce a selection bias related to the positive effects of local concentration if agglomeration economies and natural advantages coincide. We overcome this problem by exploiting exogenous variation arising from a natural experiment. When Germany was divided after World War II, a great many firms fled the socialist East to prevent expropriation and located in random West German regions. Based on micro-level data for the population of firms in the machine tool industry from 1949–2002, we identify the impact of relocated firms on incumbent firms' survival. We find a negative effect on incumbent survival, suggesting that the costs of increased competition dominate the potential benefits of agglomeration.

Keywords
Agglomeration Economies, Competition Effect, Natural Experiment

JEL Classification
R10, L10, H25, O10, J20

1. Introduction

A common theorem in economic geography is that increasing returns to scale are essential in explaining the geographical distribution of economic activity. The underlying assumption is that firms engaged in similar activities concentrate in certain regions so as to benefit from sharing inputs, indivisible facilities, and risks. They also accrue benefits from labor market matching and from the joint generation, diffusion, and accumulation of knowledge.[1] On the flip side of the coin, an increasing concentration of firms competing for a given amount of inputs also implies costs in the form of higher prices for inputs like land or labor. Given this trade-off between benefits from agglomeration economies and costs of competition, it is not a priori clear that increasing local concentration by means of local firm entry increases local incumbent performance.

This paper is an empirical investigation of the impact of increased local competition on incumbent firm performance measured as firm survival. Testing the impact of increased local firm concentration on incumbent firm performance is a difficult task due to the presence of selection effects. Rational entrants will form expectations about the expected costs and benefits of locating in each of several regions and then choose the one that suits them best. Broadly speaking, these expectations concern the costs of local competition for inputs and the benefits of agglomeration economies and natural advantages (cf. Ellison, Glaeser, and Kerr 2009). Accordingly, in studying location decisions, one might observe the result of a prior selection process and interpretations of the outcome are likely to be biased toward the positive effects of increased local

[1] See Duranton and Puga (2004) for a detailed overview of the microeconomic foundations of agglomeration economies, and Rosenthal and Strange (2004) for an overview of the corresponding empirical evidence on agglomeration economies.

firm concentration on incumbent firm performance if agglomeration economies and natural advantages coincide. To overcome this problem, we thus need a situation where randomness offsets the selection bias. One situation in which the location choice may be random is when the choosing party has incomplete information about each and every characteristic of a location. A firm can condition its location decision on certain criteria and thus limit the set of potential locations. If conditioning on these observable characteristics leaves more than one alternative, the firm should be indifferent between these alternatives and hence choose randomly among them. This idea drives the identification strategy in Greenstone et al. (2008), who analyze the effect of the opening of one large manufacturing plant on the total factor productivity (TFP) of the incumbent firms in the region. The authors describe a firm's decision about where to open a new plant as a process during which the firm initially considers dozens of possible locations. It then narrows down the list to roughly 10 sites among which there may be two or three that are very similar. Given these assumptions, the final location decision is more or less a coin toss, that is, a random choice from among these similar finalists.

Another way of overcoming the selection bias is to exploit a natural experiment where firms are suddenly forced to relocate. However, as pointed out by Holmes (2010), experimental variation is rare in regional economics and can hardly be generated in a controlled experiment. Nevertheless, there are a few such cases to be found and one of them, the natural experiment that provides the exogenous variation for this paper, is the division of Germany into four occupational zones after World War II. By 1949, the three western zones occupied by England, France, and the United States formed the Federal Republic of Germany, while the eastern part developed into a satellite state of the (former) Soviet Union. At this point in time, it was generally expected that

the eastern part of the country would adopt the Soviet Union's socialist system and the fear of expropriation prompted a great many firms to escape and reestablish their firms in Western Germany (cf. Buenstorf and Guenther 2007). Obviously, these firms did not have time for a sophisticated location decision, such as the one described by Greenstone et al. (2008). Moreover, the general destruction of Germany during World War II, not to mention its division afterward, meant that there was very little information, much less accurate information, about the future development of certain regions. Given this environment, it thus seems safe to assume that these firms chose a location in the Federal Republic of Germany more or less at random, conditional on some easily accessible initial characteristic, such as the region's affiliation with one of the three western zones of occupation.

Our empirical analysis exploits a unique data set on the entire population of firms in the machine tool industry from 1949 until 2002. This industry is characterized by the high importance to it of international trade (Carlsson, 1989) and largely consists of small and medium-size firms (Sciberras and Payne, 1985). Even though the machine tool industry is a relatively small manufacturing sector, contributing only about 2% of the national industrial production (Arnold, 2003), its products are the foundation on which the entire metalworking industry sits, thus making it great strategic importance in the industrialized world (Carlsson, 1989). Highly sophisticated industries, such as automobiles, aircraft, military, and computers, are especially reliant on the machine tool industry (Ashburn, 1988).

Based on our micro data for the machine tool industry, we compare the evolution of hazard rates of incumbent firms in regions where firms from Eastern Germany chose to locate to the evolution of hazard rates of incumbents in regions that did not experience an influx of East German firms. Due to data limitations, we cannot analyze

incumbent firms' TFP; however, a firm's TFP and its survival are closely related (cf. Griliches and Regev 1995). We find a significant and economically meaningful positive effect of the relocation on incumbent firms' risk of failure, which suggests that the costs of increased competition dominate the benefits from agglomeration economies. By contrast, we find a negative effect of increased local firm concentration on incumbent risk of failure when looking at local firm entry in general or at high-quality entry only, that is, location that arguably was not random, which gives us confidence in the validity of our results.

In an attempt to learn more about the potential channel through which relocators affect incumbent survival, we exploit another natural experiment. After World War II, West Germany experienced the inflow of about 12 million expellees who were quasi-randomly distributed across regions. Thus, some regions experienced an exogenous increase in their labor force, which should decrease the competition for labor. In line with our expectations, then, those regions characterized by a significant inflow of expellees should experience less competition for labor and hence a less pronounced effect of relocators on incumbent firms' risk of failure.

The remainder of the paper is organized as follows. Section 2 describes the natural experiment in more detail and discusses the identifying assumptions that we derive from it. Section 3 introduces our estimation strategy and data. We present our results in Section 4 and conclude with some implications in Section 5.

2. Relocation from the Russian Zone as a Natural Experiment

After World War II, Germany was initially separated into four occupational zones that were independently administered by France, the United Kingdom, the United States, and the Soviet Union. In the years following World War II, differences in ideology

between the three “western” administrations and the Soviet Union led to a second, permanent separation of Germany into a western part, which evolved into a federal parliamentary republic with a market economy, and a socialist eastern part, which adopted the Soviet system of a planned economy. Following ideological disputes between the United States and the Soviet Union, the separation became quasi-official in May 1949 when the three western zones were merged into an independent state, the Federal Republic of Germany (FRG), and the Soviet zone became the German Democratic Republic (GDR) in October of that year. Even though the West German Constitution considered the two-state solution as an artificial status quo, West Germany’s massive investment in developing the infrastructure and housing supply for its new capital of Bonn is evidence that reunification was not expected any time soon.

When it became increasingly clear that the separation was basically permanent, and when East Germany started establishing a Soviet-like socialist system, many of its citizens began looking to the West in search of political freedom and economic prosperity. This led to stricter rules and border controls, culminating in 1961 with the construction of the Berlin Wall. Nevertheless, by the time the Wall went up, more than 2.5 million people had fled East Germany to resettle in West Germany. Among the refugees from the GDR were thousands of business owners whose firms were threatened with socialization. These business owners worked out an escape plan and then relocated overnight to some region in West Germany. Given the increasingly strict controls at the border imposed to prevent a large-scale outflow of productive capital and knowledge, relocations had to be secret and quick. Accordingly, it was hardly possible to collect detailed information about the most suitable and promising location. Moreover, even if firm owners might have had the chance to evaluate

potential locations in advance, there was very little accurate information available on which to base a decision due to the vast destruction during World War II and, even more important, the subsequent dismantling of the undestroyed production facilities cancelled out the existing industry structure (cf. Laske, 1995; Mazzoleni, 1997).

The expropriation and dismantling of machine tool producers in the Soviet zone was largely based on a referendum from 30th June 1946. The referendum determined the expropriation of all Nazis and war criminals, a group that included firm owners who engaged in or were related to the production of armaments. Given that the whole machine tool industry was somehow involved in the production of armaments, most owners were subsequently expropriated and their firms were socialized. One such firm that was at risk of being socialized was the Wanderer Corporation in Chemnitz. However, the owners and the managers did not accept this and choose to escape to West Germany. Hasty and secretly, they called an extraordinary general meeting in Munich where they decided to relocate the company form Chemnitz to Munich and, from 1949 on, the company continued producing bicycles and mopeds at their new location.[2]

Another exemplary relocation story from the machine tool industry is presented in Buenstorf and Guenther (2007). It tells tell the relocation story of Pfauter Co., a producer of machine tools used in gear production that was established in Chemnitz in 1900. At the end of World War II, the firm, now being run by the founder's four sons, was receiving threatening glances from the socialistic eye of the Soviet occupation forces. In 1949, to avoid losing control of their firm, three of the Pfauter brothers,

[2] A very similar story applies to the Auto Union Corporation that was also located in Chemnitz. Here, the owners and managers choose to relocate to Ingolstadt where the firm developed over the years into the successful and well known car producer Audi.

along with some loyal employees, chose to move the company to Stuttgart, a city in southwest Germany; the fourth brother was detained by the Soviets.

All together, the separation of Germany into East and West was a hard blow for the machine tool industry. Indeed, prior to World War II, almost 30% of all machine tool manufacturers were located in the eastern part of Germany, which became the Soviet zone of occupation after the war. This separation of the former centers of the industry, especially around Chemnitz, Leipzig, and Dresden in Saxony, as well as East Berlin, resulted in a 41% reduction of production capacity as compared to 1938 (Schwab, 1996).

Given the environment in which relocation took place, it seems safe to assume that the choice of where to go was more or less a random one, based very little, if at all, on considerations about the future development of a region and its incumbent firms. Buenstorf and Guenther (2007) further show that the firms that chose to relocate are not systematically different from firms that did not leave the GDR. Therefore, we are confident that our identifying assumption enables us to estimate a plausibly unbiased effect of increased local concentration on incumbent firms' performance conditional on few easily observable characteristics.

3. Empirical Estimation Strategy and Data on Firm Relocation

3.1. Empirical Estimation Strategy

With our data on the population of firms in the German machine tool industry from its early beginning in 1936 until 2002, we intend to estimate the effect of relocated firms (i.e., those that left the Soviet zone) on incumbents' survival in the West German regions. It is important to note in this context that relocated firms should in no way be

confused with startups. As discussed in Section 2, the relocating firms are companies with industry experience, networks of customers, portfolios of existing products, and a knowledge stock sufficient to result in further improvements and innovations. Indeed, relocated firms recovered quickly and developed to be as successful as local incumbents (cf. Buenstorf and Guenther 2007). Accordingly, the relocation of these firms, which involved 23% of the East German firm population and about 8% of the entire German firm population in 1938, was indeed an exogenous shock for a region's incumbent firms, one that might have been accompanied by positive agglomeration externalities but also one that increased the competition for inputs. By "competition for inputs" we specifically mean competition for the pool of workers, which was significantly reduced as a consequence of World War II (i.e., by casualties and captivity). Given these characteristics, we are confident that we can observe and distinguish positive from negative effects of an increasing firm concentration on the incumbent firms in a region.

By restricting our analyses to a single industry within one country, we have the advantage that unobserved heterogeneity across industries and countries will not be a factor in our results. In other words, the heterogeneity found across industries and countries is often due to different modes of production and different formal and informal institutions, which is not the case with our data. However, our analysis might be compromised if differences in location factors and local demand have an impact on the survival of incumbents. Given the high importance of international trade to the industry under study (cf. Carlsson, 1989), we consider local differences in demand to be of minor importance, but we address the overall issue of heterogeneity across regions in our estimation strategy by using region-specific dummies.

We begin our observation period in 1949 for the following reasons. First, it took some time after World War II for the industry to reorganize. The prosecution (and punishment) of war crimes allegedly committed by persons and firms lasted until 1949 and thus industrial production was controlled by the occupational forces until that date. For fairly obvious reasons, heavy machine tool production was entirely prohibited after the war and other fields were severely restricted in what they were allowed to produce. It was not until 1949, in fact, that machine tool production in the Federal Republic of Germany began to recover with the signing of the Petersburg agreement, which set the framework for a free-market-based economy (Schwab, 1996). Second, it was not until the Federal Republic of Germany was created in 1949 that all firms faced a similar institutional framework and hence comparable conditions. And finally, the formal separation of East and West Germany during 1949 was a more than clear indication that division of the country was permanent and, accordingly, business owners in the east became more aware than ever that relocation was necessary if they wanted to continue to own and control their business.

To analyze the effect on incumbent firm survival of firm relocation from the Soviet zone to West German regions, we apply the following simple proportional Cox hazard model (Cox, 1972):

$$h_i(t \mid \cdot) = h_0(t) \cdot \exp(\alpha_r + \alpha_t + \beta_0 RZ_{rt} + X_{it}\beta_1 + \varepsilon_{it}) \qquad (1)$$

Here, $h_i(t \mid \cdot)$ is the hazard rate, i.e., the risk of failure, at time *t* of incumbent firm *i* located in region *r* conditional on a set of covariates; $h_0(t)$ is an unspecified baseline hazard function. When estimating Equation (1), we take into consideration the fact that incumbent firms have been at risk of failure since their foundation, even though we do not analyze their survival before 1949, and the fact that not all incumbent firms

fail before the end of our observation period in 2002.[3] Incumbents are nested within planning region. A planning region is a functional spatial unit formed on the basis of commuter distances. We concentrate our analysis on planning regions in the U.S. and British zones because the dismantling of production facilities that occurred in the French zone hardly left incumbent production facilities intact in that zone. ε_{it} is an error term clustered at the regional level (cf. Moulton, 1986).

RZ_{rt} is a count variable that takes the value 1 from the year on in which the first firm from the Soviet zone relocated to region *r*; it takes the value 2 from the year the second firm from the Soviet zone relocated to region *r*; …. The coefficient of interest is β_0 or $\exp(\beta_0)$. The latter gives us the proportional change in the incumbent firm's hazard rate, i.e., the change in $\frac{h_i(t)}{h_0(t)}$ resulting from the relocation of a firm from the Soviet zone in the same region.

α_r is a set of region-specific dummies. These dummies allow for region-specific variation in the baseline hazard rate and should capture all observed and unobserved regional (initial) heterogeneity. Conditional on the set of region-specific dummies, $\exp(\beta_0)$ gives us the change in the incumbent firm's hazard rate relative to a region-specific baseline hazard rate, i.e., the change in $\frac{h_i(t)}{h_{0r}(t)}$ resulting from the relocation of a firm in the same region.

Regional heterogeneity could be the result of regional comparative advantages for the machine tool industry, including, for example, agglomeration externalities, natural

[3] We do not have the year of foundation for all incumbents in our data. We therefore use the year of first appearance in our data (between 1936 and 1949) as the point in time at which a firm becomes subject to the risk of failure.

advantages, or a region-specific or zone of occupation-specific business-friendly public policy.

We can interpret $\exp(\beta_0)$ as the causal effect of increased local firm concentration on an incumbent's risk of failure only as long as the location decision of the relocated firm is as good as random. This implies that the survival chances of an incumbent would have been the same in the absence of relocated firms both in regions where we actually observe relocated firms and in regions where we do not. Of course, this assumption is not testable, except in the pre-relocation period. However, in Section 2, we argued that the relocation decision was as good as random, conditional on a few easily observable characteristics which should be captured by the region-specific dummies, due to time constraints and lack of information about future development.

α_t is a set of time dummies. These dummies allow for time-specific variation in the baseline hazard rate and should capture all observed and unobserved heterogeneity over time stemming from industry-specific time trends, i.e. the industry lifecycle and business cycles. Finally, X_{it} includes (time-varying) firm-specific covariates. The first of these is the number of products a firm supplies where we consider a firm's product variety as a good proxy for firm size. The second is the major technological field, i.e., metal cutting, metal forming, or special purpose machinery, in which the firm is active. Controlling for the technology in which a firm engages allows us to handle remaining production-specific unobserved within-industry heterogeneity that might result from the diverse set of customers being served, leading, in turn, to a high degree of product heterogeneity with respect to size, type, complexity, and functionality (Sciberras and Payne, 1985).

3.2. Data

Our data are based on the buyer's guide *Who Makes Machinery* (*Wer baut Maschinen*), which has been issued annually since the 1930s by the Association of the German Machine Tool Producers (*Verein Deutscher Maschinen- und Anlagenbau*). This source allows identification of the entire West German post-war (1949–2002) firm population of 2,267 machine tool producers. Machine tool producers are defined as producers of power-driven machines that are used to produce a given workpiece by cutting, forming, or shaping metal (Wieandt, 1994).

Based on the volumes of *Who Makes Machinery* issued between 1936 and 1943, we identify a total of 394 incumbent firms with pre-war experience in either the British or the U.S. zone. Moreover, we use this set of data to identify 43 machine tool producers that were originally located in the eastern part of Germany, but relocated their business activities after the war to either the British or U.S. zone of occupation and, hence, to the Federal Republic of Germany. These 43 companies constitute 23% of all firms listed at East German locations and almost 8% of the overall firm population in 1938, i.e., at the beginning of World War II. As some of these firms choose relocated to a West German region without incumbent firms whose survival could be at risk, we end up with 36 relocators (cf. Table 1).

Our data allow us to track firms' survival over time. Moreover, we have detailed information about the firms' business activities in terms of products and major technological field, i.e., metal cutting, metal forming, or special purpose machine tools.

Tables 1 and 2 set out detailed summary statistics of our data by planning region in the U.S. and British zones of occupation.

<< Tables 1 and 2 about here >>

4. Results

4.1 Basic Specification

Table 3 reports the results of the Cox hazard estimations. We report the covariate's marginal effect on the hazard ratio, i.e., $\exp(\beta)$, in case where the covariate is continuous; in the case of a dummy variable, we report the effect on the hazard ratio when the dummy changes from 0 to 1. Thus, a value of $\exp(\beta)$ larger than 1 signifies an increase in the risk of failure, whereas a value of $\exp(\beta)$ smaller than 1 signifies a decrease in the risk of failure. Standard errors are clustered at the level of the planning region in all specifications.

<< Table 3 about here >>

As a starting point, Columns (1)–(3) of Table 3 report the association between local firm entry and an incumbent's risk of failure. As noted above, new entrants (i.e., startups) are not comparable to relocated firms because they have no industry experience and thus face a higher risk of failure. This difference is reflected in our data, which suggest that there were a great many startups in the 1950s but that only a few of them became established in the market and survived for more than five or ten years (cf. Table 2). In Column (1), we look at all local entries and at those entries that occurred before 1960 (Column 2) and 1955 (Column 3), respectively. In analogy to RZ_{rt}, we construct a count variable that takes the value 1 from the year in which the first new firm opened in region *r*; takes the value 2 from the year the second new firm opened in region *r*; …. We include region-specific dummies, five-year-bin dummies (1955–1960, 1961–1965, …, with the 1949–1954 bin as reference group), and

incumbent characteristics (cf. Equation (1)). The coefficient of interest is the firm entry variable. The result shows at least a slightly negative, but not significant, association between increased local firm concentration and an incumbent's risk of failure.

In Columns (4)–(6) of Table 3 we add RZ_{rt}, which represents the number of relocated firms from the Soviet zone opened up in region *r* over time. The coefficient of the firm entry variable hardly changes in this specification, but it does become significant. In contrast to general local firm entry, the results for RZ_{rt} reveal a significantly positive impact of local firm concentration on an incumbent's risk of failure. A t-test further confirms that the two coefficients of general firm entries and relocations from the Soviet zone are statistically significantly different. Simultaneously finding significant effects for both general firm entry and for the opening of relocated firms on incumbent survival is good evidence that these two groups of firms follow different location patterns.

<< Table 4 about here >>

In a next step, we more narrowly define entrants and consider only those new firms that survived at least five or ten years, respectively. These entrants are more comparable to the relocated firms. Controlling for these firms' impact on incumbent survival should rule out concerns that the relocation effect on incumbent survival could be biased by the simultaneous entry of high-quality firms. As shown in Table 4, controlling for high-quality entrants does not change our baseline estimations, i.e., the effect of relocated firms on incumbent survival remains more or less the same. We still find a significantly positive effect of the relocators on incumbents' risk of failure that dominates the slightly positive effect of the two groups (i.e., those that survived

more than five and ten years, respectively) of high-quality entrants on incumbent risk of failure. The results for the subgroup of entrants that survived more than five years are reposted in Columns (1)–(6) and the results for those entrants that survived more than ten years are reported in Columns (7)–(12). Assuming that entrants surviving more than five or ten years are comparable to the relocators with respect to quality but differ in their location decision, which is arguably nonrandom, our results clearly suggest that analyzing the impact of increased firm concentration on incumbent firm survival on the basis of a nonrandom sample of firm entries overestimates the positive effect of the location decision. This is an important finding for policymakers: the presence of a new firm could very well have a negative effect, in the form of increased competition, on incumbent survival.

4.2 Pre-Relocation Trends

In this section, we analyze whether, prior to the relocation of a firm from the Soviet zone, the incumbents' risk of failure was the same irrespective of whether the incumbent was located in a region without future relocations or in a region where at least one relocation would occur in the future. For this purpose, we construct a dummy variable that equals unity from the year in which the first relocated firm from the Soviet zone opened in region *r*, otherwise it is 0. We further add a pre-reloaction year dummy that equals unity for the year before the first opening of a relocated firm in a planning region; for all other years, as well as for planning regions without relocated firms, this dummy is equal to 0. If the planning regions with and without relocated firms evolve similarly prior to the first relocation, then the coefficient of this dummy should be 0.

<< Table 5 about here >>

Table 5 reports the results. For purposes of comparison, Column (1) shows the results when only including the relocation dummy. The significant coefficient of 4.428 suggests that after the first opening of a relocated firm in a given region, the incumbents' risk of failure in that same region is, on average, about four times higher than before arrival of the relocated firms. Note that this effect must be viewed as a cumulative effect of all following openings of relocated firms. We then additionally control for entrants that started up over the whole observation period (Column 2), before 1955 (Column 3), and before 1960 (Column 4). Again, controlling for entrants hardly changes the effect of relocated firms on incumbents' survival.

To understand where the variation in this effect comes from, it is necessary to revisit the descriptive statistics (cf. Tables 1). In our data, 18 of the 40 West German planning regions located in the U.S. or British zones have at least one firm relocated from the Soviet zone. In nine of these 18 planning regions, the first relocation occurred in 1949, the first year of our observational period. Thus, for these planning regions, our relocation dummy does not differ from the respective planning region dummies. For the remaining nine planning regions, the first relocated firm started business sometime between 1949 and the formal separation of East and West Germany; five of them in 1951. Thus, it is the planning regions with late firm relocation that provide the variation to identify the relocation effect.

In Columns (5) – (8) of Table 5 we add the pre-treatment dummy, and the figures in these columns reveal that the coefficient of this pre-treatment dummy is not significantly different from zero. Indeed, the magnitude and significance of the relocation dummy hardly changes. Of course, we would like to include pre-treatment year dummies for the second, third, …, pre-treatment years, but given the fact that our

observational period starts in 1949 and that most of the first relocated firms opened until 1951, doing so is not possible.

4.3 Exploring the Source of Competition in the Local Labor Market

To explore whether increased local firm concentration acts on incumbent survival via competition in the local labor market, we exploit another natural experiment in German post-war history that provides us with exogenous variation in the size of the local workforce. This variation results from the distribution of expellees after World War II (cf. Falck et al. 2009). Expellees were either German citizens or ethnic Germans who, before and/or during the war, lived within the Eastern German borders as they existed between 1917–1937 or in Austria-Hungary (§1, Federal Expellee Law, May 19, 1953). Late in World War II, these individuals were forced by the Red Army and, after the war, by the Potsdam Treaty, to leave their homeland and settle within the new borders of Germany or Austria. Almost 12 million ethnic Germans fled or were expelled from their homes in East Prussia, Pomerania, Silesia, East Brandenburg, and the Sudetenland to find refuge in other German states.

The expellees had little choice in where they were settled, being generally distributed across regions based on the availability of food and housing. At the beginning of their relocation, it was often difficult for the expellees to find work; sometimes, for example, their formal qualifications were not recognized as valid. However, in 1953, the Federal Republic of Germany enacted the Federal Expellee Law (*Bundesvertriebenengesetz*), which regulated the expellees' status and granted them full access to the local labor market. The post-war exogenous location mechanism provides us with an important variation in the local workforce, which we exploit in the next step.

As competition for employees should be less fierce in planning regions with a higher number of expellees, we only look at planning regions that received a number of expellees equal to or more than 12.5% of then existing local population. This leaves us with 31 planning regions and 194 incumbents at risk for our analysis. Table 6 reports the results.

<< Table 6 about here >>

Across all specifications, the impact on incumbent survival is indeed weaker in those regions that experienced an exogenous labor market shock. These findings are in line with our assumption that the effect of a relocated firm on incumbent survival mostly has to do with increased competition for labor.

5. Conclusions

We find that the relocation of a firm from the Soviet zone to a West German region increases an incumbent's risk of failure in the same region by a factor of 1.27 (cf. basic specification in Table 3, Column 4). We argued that the location decisions of firms from the Soviet zone are as good as random, conditional on few easily observable characteristics, due to time constraints and a lack of information about the future development of regions. We are thus confident that our results reflect a plausibly causal effect of increased local firm concentration on incumbent firm survival

Even though the paper is based on a historic natural experiment, we believe that our results are highly relevant to today's world as they shed light on the long-term impact of firm location decisions, decisions that imply substantial sunk investment and, eventually, path dependencies. Firm location decisions can have an impact on

incumbents not only at the intensive margin, i.e., the production volume, but also at the extensive margin, i.e., could result in incumbent shutdown. Policymakers need to be aware of such long-term consequences when offering substantial subsidies to firms as a location incentive. Betting on the wrong horse might have irreversible side effects.

Another lesson from our economic history is that agglomeration externalities are highly industry specific. For example, the German machine tool industry is traditionally characterized by strong manufacturer-user relationships. These relationships are the main impetus of innovation in this industry (Lee, 1996; Hirsch-Kreinsen, 2000), instead of relying heavily on formal R&D as is the case in other fields. For this specific industry, our results suggest that the costs of competition outweigh the benefits of agglomeration economies, if there even are any. Our results are thus a warning to local policymakers to exercise some caution before using the presence of “beneficial” agglomeration externalities as an enticement to new business.

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Table 1: Descriptive Statistics – Relocations

	First Relocation	Last Relocation	# Relocators
Berlin	1949	1955	3
Muenster	1949	1951	2
Düsseldorf	1949	1953	6
Aachen	1949	-	1
Northern Hesse	1949	-	1
Upper Neckar	1949	1951	2
Franconia	1949	-	1
Middle Upper Rhine	1949	-	1
Stuttgart	1949	1955	5
Schleswig-Holstein South	1951	-	1
Bochum/Hagen	1951	-	1
Bonn	1951	-	1
Rhine-Main	1951	1955	5
Munich	1951	-	1
Brunswick	1953	-	1
Hamburg	1955	1957	2
Duisburg/Essen	1956	-	1
Starkenburg	1963	-	1
Schleswig-Holstein East	-	-	0
Bremen	-	-	0
Hanover	-	-	0
Hildesheim	-	-	0
Gottingen	-	-	0
Bielefeld	-	-	0
Arnsberg	-	-	0
Dortmund	-	-	0
Cologne	-	-	0
Siegen	-	-	0
Central Hesse	-	-	0
Eastern Hesse	-	-	0
Northern Black Forest	-	-	0
Eastern Wuertemberg	-	-	0
Bavarian Lower Main	-	-	0
Wurzburg	-	-	0
Upper Franconia-West	-	-	0
Industrial Region Central Franconia	-	-	0
Western Central Franconia	-	-	0
Landshut	-	-	0
Danube-Iller (BY)	-	-	0
Allgaeu	-	-	0

Table 2: Descriptive Statistics – Planning Regions

	Zone	Pop. Density	# Entries	# HQ Entries (5)	# HQ Entries (10)	Dom. Technology	# Prod	Expellees	# Incum
Schleswig-Holstein East	B	258.67	9	2	2	Metal Forming	0.38	32.5	2
Schleswig-Holstein South	B	182.03	14	11	7	Metal Forming	5.38	37.5	1
Hamburg	B	2306.60	40	27	20	Metal Forming	3.54	7.5	9
Bremen	A	1807.89	10	5	5	Metal Cutting	6.77	7.5	1
Hanover	B	306.79	16	8	6	Metal Cutting	3.69	32.5	4
Brunswick	B	226.60	16	9	8	Metal Forming	1.70	32.5	5
Hildesheim	B	225.89	7	3	3	Metal Forming	3.68	35	2
Gottingen	B	158.51	12	8	8	Metal Cutting	1.93	27.5	2
Berlin	B	4493.29	96	46	31	Metal Cutting	3.60	7.5	20
Muenster	B	218.08	10	4	3	Metal Cutting	2.61	12.5	1
Bielefeld	B	342.52	42	26	21	Metal Cutting	6.22	17.5	8
Arnsberg	B	154.70	18	6	6	Metal Cutting	5.07	17.5	2
Dortmund	B	1084.15	15	7	6	Metal Forming	12.36	7.5	7
Duisburg/Essen	B	790.07	36	11	8	Metal Forming	6.35	7.5	3
Düsseldorf	B	1152.15	237	114	80	Metal Forming	5.34	7.5	102
Bochum/Hagen	B	858.69	74	46	31	Metal Forming	4.58	7.5	37
Cologne	B	710.84	62	29	18	Metal Forming	6.67	12.5	20
Aachen	B	303.84	18	11	9	Metal Forming	7.80	7.5	10
Bonn	B	460.56	9	7	7	Metal Cutting	9.82	12.5	1
Siegen	B	211.41	38	31	29	Metal Forming	5.85	12.5	15
Northern Hesse	B	146.54	22	12	7	Metal Cutting	4.10	17.5	2
Central Hesse	B	173.03	24	13	10	Metal Forming	6.57	22.5	5
Eastern Hesse	B	122.65	5	4	2	Metal Cutting	1.00	22.5	1
Rhine-Main	A	458.81	72	48	31	Metal Cutting	5.53	12.5	25
Starkenburg	A	332.96	18	12	7	Metal Cutting	3.52	12.5	4
Upper Neckar	A	387.27	22	7	5	Metal Cutting	1.22	17.5	3
Franconia	A	138.46	22	17	13	Metal Cutting	7.86	17.5	5
Middle Upper Rhine	A	383.76	24	11	6	Metal Cutting	3.39	12.5	7

Northern Black Forest	A	198.88	58	30	25	Metal Forming	3.45	7.5	11
Stuttgart	A	585.68	136	88	58	Metal Cutting	6.77	22.5	43
Eastern Wuertemberg	A	177.37	15	8	6	Metal Cutting	1.88	22.5	2
Bavarian Lower Main	A	213.63	15	10	7	Metal Forming	2.80	12.5	2
Wurzburg	A	142.95	13	9	5	Metal Cutting	1.00	17.5	1
Upper Franconia-West	A	148.68	11	8	7	Metal Forming	7.80	22.5	5
Industrial Region Central Franconia	A	358.64	38	19	12	Metal Cutting	4.03	17.5	15
Western Central Franconia	A	149.79	31	16	11	Metal Cutting	1.00	22.5	1
Landshut	A	94.63	4	2	2	Metal Forming	1.22	27.5	2
Munich	A	348.99	47	24	18	Metal Cutting	5.85	22.5	5
Danube-Iller (BY)	A	151.06	17	9	8	Metal Cutting	8.24	27.5	1
Allgaeu	A	117.30	11	7	6	Metal Forming	3.08	22.5	2

Notes: B refers to British zone of occupation. A refers to U.S. zone of occupation. HQ refers to high-quality. Population density is measured in 1,000 inhabitants per square kilometer in 1949. Dominant Technology refers to the technology in which most of the planning region's incumbents are engaged. "Products" refers to product variety, i.e., the average number of products produced by the planning region's incumbents. Expellees is calculated as the number of expellees over the planning region's population.

Table 3: Results for all entrants and relocators

	(1)	(2)	(3)	(4)	(5)	(6)
Entrants	0.995	-	-	0.993**	-	-
	(-1.40)			(-2.09)		
Entrants before 1955	-	1.000	-	-	0.990	-
		(-0.06)			(-1.38)	
Entrants before 1960	-	-	0.999	-	-	0.992*
			(-0.31)			(-1.66)
Relocators	-	-	-	1.275**	1.236*	1.235**
				(2.35)	(1.78)	(2.09)
Products	0.835***	0.835***	0.835***	0.835***	0.835***	0.835***
	(-5.75)	(-5.73)	(-5.73)	(-5.76)	(-5.72)	(-5.72)
Region dummy	YES	YES	YES	YES	YES	YES
Time dummy	YES	YES	YES	YES	YES	YES
Technology dummy	YES	YES	YES			
Wald test	***	***	***	***	***	***
Subjects	394	394	394	394	394	394
Failures	316	316	316	316	316	316
N	12,041	12,041	12,041	12,041	12,041	12,041
Number of regions	40	40	40	40	40	40

Notes: The table presents the baseline specifications of a Cox hazard model that estimates the hazard imposed by entrants and relocated firms on the incumbent firms' survival. Incumbent firms are located in 40 planning regions in Germany. Columns (1)–(3) present the results when focusing on the impact of new entrants that started up across the entire observation period (Column 1), before 1955 (Column 2), and before 1960 (Column 3). Columns (4)–(6) then additionally consider the number of relocated firms while controlling for the three groups of new entrants. All models are conditional on region and time fixed effects and standard errors are clustered at the level of planning regions. We report the cluster robust z-statistics in parentheses.

Table 4: Results for high-quality entrants and relocators

	Entrants that survived at least 5 years						Entrants that survived at least 10 years					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Entrants	0.988* (-169)	-	-	0.981*** (-2.72)	-	-	0.984* (-1.67)	-	-	0.972*** (0.196)	-	-
Entrants before 1955	-	0.999 (-0.06)	-	-	0.982 (-1.34)	-	-	0.999 (-0.08)	-	-	0.977 (-1.39)	-
Entrants before 1960	-	-	0.997 (-0.27)	-	-	.980 (-1.58)	-	-	0.997 (-0.28)	-	-	0.974* (-1.65)
Relocators	-	-	-	1.356*** (2.57)	1.246* (1.74)	1.281* (1.95)	-	-	-	1.382** (2.29)	1.251* (1.76)	1.303** (1.96)
Products	0.835*** (-5.79)	0.835*** (-5.73)	0.835*** (-5.73)	0.834*** (-5.81)	0.835*** (-5.74)	0.835*** (-5.74)	0.835*** (-5.81)	0.836*** (-5.73)	0.836*** (-5.73)	0.834*** (-5.84)	0.835*** (-5.74)	0.835 (-5.74)
Region dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Technology dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Wald test	***	***	***	***	***	***	***	***	***	***	***	***
Subjects	394	394	394	394	394	394	394	394	394	394	394	394
Failures	316	316	316	316	316	316	316	316	316	316	316	316
N	12,041	12,041	12,041	12,041	12,041	12,041	12,041	12,041	12,041	12,041	12,041	12,041
Number of regions	40	40	40	40	40	40	40	40	40	40	40	40

Notes: The table presents the specifications of a Cox hazard model that estimates the hazard imposed by high-quality entrants and relocated firms on the incumbent firms' survival. Incumbent firms are located in 40 planning regions in Germany. Columns (1)–(3) present the results when focusing on the impact of high-quality entrants that started up across the entire observation period (Column 1), before 1955 (Column 2), and before 1960 (Column 3) and survived at least five years. Columns (4)–(6) then additionally consider the number of relocated firms while controlling for the three groups of new entrants. Columns (7)–(12) present the same results for entrants that survived at least 10 years. All models are conditional on region and time fixed effects and standard errors are clustered at the level of planning regions. We report cluster robust z-statistics in parentheses

Table 5: Pre-relocation trends

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
First relocation	4.428***	4.094**	4.618***	4.564***	4.037*	3.696	4.047*	4.017*
	(2.76)	(2.55)	(2.85)	(2.83)	(1.69)	(1.54)	(1.70)	(1.68)
Number of products	0.835***	0.835***	0.835***	0.835***	0.835***	0.835***	0.835***	0.835***
	(-5.70)	(-5.73)	(-5.70)	(-5.70)	(-5.70)	(-5.73)	(-5.70)	(-5.70)
Entrants	-	0.997	-	-	-	0.996	-	-
		(-0.91)				(-1.18)		
Entrants 1955	-	-	1.004	-	-	-	1.000	-
			(0.69)				(0.05)	
Entrants 1960	-	-	-	1.002	-	-		1.000
				(0.44)				(-0.08)
Pre-treatment (1 year)	-	-	-		0.727	0.736	0.727	.728
					(-0.28)	(-0.27)	(-0.28)	(0.824)
Region dummy	YES	YES	YES	YES	YES	YES	YES	YES
Time dummy	YES	YES	YES	YES	YES	YES	YES	YES
Technology dummy	YES	YES	YES	YES	YES	YES	YES	YES
Wald test	***	***	***	***	***	***	***	
Subjects	394	394	394	394	394	394	394	394
Failures	316	316	316	316	316	316	316	316
N	12,041	12,041	12,041	12,041	11,889	11,889	11,889	11,889
Number of regions	40	40	40	40	40	40	40	40

Notes: The table presents the specifications of a Cox hazard model that estimates the hazard imposed by the incidence of relocated firms on the incumbent firms' survival. "First relocation" is a dummy that equals unity from the first relocation on. Incumbent firms are located in 40 planning regions in Germany. Column (1) presents the baseline specification; we then additionally control for entrants that started up over the whole observation period (Column 2), before 1955 (Column 3), and before 1960 (Column 4). Columns (5)-(8) add a pre-treatment dummy to control for potential differences between treatment and control regions before the first relocation. All models are conditional on region and time fixed effects and standard errors are clustered at the level of planning regions. We report cluster robust z-statistics in parentheses.

Table 6: Results - Expellees

	All Entrants			High-Quality Entrants (5 years)			High Quality Entrants (10 years)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Entrants	0.975*** (-3.45)	-	-	0.964*** (-3.98)	-	-	0.955*** (-3.65)		
Entrants before 1955	-	0.956* (-1.81)	-	-	0.937* (-1.86)	-	-	0.923* (-1.65)	
Entrants before 1960	-	-	0.953** (-2.24)	-	-	0.929** (-2-56)	-		0.904*** (-2.57)
Relocators	1.165** (2.08)	1.101* (1.69)	1.137** (2.16)	1.193** (2.38)	1.105* (1.73)	1.179*** (2.65)	1.177** (2.18))	1.112* (1.89)	1.235*** (3.15)
Products	0.842*** (-4.74)	0.844*** (-4.52)	0.844*** (-4.52)	0.842*** (-4.75)	0.845*** (-4.51)	0.844*** (-4.51)	0.843*** (-4.71)	0.845*** (-4.51)	0.844*** (-4.52)
Region dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
Time dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
Technology dummy	YES	YES	YES	YES	YES	YES	YES	YES	YES
Wald test	***	***	***	***	***	***	***	***	***
Subjects	194	194	194	194	194	194	194	194	194
Failures	150	150	150	150	150	150	150	150	150
N	6101	6101	6101	6101	6101	6101	6101	6101	6101
Number of regions	31	31	31	31	31	31	31	31	31

Notes: The table presents the results of a Cox hazard model that estimates the hazard imposed by new entrants and relocated firms on the incumbent firms' survival. Incumbent firms are located in 31 planning regions in Germany that are characterized by a share of expellees that exceeds the 25th percentile of the extant local population. In Columns (1)–(3), "entrants" refers to all entrants, in Columns (4)–(6) entrants refers to those entrants that survived at least 5 years, and in Columns (7)–(9), entrants refers to those entrants that survived at least 10 years. All models are conditional on region and time fixed effects and standard errors are clustered at the level of planning regions. We report cluster robust z-statistics in parentheses.