Oct 2018 No.390

Diasporas, Diversity, and Economic Activity: Evidence from 18th-century Berlin

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WORKING PAPER SERIES

Centre for Competitive Advantage in the Global Economy

Department of Economics

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October 2018

Abstract

Diversity may either increase economic activity by utilizing complementarities in production or lead to costly conflict over resources. Using city-district panel data from 18th-century Berlin, a major center of refuge for persecuted minorities in early modern Europe, we analyze the relationship between changes in diversity and economic activity. Prussian rulers specifically invited groups of skilled immigrants, such as Jews, Huguenots, and Bohemians, to settle in Berlin's newly-developed city quarters. We find that the resulting ethnic diversity fosters textile production in a much broader range of products than individual ethnicities, arguably reflecting complementarities between groups.

Keywords: Ethnic Diversity, Minorities, Huguenots, Jews, Productivity
JEL classification: N33, J61, Z12, O33

1 Introduction

The history of ethnic and religious minorities is laced with persecution and involuntary relocation. When economic shocks occur, attitudes toward minorities may depend on the economic benefits for the majority group leading to scapegoating and conflict if complementarities are low (see Jedwab et al., 2017) or competition is high (see Becker and Pascali, 2016). A growing literature discusses the consequences of forced minority migration for sending countries.[1] In the majority of historical episodes, expulsion targeted an ethnic or religious minority that was more skilled and prosperous than the average population. Absorbing these refugees may thus be highly beneficial for receiving countries if migrants possess skills (and wealth) that are complementary to the skills of the native

*Comments from Francesco Cinnirella, Ran Abramitzky, and two anonymous referees are gratefully acknowledged. Tamara Bogatzki provided helpful research assistance.

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[1]Recent examples of articles providing econometric evidence for the consequences of historical episodes of forced migration on the sending country include the expulsion of Armenians from Greece (Arbatli and Gokmen, 2017), the expulsion of Muslims from Spain (Chaney and Hornbeck, 2016), the slave trade in Africa (Nunn, 2008), and the expulsion of Jews from Nazi-Germany (Waldinger, 2010, 2016).

population. The literature on the consequences of absorbing forced migrants for the receiving country is less extensive and does not discuss the resulting changes in ethnic diversity.[2]

If absorbing one group of refugees is beneficial, do regions that absorb multiple migrant groups of various origins benefit more or less? In the 17th and 18th centuries, the German state of Brandenburg-Prussia allowed several groups of persecuted minorities to settle. This provides us with an interesting setting to explore the returns to changes in ethnic diversity.[3] We follow Jha (2013) in arguing that combining ethnic-religious groups may create complementarities that are beneficial to receiving locations. This hypothesis resonates with the idea that, under certain circumstances, diversity may be positively related to economic activity.[4]

In this paper, we examine whether locations benefit from offering refuge to individual groups of migrants of various origins and whether the resulting diversity is beneficial or harmful. We explore this question by testing first, whether individual groups of immigrants increase economic activity, and second, how ethnic diversity due to co-location of multiple ethnicities is related to such activity. We do so using unique annual census data for the 18 police districts (*Commissaires des Quartiers*) of Berlin for the period 1743–1804. This specific within-city setting allows us to inspect the returns to diversity in a very controlled environment, thus excluding concerns of selective sorting due to unobserved heterogeneity in geography, institutions, and culture.

Berlin, the capital of Brandenburg-Prussia, was a major center of refuge for various ethnic minorities that were expelled from other countries, such as Austrian Jews, French Huguenots[5], and Bohemian Brethren. Jews, the most widely discussed group of forced migrants in the literature, are typically found to substantially contribute to growth in locations where they were tolerated (Johnson and Koyama, 2017). Similarly, Protestant Huguenots, ones expelled from Catholic France in 1685, contributed to technological diffusion and growth in receiving countries across Europe (Hornung, 2014). The Prussian rulers, attempting to rekindle population growth after the devastating Thirty Years' War, attracted a colorful selection of religiously persecuted minorities (Nipperdey, 2012; Schunka, 2016). The majority of such migrants headed for Berlin, massively increasing the diversity of the local population. During the seventeenth century, Berlin was a vibrant city that experienced unprecedented population growth. The absence of major economic downturns and epidemics allowed religious minorities to avoid scapegoating and to capitalize on economic opportunities. Furthermore, the lack of an entrenched patrician class in early modern Berlin may have resulted in comparatively low levels of competition between locals and immigrants.

We confirm earlier findings in the literature that Huguenots significantly increased economic activity in textile production. Using a district-fixed-effects panel approach, our results show a positive significant association of changes in the local Huguenot population with changes in

[2]Recent examples of articles providing econometric evidence for the consequences of historical episodes of forced migration on the receiving country include the emigration of French Huguenots to Prussia (Hornung, 2014), the emigration of Jewish scientists to the U.S. (Moser et al., 2014), and the population exchange between Greece and Turkey (Murard and Sakalliz, 2018). Other examples of forced migration, ones unrelated to the persecution of an ethnic minority, are the post WWII population relocations from Russia to Germany (Bauer et al., 2013; Braun and Kvasnicka, 2014; Falck et al., 2012) and within Finland (Sarvimäki et al., 2018).

[3]For simplicity we employ the term 'ethnic diversity', although in this paper we will not be able to disentangle among ethnic, religious, linguistic, genetic, or birthplace diversities.

[4]While the seminal contribution by Easterly and Levine (1997) finds ethnic diversity to reduce growth, a literature survey by Alesina and La Ferrara (2005) shows that in many instances diversity is associated with higher productivity. Related to our setting, Cinnirella and Streb (2017) find that a higher level of religious tolerance as measured by religious diversity across Prussian cities is associated with higher innovative activity.

[5]For simplicity, we use the terms French and Huguenot interchangeably—aware of the fact that potentially a small number of French residents in Berlin were not Huguenots.

the local utilization of loom technology. Based on annually collected census information on the location and size of ethnic groups, we further inspect how ethnic diversity affected economic activity. Replacing measures of individual immigrant-group size with a measure of ethnic diversity, we find changes in diversity to be positively associated with changes in economic activity in textiles. Concerns of selective location of migrants are addressed by using a so-called 'shift-share' instrument commonly employed in the economics of migration literature. Furthermore, inspecting heterogeneity in textile production by product, we find diversity to increase economic activity even in products unrelated to any individual migrant group. We speculate that, in our specific micro-level setting, where individuals are highly likely to interact across ethnic boundaries, diversity may reflect complementarities between individuals belonging to groups that possess the relevant inputs to the production process—capital, skills, and access to trade networks.

The next section presents the historical background of persecution and migration to and assimilation in Berlin. Section 3 introduces the dataset, the empirical framework, and the results, before we conclude.

2 Historical Background

At the end of the Thirty Years' War (1618–48), territories in the Holy Roman Empire were vastly depopulated, and many rulers desperately tried to repopulate their deserted realms (see i.e., Nipperdey, 2012; Schunka, 2016). The most well-known example for actively pursuing repopulation policies is Frederick William, the Elector of Brandenburg, who invited several persecuted minorities to settle in what was soon to become the Kingdom of Prussia. After converting to Calvinism in 1613, the electors of Brandenburg established an exception to the rule 'cuius regio, eius religio' (whose realm, his religion) and allowed their subjects to remain of Lutheran Protestant faith. Similarly, they tolerated Catholicism in their fiefdom the Duchy of Prussia, thereby setting a precedent of religious tolerance for which Prussia became well known.[6]

Subsequent Prussian rulers continued the tradition of religious tolerance and invited various persecuted religious groups to Brandenburg-Prussia. Next to religious sentiments, Prussian rulers held economic motives when inviting skilled and affluent immigrants to Brandenburg-Prussia. In line with the mercantilist school of economic thought during this period, their aim was to stimulate domestic production. The small country with its 1.5 million inhabitants absorbed large groups of immigrants, including Jews from Vienna, Huguenots from France, and Protestants expelled by the Habsburg Monarchy. These groups arguably contributed to Prussia's development to a center of economic activity within Europe. A large share of refugees took residence in Berlin, the capital of Brandenburg-Prussia, where groups received the right to establish their own congregation, jurisdiction, and schooling.[7]

Due to space constraints in the old town, Prussian rulers cleared farmland outside the city walls to be settled by the immigrants. The new suburbs (*Vorstädte*), such as Friedrichstadt, were planned and developed for housing using a grid plan typical for city expansions (e.g., see districts 7–10 in Figure A-II in the Appendix). Figure 1a presents a map of Berlin's districts reflecting the

[6] Frederick the Great famously wrote that all religions must be tolerated, for everyone must get to heaven in their own way ("Die Religionen Müsen alle Tolleriret werden und Mus der Fiscal nuhr das Auge darauf haben, das keine der andern abrug Tuhe, den hier mus ein jeder nach seiner Fasson Selich werden" (Lehmann, 1881, p. 4)).

[7] For a full history of minorities in historical Berlin see Jersch-Wenzel and John (1990).

spatial expansion of the city from approximately 17,500 inhabitants in 1685 to 170,000 around 1800. This population growth was largely fed by immigration, making Berlin a diverse city and the center of German enlightenment during the second part of the eighteenth century. The economic returns to immigration were realized in the long run (Scoville, 1952a,b). According to Jersch-Wenzel (1978) and Scheiger (1990), who inspect surnames of owners in a 1769 factory census to infer ethnicity, 17 firms were managed by a Jewish owner, 61 were run by French, 47 by Bohemians, and 423 by natives or unidentifiable immigrants. The average size was 165 employees for Jewish firms, 18 for French, 5 for Bohemian, and 8 for natives.

Berlin had been of little importance as a market town after it became the seat of the Hohenzollern dynasty in 1451. The absence of a well-entrenched patrician class permitted social mobility even for religious minorities, including Jews (Lowenstein, 1994, p. 4). Arguably, the lack of competition with an established elite reduced the propensity of conflict between natives and immigrants and allowed the economy to reap the benefits of diversity. For example, during the Raid on Berlin in 1760, one of the major incidents for Berlin's economy during the Seven Years' War, Russian troops seized two Jews to extract a special contribution from the city's Jewry. However, negotiations clarified that Jews had full rights of citizenship and were thereby covered when paying their share of the general contributions to the Russians (Henderson, 1963, p. 92). If Jews hadn't provided important complementarities to Berlin's economy, the willingness to negotiate on their behalf would probably have been lower. Below we will describe the history, settlement pattern, and assimilation of the three individual immigrant groups in Berlin.

2.1 The Jewish Population of Berlin

When the Jews were expelled from Vienna in 1669/1671, Frederick William (the Great Elector) took the opportunity to invite 50 Jewish families to settle in Brandenburg under his protection. For the first time after their expulsion in 1573, Jews were allowed to take up residence in Berlin. By 1700, 117 Jewish families (585 individuals) had settled in Berlin. Jewish population size was restricted to a fixed number of certificates of protection (*Schutzbriefe*).[8]

Jewish settlement was concentrated in three districts of Alt-Berlin that existed at the time of their invitation, close to the royal palace and within eyeshot of the ruler. The convex border between districts 2 and 3 in Figure 1a follows the Jüdenstraße (*Street of the Jews*) that was established by the first Jewish community in Berlin during the 13th century. Throughout the second half of the 18th century, when the enlightenment took hold in Berlin, a small but increasing number of families diffused to other city districts.[9]

Upon arrival, Jews faced a lump-sum tax of 10,000 Reichsthaler and several other restrictions including limited housing permits and varying limits of occupational choice that peaked around 1750. Similar to the rules in other European cities, Jewish citizens were confined to occupations in moneylending and trade, and were excluded from any craft under guild restrictions. Thus, the

[8]First-born children received the right to marry and take up an occupation, second-born children were required to purchase a certificate of protection, whereas any additional child would need to leave the city for such reasons. The average number of children in Jewish families was four in 1749.

[9]The settlement pattern may have expanded to northern districts due to the fact that Jews were restricted and could use only the two northern gates in the city's tariff walls. Specifically, remaining located in the districts in close proximity to the Rosenthaler Tor (also called Jew's Gate), may have reduced journey time for visiting non-resident Jews, e.g., other traders and merchants, which were only allowed to stay in Berlin for one day.

occupational structure of the Jewish community was largely defined by these legal restrictions. Like everywhere, Jews faced concerted resistance from local guildsmen and shopkeepers but enjoyed wide-ranging freedoms due to their 'usefulness' to the King (Clark, 2006, p. 258–261). According to data collected by Scheiger (1990), in a sample of 922 Berlin Jews with information on their occupations, 20.5 percent were occupied in money trading, 47.5 percent in goods trading, and 11.4 percent in crafts. In fact, Jews were allowed to trade goods produced in factories, and were specifically engaged in the trading of textiles and apparel (Scheiger, 1990, p. 207). Their successful strategy of 'product management', an early form of advertising, included flexible adjustment of prices. Furthermore, the ruler compelled wealthy Jews to take over insolvent firms, such as the velvet and silk factories of well-known Berlin merchant Gotzkowsky (a former immigrant from Poland) and inject them with new capital and management practices (Henderson, 1959, p. 96).

By mid-century, members of the Jewish community were well integrated into the social and economic society of Berlin (Clark, 2006, p. 257). Due to their immigration from German-speaking regions (only 2.1 percent had non-German origins in the early 19th century), Berlin Jews did not lack language proficiency. Jewish schools taught in German. Jewish businessmen kept their books in German and adopted the local dress and hairstyle. Especially with the Jewish emancipation (*Haskala*) that pursued a deeper consolidation of the faith with the local culture, Berlin became a center of intellectual exchange between leaders of the Jewish emancipation and Christian leaders during the second half of the 18th century.[10] Cultural and intellectual integration was also amplified by the fact that Jews were allowed to study medical surgery at the Collegia medico-chirurgica (Berlin did not have a university until 1809) with at least 114 enrolled Jews during the period 1730–1797 (Scheiger, 1990).

2.2 The French Population of Berlin

When the Huguenots were expelled from France in 1685, Frederick William (the Great Elector) was quick to issue the Edict of Potsdam, offering his estates as a refuge to the reformed Protestants. Approximately 16,000 to 20,000 Huguenots fled to Brandenburg-Prussia, and Berlin became the final destination for many Huguenots. The majority of refugees arrived at Berlin until the turn of the 17th century, when the city boasted 5,682 Huguenots that made up more than 20 percent of the population. Upon arrival, some Huguenots were allocated to vacant houses deserted after the Thirty Years' War, in the twin cities of Alt-Berlin and Alt-Cölln that formed the old town of Berlin. After the old town became crowded, most Huguenots were located to the newly formed suburbs of Friedrichswerder (est. 1662), Dorotheenstadt (est. 1674), and especially Friedrichstadt (est. 1688) that replaced parts of the royal hunting area (*Tiergarten*) and some royal demesne. The settlement pattern of Huguenots thus reflects the expansion of the city west of the historic old town at the time of their arrival. The French colony was centered around the Französische

[10] According to Lowenstein (1994), Berlin became the center of the Jewish Enlightenment in the 1770s after a range of Jewish businessmen made a fortune (by assisting Frederick the Great in debasing the Prussian coin) during the Seven Years' War. The prominent leader of the Berlin-Haskala movement, Moses Mendelssohn is a figurehead of a much larger group of Jewish intellectuals that were well established in Berlin's society. After Mendelssohn's death, the movement developed a more radical arm when especially younger Jews maintained an increasing number of relationships outside the Jewish community, and conversions for the purpose of marrying Christians surged (Lowenstein, 1994, p. 6). Note, however, that the period studied in this paper (1743–1804) is prior to the legal emancipation of Jews in 1812 in Prussia and therefore prior to Reform Judaism and the influx of less orthodox Jews from eastern Europe during the 19th century (see also Carvalho and Koyama, 2016).

Straße (French Street) and the Friedrichstadt church (later French Cathedral) located in district 7 (see Figure 1a and 1c).[11]

Upon arrival and different from Jews, Huguenots received a range of privileges and tax reliefs for a period of approximately 15 years. For this period they were explicitly excluded from guild coercion and allowed to enter any occupation. However, even after the period expired, existing guilds were reluctant to admit Huguenots, and it took until the middle of the 18th century, when joint guilds became common. Keenly aware of their knowledge and skills in textile production, Frederick William hoped that Huguenots would boost the local economy. Indeed, the historical narrative describes many products and processes that were newly introduced by the Huguenots (see, e.g., Scoville, 1952a,b). According to data collected by Birnstiel and Reinke (1990), in a sample of 1,468 married Berlin Huguenots providing information on occupations, 14.8 percent were occupied in trading, and 58.6 percent in crafts. Specifically, of the 860 craftsmen, 65.4 percent were occupied in textiles and apparel. As shown by Hornung (2014), the Huguenots indeed increased the productivity of Prussian textile manufacturing in the long run.

After some initial frictions, including hostilities between Lutheran natives and the Reformed French, Huguenots became well integrated into the social, cultural, and economic society of Berlin (Birnstiel and Reinke, 1990, p. 101). French was the dominant language at court, and French culture was highly admired by the elites. Although the French community had their own churches, schools, and arbitration courts, schooling became bilingual in the early 18th century, and conflicts with the local population were ruled according to municipality courts. Quantitative evidence on assimilation can be derived from marital registers of the French colony parish. In a sample of 1,585 marriages analyzed by Birnstiel and Reinke (1990), the incidence of mixed marriages between French and Germans rose from 10.7 percent in the period 1676–1700, to 32.4 percent in 1732–1756, to 62.3 percent in 1788–1812.

2.3 The Bohemian Population of Berlin

After the Thirty Years' War, the Catholic Habsburg monarchy persecuted members of the Unity of the Brethren (Hussites) in Bohemia, triggering a constant outflow of Protestants to neighboring regions. Throughout the 17th and early 18th century, communities of Bohemians fled across the border and settled in Saxony. However, when economic conditions in Saxony deteriorated, in 1732 the migrants approached Frederick William I (the Soldier King) to ask for refuge in Prussia. Indeed, the Prussian King allowed members of the Unity of the Brethren from colonies in Großhennersdorf, Kottbus, and Gerlachsheim to settle in Berlin.[12]

Bohemians came in two groups, the smaller one creating the municipality of Bohemian Rixdorf, just outside of the city and the larger one settling in the southernmost district 10 of Friedrichstadt (see Figure 1a and 1d) that became part of the city when the customs wall was built in 1734–1736. Initially ignored by the King, Bohemians camped in the open fields of Friedrichstadt and were exposed to the hostility of the locals. After the German merchant Daniel Kirchner provided them with some work in spinning and weaving, the Bohemians were able to rent a house in

[11] The first Huguenot church was built in this place from 1701 to 1705. The French Street received its name in 1706.

[12] Note that the Berlin diaspora of Bohemians is unrelated to the 30,000 Protestants exiled by the Bishop of Salzburg in 1731 (*Salzburger Exulanten*), ones that were largely directed to East Prussia where approximately 20,000 settled.

Friedrichstraße that accommodated 360 people and provided sufficient work space. In 1737, the Bohemians received land and subsidies to build 34 houses in nearby Wilhelmstraße, thus remaining exclusively located in district 10 of Friedrichstadt.

Bohemians were initially occupied in spinning and weaving of linen but switched to cotton due to their inability to compete with Dutch and Saxonian products (Graffinga, 1990). According to Hoffmann (1969), in 1769 there were 25 Bohemian cotton manufacturers with 163 looms, and 18 Bohemian linen manufacturers with 57 looms. In 1749, George Urban bought a textile factory with 42 looms in Friedrichstraße and switched production to cotton, thereby attracting an additional 14 weaver families from Saxony to settle in Berlin. A syndicate of eight Bohemians directed by George Ostry created the textile factory Kubassek & Co. that aimed to employ 100 looms, but failed after Ostry was arrested in Prague when trying to recruit more workers willing to migrate.

The Bohemian community remained largely isolated from interactions with other groups in Berlin. Bohemians continued to use the Czech language and married either within their parish or with members of other Bohemian colonies in proximity to Berlin (Graffinga, 1990, p. 571).

3 Data, Empirical Framework, and Results

3.1 The Data

In 1742, the Prussian King installed a police department, introduced 18 policing districts, and appointed commissioners to every district. Commissioners were assigned to acquire the registration of the resident population and filed annual reports to the King. These annual reports are available in archival sources for the period 1743 to 1804 (see GStA PK, 1742–1806). The tables report the resident population (men, women, sons, and daughters) and lodgers (journeymen (*Gesellen*), apprentices (*Jungen*), and male and female domestics), and provide additional information about ethnic minorities (Jews, French, and Bohemians). The census was extended to report information regarding the number of active looms by type of fabric from 1749, and the number of textile manufacturers and workers by type of fabric from 1766.

According to the data, the population of Berlin grew from 89,523 inhabitants in 1750 to 146,911 in 1800. In 1750, Jews accounted for 2.4 percent of Berlin's population, the French constituted 7.4 percent, and Bohemians amounted to 1.7 percent. While the total Jewish population increased from 2,188 to 3,588, the overall number of individuals recorded as Huguenots declined from 6,592 to 4,225 (likely) due to home migration and assimilation, and the Bohemian population diminished from 1,534 to 852. As can be observed in Figure A-III in the Appendix, Huguenots resided in each of the 18 districts by 1750, Jews and Bohemians were mostly confined to their initially assigned quarters and dispersed into other districts only over time. The unidirectional change in aggregate numbers masks the fact that the spatial dispersion of ethnic groups throughout the city creates considerable intertemporal variation in the ethnic population. The decline of an ethnic population in one district may be the result of an increase in another. In the econometric analysis below, the use of district-fixed effects models will exploit within-district changes and therefore the entire spectrum of the rise and decline of groups in a district.

In the second half of the 18th century, Berlin experienced increasing economic activity most pronounced in textile manufacturing. By 1750, approximately 5,000 looms were active in Berlin—

one for 16 adult inhabitants. This number increased to more than 11,000 in 1800, equivalent to one loom for 11 adult inhabitants. The number of active looms for silk, cotton, and passement continuously increases while a decline in use looms for wool accelerates from the 1780s. Whether textile production took place at home or in factories is unobservable to us. Indeed, the literature indicates that only textile factories managed by Jews were centralized. Until the introduction of the first horse bus line in 1840, the working population typically used to settle where they worked, leading to little work commutes across districts (Scheiger, 1990).

We digitized all available annual censuses and constructed a panel dataset.[13] The dataset spans the period 1743 to 1804, resulting in 918 district-by-year observations. We decided to average the data over five-year windows to account for potential stationarity and to reduce the impact of outliers that naturally occur in annual historical data, which led to 198 district-by-period observations. This leaves us with eleven periods from 1750 to 1804 for which we have full information on economic activity, i.e., active looms, and ethnic diversity, i.e., the population by ethnic group.[14] Summary statistics are presented in Table A-I and Figure A-III in the Appendix.

3.2 The Empirical Framework

For the econometric analysis, we draw on two indicators of economic activity y—the number of active looms and the number of textile workers (available only from 1766 and thus for 8 periods) to estimate the relationship of interest in the following model:

$$\ln(y_{it}) = \alpha_i + \tau_t + \beta ln(Min'_{jit}) + ln(X'_{it})\gamma + \varepsilon_{it} \tag{1}$$

where α_i and τ_t are district and time-period fixed effects, respectively (t constitutes 5-year periods, i.e., 1750–54, 1755–1759, ..., 1800–1804). Min' is a vector of indicators for the size of each ethnic group j, and X' is a vector of district level controls. The coefficient β reflects how changes in the number of active looms are related to changes in the size of the local ethnic population. The term ε_{it} captures a zero-mean random error. Our main estimates will substitute Min' with a fractionalization index of ethnic diversity Div. We use a standard fractionalization index, similar to the Herfindahl index, defined as $Div_{it} = 1 - \sum_{j=1}^{N} s_{jit}^2$, where s_{jit} is the share of ethnic group j in the total population of district i at time t. The index represents the probability that two randomly selected individuals from a district belong to different groups.[15] This index is composed of four groups—Jews, Huguenots, Bohemians, and native Prussians.[16]

A major caveat in the migration literature is the selective location of migrants. If ethnic minorities switch between districts that offer better economic opportunities, e.g., pockets of textile manufacturing, our estimated β-coefficient would be biased upwards. The historic setting of Berlin alleviates such concerns, since the initial location choice of refugees is strongly restricted due to centralized allocation to city quarters by the Elector and the availability of newly established

[13] Reports were organized in annual tables that are missing for the periods 1760–1762, 1770–1771 and for the year 1801 for unknown reasons.

[14] The results are qualitatively similar when using annual data (available upon request).

[15] Note that, different from Ager and Brückner (2013) who analyze the mass inflow of immigrants to the U.S. from 1850 to 1920, our findings do not change when we use the index of polarization proposed by Montalvo and Reynal-Querol (2005b,a).

[16] In the absence of information regarding the ethnic composition of natives, this index constitutes a lower bound measure of diversity. Regressions using such an index thus underestimate the actual effect of diversity.

districts at arrival. However, changes in the district-level size of groups over time may reflect endogenous within-city migration. To address such concerns, we employ a commonly used instrumental variable approach—the so-called shift-share instrument. Introduced by Bartik (1991) and further refined by Card (2001), this instrumental variable projects changes in the local ethnic population using the aggregate city-wide change in the size of the ethnic group (the shift) based on the initial distribution of members of this ethnicity across districts (the share). Changes in the aggregate ethnic population are arguably exogenous to local (district-level) demand shocks, thereby mollifying concerns of endogenous location choice across districts. We use the predicted values for the four ethnicities to generate a shift-share index of ethnic diversity $SSI\ Div_{it}$ to instrument the potentially endogenous diversity index Div_{it} :

$$Div_{it} = \phi_i + \zeta_t + \delta SSI\ Div_{it} + ln(X'_{it})\omega + \nu_{it}\ , \tag{2}$$

where:

$$SSI\ Div_{it} = 1 - \sum_{j=1}^{N} (Sh_{ji,1743} \cdot Min_{jt})^2\ . \tag{3}$$

$Sh_{ji,1743}$ is defined as the number of members of ethnic group j in district i in the year 1743 divided by the total city-wide size of the ethnic group j in 1743. Figures 1b–1e present maps for the distribution of immigrants across districts and the resulting diversity measure for the year 1743. We chose the year 1743 as it is the first year for which we observe the distribution of ethnic groups across city districts prior to the 1750–1804 period of analysis. No similar information is available prior to the establishment of policing districts in Berlin. The fact that many Huguenots and Bohemians settled in newly founded quarters of the city, developed from developed from greenfield land, alleviates concerns of pre-existing trends in these districts.

By 1743, a substantial amount of time had passed since the initial arrival of immigrant groups to Berlin. Consequently, the distribution of ethnic groups may be prone to selective sorting into more attractive districts. We address this concern by predicting the actual district-level migrant share $Sh_{ji,1743}$, based on our knowledge about the allocation of groups.[17] Using simple OLS regressions, we predict the distribution of Jews with a binary variable identifying the three districts in Alt-Berlin where the first Jewish community lived in the 13th century (see Figure 1b).

We predict the distribution of members of the French colony across districts with distance to the French Cathedral (see white cross in Figure 1c) initially erected as the Friedrichstadt church. This measure reflects Huguenot's preference to locate in proximity to the spiritual center of their parish and is arguably unrelated to economic activity. The location of the church was determined by the Elector who dedicated five (later three) contiguous blocks for public buildings when developing Friedrichstadt. In 1699, the French congregation requested to purchase the southern block and build a church. At the same time, a Lutheran congregation requested to build one on the middle block opposite of the French church. After debates about access to a gate in the walls of Friedrichswerder, the Elector assigned the northern block to the French, ruled to leave the middle block requested by the Lutherans empty, and assigned the southern block to the

[17] Results will be qualitatively similar when using the actual distribution in 1743 or any other year prior to 1750.

Lutheran church (see Muret, 1885). The French and the German churches remain in these places until today.

Finally, we predict the share of Bohemians with a binary variable identifying district 10 in Friedrichstadt, where they first received housing after their arrival (see Figure 1d). For each of the migrant groups we thus predict the distribution of members based on indicators that are arguably exogenous to pre-existing trends in textile production. Results of these quasi first-stage regressions can be found in Table A-II in the Appendix.

Using predicted values for the distribution of group members across districts, we aim at alleviating concerns of endogeneity. Consequently, the diversity effect is identified under the condition that the predicted cross-sectional distribution of ethnic groups in 1743 is unrelated to economic opportunities in textile manufacturing, and the time variation of city-level changes in ethnic-group size is exogenous to the district-level changes in textile manufacturing.

3.3 Ethnic Groups and Economic Activity

We start by showing the relationship between Huguenots and the active use of looms for textile production in a district in Table 1. Bivariate regressions presented in Column 1 show a positive significant relationship—a 10 percent increase in the number of Huguenots is associated with a 5.8 percent increase in the number of active looms. Considering that the raw number of Huguenots includes people of both genders and all ages that presumably do not all work in textile production, this is a substantial elasticity. In Column 2, we find that neither changes in the Jewish nor the Bohemian population result in similar increases in the use of looms.[18] While the expected relationship of changes in the Jewish population to changes in the active use of looms is a priory unclear, it is interesting to find that Bohemians, known for their production of cotton and linen textiles, do not show such a statistical relationship either.

The observed relationship might merely reflect changes in the size of the district population, i.e., the per capita use of looms. Thus, Column 3 aims at capturing such unobserved heterogeneity by controlling for the size of the population.[19] The data further allow us to consider confounding factors related to fertility and the social structure of a district. By adding a control variable for children (both genders), we aim at capturing overall district-specific fertility trends. We further add variables for the presence of journeymen and apprentices that indicate a local economy based on craft and production, and the number of domestic servants (again combining both genders) that indicate an economic structure based on rental income, i.e., the presence of nobility.[20] Nevertheless, the relationship between Huguenot presence and technology use is robust to accounting for population size, fertility, and economic structure.[21] However, the smaller coefficient on Huguenots of 0.34 implies that part of the estimated relationship captures population growth through fertility.

[18] This does not exclude the fact that these groups are significantly associated with economic activity in other sectors.

[19] Results are similar when estimating the relationship in per capita terms.

[20] Note that our data do not allow distinguishing between the ethnicity of children, apprentices, journeymen, or domestic servants. Thus, all of our control variables may capture variation that is endogenous to the relationship of interest.

[21] Comparing the distribution of Huguenots in 1750, 1775, and 1800 in Figures A-IIId-A-IIIf, we find that the number of Huguenots increased in 6 districts but declined in 12 districts (1750–1775). Comparing 1775 and 1800, Huguenot numbers increased in 4 districts and declined in 12 districts. Accordingly, our results also indicate that a decrease in Huguenots is associated with a decrease in technology use.

3.4 Diversity and Economic Activity

Columns 4–8 of Table 1 address our main question whether ethnic diversity is related to economic activity in textiles by substituting the individual ethnic groups with the index of ethnic diversity. We find that changes in diversity are positively associated with changes in technology use in textiles. Since our main variable of interest is standardized with mean zero and a standard deviation of one, the coefficient can be interpreted to suggest that increasing diversity by one standard deviation (0.11) increases the employment of looms in textile production by 0.34 standard deviations. The mix of ethnicities across Berlin's districts seems to have been beneficial for the economy.

The potentially endogenous location decisions that drive changes in groups sizes and therefore in our diversity index may lead to biased results. To address concerns of omitted variable bias, we follow the work of Altonji et al. (2005) and Oster (forthcoming) to quantify potential selection on unobservables. The parameter δ reported at the bottom of Table 1 shows a ratio of 5.4 by which unobservables would need to outperform observables to produce a treatment effect of zero. The literature considers ratios of $\delta > |1|$ sufficient to confirm robustness.[22]

In an attempt to further address concerns of endogeneity, we present results using the proposed shift-share instrument in columns 5 and 6. The first-stage results in column 5 and the first-stage F-statistic indicate that predicted diversity has sufficient statistical power to instrument actual diversity. Column 6 shows that an increase in diversity by one standard deviation translates to an increase of textile production by ca. 51 percent of a standard deviation.[23] Due to the fact that the censuses only provide categories for the largest ethnic groups, potentially omitting smaller ethnicities, it is likely that diversity is very nosily measured. In this case, the 2SLS estimation may be able to reduce a downward bias on the OLS results. Columns 7 and 8 confirm that our findings are robust to using the number of workers in textiles as an alternative measure for economic activity.[24]

In sum, the results indicate that diversity is indeed positively related to economic activity, contradicting a part of the literature that finds higher levels of diversity to be associated with conflict and lower economic activity. In the absence of quantitative information on conflict, we can, however, not exclude that the aggregate effect would be negative. This could be the case if the additional activity in textile production were to be dominated by negative consequences of conflict in other areas of the economy and society. Nevertheless, our results are in line with recent findings indicating that diversity affects economic prosperity through complementarities in skills (see Alesina et al., 2016). Economic activity requires individuals to interact and organize in networks of production, knowledge, and trade. In a city-district setting such as ours, where ethnic groups are very likely to interact within their neighborhoods, the index might be indicative of complementarities between groups, i.e., between Huguenots, well-known to be highly skilled and

[22] We use the Stata command `psacalc` to calculate δ as the relative degree of selection on unobservables to observables. Our calculation uses point estimates when a full set of controls are admitted (i.e., $\tilde{\beta}$ and $\tilde{R}$ from Table 1, columns 4 and 7) and compares them to results when only district and time-fixed effects are included (i.e., β^0 and R^0). Following suggestions by Oster (forthcoming), we assume R^{max} to be $1.3 \times \tilde{R}$. Assuming $R^{max} = 1$ would return a ratio of 2.2. The full formula for the bias-corrected estimate is $\beta^* \approx \tilde{\beta} - \delta(\beta^0 - \tilde{\beta})[(R^{max} - \tilde{R})/(\tilde{R} - R^0)]$.

[23] Results are qualitatively similar when dropping districts that were established prior to the arrival of immigrants (see Table A-III in the Appendix). Using only variation within districts where immigrants settled on the green field may alleviate concerns of pre-existing differential trends in textile production.

[24] We drop one observation that reports an unreasonably low number of looms in columns 7 and 8.

specialized in textile production, and Jews, excluded from crafts but highly specialized in textile trading.

We provide further evidence for complementarities between the groups in Table 2. Here, we are able to inspect heterogeneity in textile production since the data allow us to distinguish between eight types of looms by fabric. Again, we start by inspecting how individual groups are associated with textile production across products in Panel A before we focus on the returns to diversity in Panels B and C. Since the Huguenots are known for their skillful silk-, wool-, and hosiery weaving, we expect to find positive coefficients in these categories. Columns 1, 3, and 8 of Panel A confirm this prior. Bohemian weavers are mostly known for producing cotton textiles, a category where we find a positive albeit insignificant coefficient. This may be due to the fact that Bohemians concentrate in a single district, providing us with little variation to estimate a precise relationship. The positive association between changes in Jewish presence and cotton production may indicate that cotton was an import commodity requiring a merchant and capital.

In Panel B, we substitute the individual groups with the diversity index. Different from Panel A, we find that diversity is positively related to the active use of looms across almost all fabrics. Again, the coefficients can be interpreted in standard deviations and vary between approximately one-third to two-thirds. The Oster-δ crosses the threshold of one in five out of eight cases. These findings indicate that there indeed exist complementarities between ethnic groups that facilitated textile production. A Jewish merchant population may have been able to muster up the necessary resources to successfully exploit economies of scale in cotton and linen trading when combined with Bohemian or Huguenot weavers. In Panel C, we confirm the findings from Panel B using the shift-share instrument. Although coefficients are similar in magnitude to the OLS estimates, larger standard errors lead to less precisely estimated results, so that the coefficients on cotton and passement fail to reach conventional measures of significance.

4 Conclusion

This paper has shown that the city of Berlin benefited from offering refuge to persecuted minorities who then increased the production of textiles. Combining religious tolerance with a keen eye on attracting skilled craftsmen and entrepreneurs thus worked in favor of the Prussian rulers, specifically through creating diversity. While Huguenots are strongly associated with technology use in some areas of textile production, we establish that the presence of other ethnic groups contributed to economic activity through diversity. When substituting individual measures of minority groups with a standard index of diversity, we find diversity to be positively linked to textile production in most areas. Although we can only speculate about the specific mechanisms at play, our city-district setting may be particularly suitable to examine the hypothesis that higher levels of diversity create a higher propensity for interaction between members of different groups, leading to a stronger utilization of complementarities across groups. Finally, we qualify these findings by mentioning that a) diminishing returns to diversity have not been examined in this paper but may be present in even more diverse settings and b) Berlin may have benefited from the absence of major shocks that otherwise could have resulted in the scapegoating of ethnic and religious minorities during the sample period.

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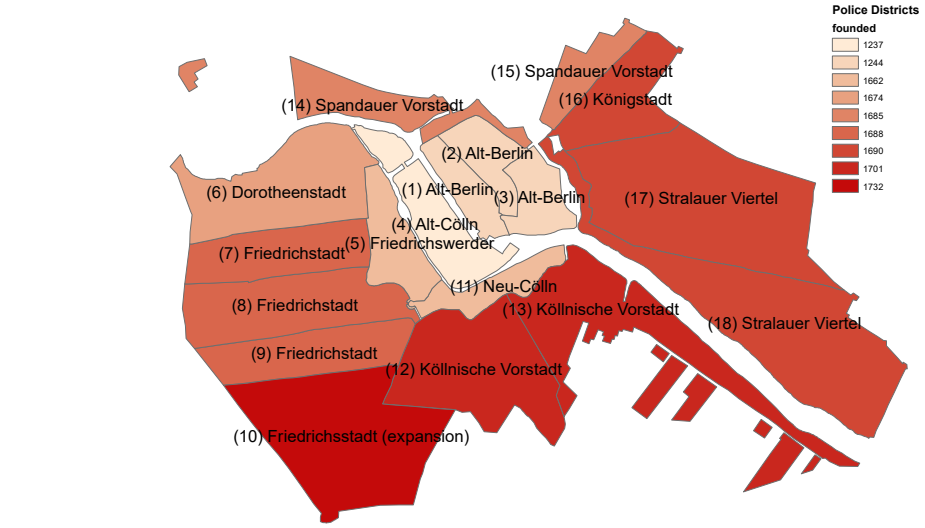
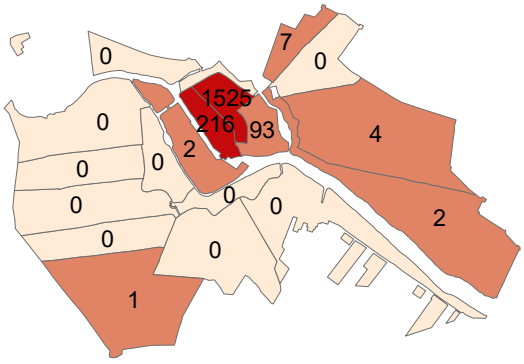
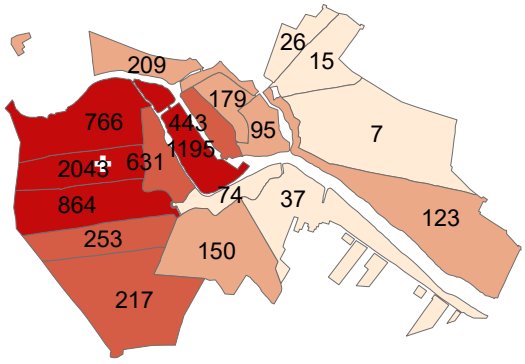
Figure 1: The Spatial Development of Berlin and the Distribution of Ethnic Minorities



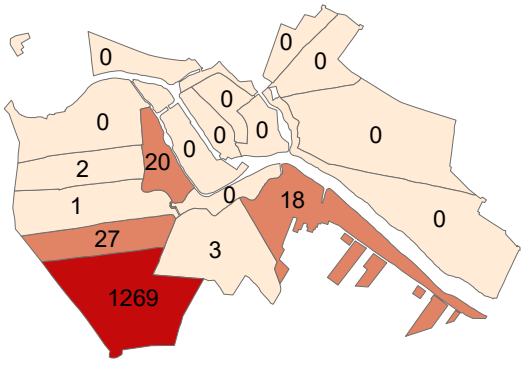
(a) Expansion of Berlin



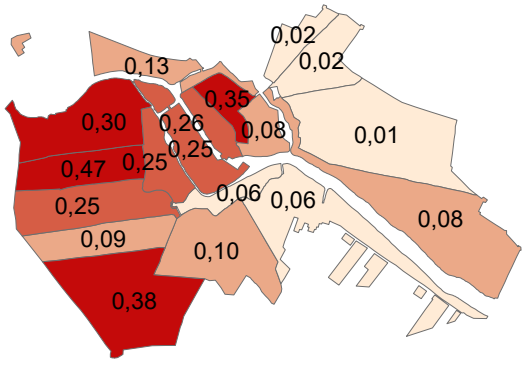
(b) Jews in 1743



(c) Huguenots in 1743



(d) Bohemians in 1743



(e) Diversity in 1743

Notes: Map (a) shows the quarters and police districts of Berlin (district numbers in parenthesis); colors reflect year of foundation. All districts were part of the census from 1743 to 1800. Maps (b), (c), and (d) show distribution of Jews, Huguenots, and Bohemians across districts. Map (e) shows the index of diversity across four ethnic groups (Bohemians, Huguenots, Jews, and Prussians) calculated as a standard Herfindahl index.

Table 1: Ethnic Groups, Diversity, and Economic Activity in Textile Production

Dependent variable:	(ln) Looms						(ln) Textile workers	
	OLS	OLS	OLS	OLS	First stage	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(ln) Huguenots	0.583***	0.601***	0.341**					
	(0.191)	(0.201)	(0.160)					
(ln) Bohemians		-0.087	-0.077					
		(0.066)	(0.059)					
(ln) Jews		-0.000	-0.038					
		(0.047)	(0.046)					
Diversity index				0.344**		0.512***	0.428***	0.398**
				(0.155)		(0.112)	(0.131)	(0.190)
SSI Div					1.216***			
					(0.169)			
(ln) Population			-0.405	-0.369	-0.010	-0.401	1.839	1.835
			(1.258)	(0.931)	(0.069)	(0.912)	(1.246)	(1.170)
(ln) Children			1.853*	1.588**	-0.007	1.529**	-0.120	-0.108
			(0.895)	(0.737)	(0.058)	(0.709)	(0.831)	(0.770)
(ln) Journeymen			0.420***	0.378***	0.010	0.390***	0.150	0.152
			(0.144)	(0.105)	(0.014)	(0.110)	(0.171)	(0.157)
(ln) Apprentices			-0.326	-0.174	-0.017	-0.167	-0.237	-0.239
			(0.340)	(0.273)	(0.016)	(0.264)	(0.277)	(0.253)
(ln) Domestic servants			-0.373	-0.407*	-0.034**	-0.385*	-0.647**	-0.644***
			(0.353)	(0.229)	(0.013)	(0.222)	(0.225)	(0.210)
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oster δ for $\beta = 0$				5.4			4.9	
Kleinbergen-Paap F-stat.						51.8		24.7
Observations	198	198	198	198	198	198	143	143
Districts	18	18	18	18	18	18	18	18
Periods	11	11	11	11	11	11	8	8
Adjusted R-squared	0.39	0.41	0.56	0.57	0.77	0.55	0.53	0.53

Notes: This table reports OLS and 2SLS regressions in a panel of city districts. The dependent variable is the log of the average annual number of active looms (column 1–6) or textile workers (column 7–8) in a district, measured over 5-year periods. The explanatory variables are the log of the average annual number of members of an ethnic group in a district, measured over 5-year periods, or an index of diversity across four ethnic groups (Bohemians, Huguenots, Jews, and Prussians) calculated as a standard Herfindahl index. *SSI Div* is a shift-share index of diversity calculated similar to a Herfindahl index of fractionalization derived from interacting the city-wide growth of ethnic groups with their predicted initial distribution across districts. Standard errors, clustered at the district level, are reported in parentheses. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 2: Ethnic Diversity and Economic Activity in Textile Production

Dependent variable: (ln) Looms in	Silk	Halfsilk	Wool	Cotton	Linen	Passement	Silk hosiery	Wool hosiery
Panel A - Immigrant Minorities and Technology Use in Textile Production								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(ln) Huguenots	1.113***	-0.116	0.493**	0.094	0.306	0.414	0.188	0.532**
	(0.253)	(0.296)	(0.191)	(0.246)	(0.367)	(0.252)	(0.148)	(0.195)
(ln) Bohemians	-0.110	0.084	-0.056	0.090	-0.060	0.005	-0.003	0.016
	(0.103)	(0.114)	(0.080)	(0.058)	(0.058)	(0.069)	(0.074)	(0.083)
(ln) Jews	-0.148*	0.071	-0.024	0.120*	-0.017	-0.066	-0.129	0.093
	(0.084)	(0.108)	(0.074)	(0.068)	(0.072)	(0.062)	(0.101)	(0.086)
Adjusted R-squared Panel A	0.62	0.32	0.36	0.70	0.34	0.58	0.58	0.34
Panel B - Diversity and Technology Use in Textile Production (OLS)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Diversity index	0.456***	-0.041	0.386***	0.094*	0.314**	0.329	0.282*	0.687***
	(0.156)	(0.209)	(0.116)	(0.051)	(0.128)	(0.339)	(0.152)	(0.144)
Adjusted R-squared Panel B	0.58	0.30	0.42	0.70	0.37	0.57	0.58	0.39
Oster δ for $\beta = 0$	2.4	-0.6	5.6	0.8	4.7	1.8	0.9	4.7
Panel C - Diversity and Technology Use in Textile Production (2SLS)								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Diversity index	0.437**	-0.091	0.588***	0.098	0.513***	0.550*	0.342*	0.731***
	(0.215)	(0.269)	(0.077)	(0.113)	(0.137)	(0.322)	(0.193)	(0.172)
Adjusted R-squared Panel C	0.58	0.30	0.39	0.70	0.35	0.56	0.57	0.39
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	198	198	198	198	198	198	198	198
Districts	18	18	18	18	18	18	18	18
Periods	11	11	11	11	11	11	11	11

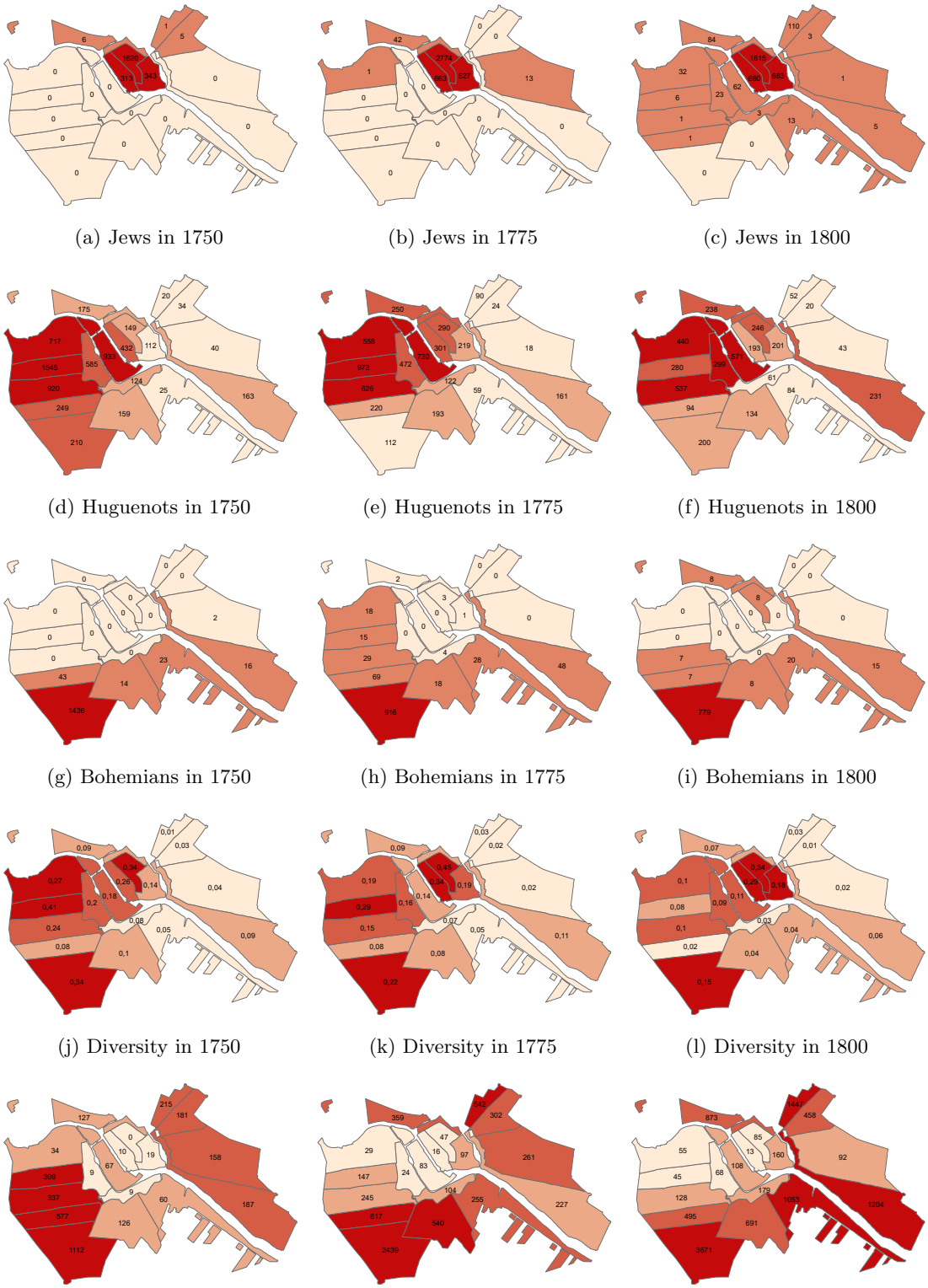
Notes: This table reports OLS (Panels A and B) and 2SLS (Panel C) regressions in a panel of city districts. The dependent variable is the log of the average annual number of active looms by fabric in a district, measured over 5-year periods. The explanatory variables are the log of the average annual number of members of an ethnic group in a district, measured over 5-year periods, or an index of diversity across four ethnic groups (Bohemians, Huguenots, Jews, and Prussians) calculated as a standard Herfindahl index. In Panel C, diversity is instrumented with a shift-share index of diversity calculated similar to a Herfindahl index of fractionalization derived from interacting the city-wide growth of ethnic groups with their predicted initial distribution across districts. For first-stage regression results of the 2SLS regressions, see Column 6 of Table 1. Baseline controls include Population, Children, Journeymen, Apprentices, and Domestic Servants. Standard errors, clustered at the district level, are reported in parentheses. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.

Appendix Supplementary Material for Online Publication

Figure A-II: The Police Districts of Berlin in 1798

Notes: The Map shows the police districts of Berlin. Districts 1–18 were part of the census in the period under analysis. Source: Nicolai (1799, p. 307)

Figure A-III: Mapping Panel data to the Districts of Berlin



(a) Jews in 1750 (b) Jews in 1775 (c) Jews in 1800

(d) Huguenots in 1750 (e) Huguenots in 1775 (f) Huguenots in 1800

(g) Bohemians in 1750 (h) Bohemians in 1775 (i) Bohemians in 1800

(j) Diversity in 1750 (k) Diversity in 1775 (l) Diversity in 1800

(m) Looms in 1750 (n) Looms in 1775 (o) Looms in 1800

Notes: Maps show panel data for variables of interest across the police districts of Berlin. Columns show maps for 1750, 1775, and 1800. Rows show maps for the spatial distribution of Jews, Huguenots, Bohemians, the index of ethnic diversity, and looms.

Table A-I: Descriptive statistics of the main variables in the analysis

	1750–54	1765–69	1780–1784	1795–99
	(1)	(2)	(3)	(4)
Looms	260.89	258.71	331.92	469.02
	(336.3)	(335.8)	(397.4)	(537.4)
Manufacturers of textiles		187.64	271.43	346.84
		(244.4)	(313.1)	(430.3)
Jews	132.93	213.13	187.00	191.87
	(415.3)	(638.7)	(486.6)	(465.6)
Huguenots	364.30	308.90	292.63	222.78
	(392.1)	(278.2)	(266.1)	(161.9)
Bohemians	78.61	69.20	57.68	39.72
	(309.2)	(255.9)	(195.3)	(146.3)
Prussians	4696.24	5224.07	5611.63	7206.11
	(1809.6)	(1884.7)	(1890.2)	(2356.4)
Diversity index	0.16	0.15	0.14	0.10
	(0.1)	(0.1)	(0.1)	(0.1)
Children	1872.54	2118.09	2255.70	2729.47
	(726.6)	(818.4)	(760.2)	(874.1)
Journeymen	313.42	257.37	319.51	495.04
	(219.4)	(147.8)	(199.9)	(263.4)
Apprentices	139.60	156.71	139.38	162.42
	(124.6)	(148.7)	(98.9)	(82.8)
Domestics	694.54	745.06	721.82	850.39
	(460.0)	(428.4)	(464.3)	(472.2)
Observations	18	18	18	18

Notes: Descriptive statistics for a selection of one period every 15 years. Standard deviation in parentheses.

Table A-II: Predicting the distribution of ethnicities across Berlin's districts

	Jews	Huguenots	Bohemians
	(1)	(2)	(3)
Dummy for Jewish church	0.330***		
	(0.096)		
(ln) distance French church		-0.088***	
		(0.018)	
Dummy for Bohemian church			0.944***
			(0.007)
Constant	0.001	0.065***	0.003*
	(0.039)	(0.012)	(0.002)
Observations	18	18	18
R-squared	0.42	0.58	1.00

Notes: This table reports bivariate OLS regressions in a cross section of city districts. The dependent variable is the district-level share of the total number of members of the respective ethnic group in 1743. Standard errors are reported in parentheses. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table A-III: Excluding districts established before 1685

Dependent variable:	(ln) Looms						(ln) Textile workers	
	OLS	OLS	OLS	OLS	First stage	2SLS	OLS	2SLS
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(ln) Huguenots	0.656***	0.677**	0.402***					
	(0.209)	(0.227)	(0.129)					
(ln) Bohemians		-0.101	-0.101*					
		(0.070)	(0.050)					
(ln) Jews		-0.001	-0.040					
		(0.050)	(0.042)					
Diversity index				0.394***		0.411***	0.343***	0.346***
				(0.065)		(0.079)	(0.070)	(0.083)
SSI Div					1.092***			
					(0.146)			
(ln) Population			1.330	0.584	-0.031	0.580	1.362	1.360
			(1.003)	(0.733)	(0.047)	(0.653)	(1.233)	(1.102)
(ln) Children			1.108	1.077*	0.015	1.059**	0.573	0.574
			(0.781)	(0.518)	(0.038)	(0.477)	(0.833)	(0.741)
(ln) Journeymen			0.182	0.253**	0.010	0.254***	0.067	0.066
			(0.148)	(0.091)	(0.014)	(0.083)	(0.184)	(0.164)
(ln) Apprentices			-0.230	-0.086	-0.014	-0.083	0.132	0.132
			(0.175)	(0.184)	(0.020)	(0.167)	(0.169)	(0.150)
(ln) Domestic servants			0.001	-0.287	-0.026**	-0.292*	-0.473*	-0.474**
			(0.277)	(0.173)	(0.011)	(0.155)	(0.251)	(0.218)
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oster δ for $\beta = 0$				2.7			4.6	
Kleinbergen-Paap F-stat.						56.1		26.0
Observations	132	132	132	132	132	132	96	96
Districts	12	12	12	12	12	12	12	12
Periods	11	11	11	11	11	11	8	8
Adjusted R-squared	0.44	0.47	0.75	0.79	0.87	0.79	0.72	0.72

Notes: This table reports OLS and 2SLS regressions in a panel of city districts, excluding those established before the arrival of Huguenots and Bohemians. The dependent variable is the log of the average annual number of active looms (column 1-6) or textile workers (column 7-8) in a district, measured over 5-year periods. The explanatory variables are the log of the average annual number of members of an ethnic groups in a districts, measured over 5-year periods, or an index of diversity across four ethnic groups (Bohemians, Huguenots, Jews, and Prussians) calculated as a standard Herfindahl index. *SSI Div* is a 'shift-share' index of diversity calculated similar to a Herfindahl index of fractionalization derived from interacting city-wide growth of ethnic groups with their predicted initial distribution across districts. Standard errors, clustered at the district level, are reported in parentheses. *** denotes statistical significance at the 1% level, ** at the 5% level, and * at the 10% level.