Pale in Comparison

Jews as a Rural Service Minority*

Yannay Spitzer†

The Hebrew University of Jerusalem

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Abstract

Jews are typically characterized as an urban minority. This paper challenges this view, while explaining the geographic distribution and variations in the occupational choices of Jews in the Pale of Settlement at the end of the nineteenth century. Viewing Jews as a *rural* service minority, with comparative advantage in countryside commerce, not in dense urban centers, a simple model of a regional labor market with inter-ethnic complementarities produces a series of empirical predictions. Using data from the 1897 Russian census, I show that the geographic dispersion of Jewish communities and the variation in their occupational distribution could be explained by this model. The mechanism at work was adverse effects of ethnic congestion in the niche of rural services: When the share of Jews in the population grew, Jews spilled across two margins—occupational, as manufacturing workers, and geographic, as frontier migrants to districts where Jews were scarce. There was little distinction between rural and urban Jewish labor markets, and no preference for large urban centers over small towns or for urban congestion effects. The patterns exhibited in the US after migration appear as a sharp break from, rather than a continuation of, old country tradition. The case of Russian Jews exemplifies how inter-ethnic complementarities shape the long-run spatial distribution of an ethnic minority group, and in particular, that economic incentive can lead to cross-regional dispersion.

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†Department of Economics, The Hebrew University of Jerusalem. Email: yannay.spitzer@huji.ac.il, personal website: yannayspitzer.net.

1 Introduction

Jews are typically considered to have been a quintessentially urban minority. Since the Early Middle Ages, Jews were relatively literate, they clustered in urban environments, specialized in urban occupations, and rarely took up agricultural labor (Botticini and Eckstein 2012). In particular, this was the case at the end of the nineteenth century in the *Pale of Settlement*—the western provinces of the Russian Empire to which legal Jewish residence was generally confined—that was home to five million Jews, more than half of world Jewry at that time. In the words of Jacob Lestschinsky, probably the most prolific scholar to have ever worked on the demographics of the Jews, "There is general consensus that Jews are an 'urban' people, and East European Jewry was no exception." (Lestschinsky 1961, p. 72).

This paper seeks to challenge this view, by asking whether turn of the century East European Jews were really urban or rural agents, from an economic perspective.[1] I argue that explaining the patterns of settlement and occupation practiced by Jews in the Pale of Settlement requires thinking of them as a *rural service minority*, the countryside its habitat. These patterns had been qualitatively different from the metropolitan nature Jews soon assumed when they migrated to the New World and to Western Europe. Whereas after their migration, Jews overwhelmingly clustered in metropolitan centers and were largely absent in the countryside, in the old country Jews tended to disperse uniformly across space, and though clustered in small urban localities, they were present in virtually every district and showed no particular preference for larger urban centers.

I explain the joint patterns of occupation and settlement of Russian Jews using a model of a regional labor market with inter-ethnic complementarities in a partial spatial equilibrium. It considers Jews as a rural service minority, an ethnic group that specializes in rural services (commerce, in the model) whose labor is complementary to the that of the agricultural majority group within a regional labor market (Slezkine 2004). A full formal description of the model is presented in Appendix D, and its main outline is as follows: The output of the district is a function of capital (land), and of two complementary types of labor: commerce and agriculture.[2] Workers differ by their comparative advantage in commerce relative to agriculture, which is their rate of substitution between the two types of labor.[3] The district labor market is competitive in the sense that workers can choose their sector and are paid their marginal product. The degree of comparative advantage of workers is heterogeneous, and Jews differ from non-Jews by being drawn from

[1] To be clear, the urban-rural distinction is used here in a restricted economic-demographic sense, and is not meant to bear any cultural meaning.

[2] Commerce and agriculture are complementary in the same sense that skilled and unskilled labor are complementary in Katz and Murphy (1992).

[3] For example, a worker who in a unit of time can contribute 1 units of effective agricultural labor and 3 units of commerce labor, has comparative advantage in commerce relative to another worker who can contribute 2 or 4 units.

a "higher" distribution of comparative advantage in commerce.[4] The main mechanism at work is within-ethnic congestion: When there are more Jews in the district, the relative supply of commerce skills rises and its relative wage diminishes, such that the marginal workers of either group are crowded out of commerce. Facing congestion where their relative skills are abundant, Jews either move to agriculture (which stands for second-best occupations, including manufacturing), or migrate to regions in which their share is low, and therefore Jewish profits are high.

The model predicts a number of empirical patterns, some of which were hitherto unknown, unnoticed, or merely speculated. First, the model predicts that Jews would avoid clustering at the district level. They may form a majority at the level of the locality, but unlike other ethnic minorities, never at the level of the district. Obversely, they will tend to distribute evenly across space, and would spill over to new geographic frontiers when the option becomes available. A Jewish vacuum at the level of the district will not be a viable state. If open for Jewish settlement for a sufficient amount of time, greater profits in commerce will lure Jews in, such that in the long run all districts will have a sizable Jewish minority. Low Jewish density will be found in regions in which the option to settle is new, and will reflect a temporary state of partial equilibrium, to be gradually offset by immigration from high density regions. All else equal, in districts with higher Jewish density there will be more commerce workers overall, but the share of commerce workers among both Jews and non-Jews will be lower. That is, a larger proportion of Jews crowds both Jews and non-Jews out of commerce.

The assumption that the labor markets are regional and not local has two important implications, that are arguably at odds with the common view of Jews as urban agents. First, the model is agnostic as to whether Jews would choose to cluster in large cities, small towns, or villages. This is in contrast to a hypothetical alternative model that would charachterize Jews as a metropolitan minority with comparative advantage in greater urban centers, increasingly over-represented in larger cities. Second, there will not be congestion effects at the level of the locality. This means that unlike the regional (district) level, at the level of the locality there will not be a correlation between the share of Jews in the population and their occupational distribution, conditional on the share of Jews in the district. There could exist "anti-shtetls"—small towns with hardly any Jews—without necessarily having extraordinarily high profits in commerce that would attract Jews in. Similarly, there could exist towns that are almost entirely Jewish, without congestion effects that erode Jewish profits.

I use data from the 1897 Russian census to test the predictions of the model. The census provides a cross-sectional snapshot of the Pale of Settlement, with its 26 provinces, 246 districts, and 346 administrative

[4] Specifically, their distribution of the rate of comparative advantage first-order stochastically dominates that of non-Jews.

towns, as well as thousands of smaller localities.[5] I also make use of data on the remaining 34 provinces of European Russia, beyond the Pale, to compare the economy of the Pale with a similar yet Jewless economy. The first empirical findings lay out a series of stylized facts that help justify the assumptions of the model. Commerce, particularly rural commerce, was the segment of the labor market in which Jews were the most over-represented. Furthermore, although Jews were over-represented in urban localities, within this class they were not more over-represented in large cities relative to small towns.

The remaining findings corroborate the predictions of the model. The distribution across districts of *Jewish density*, the share of Jews in the population of the district, was remarkably uniform, suggesting forces pushing towards an equilibrium rate of Jewish density. Districts that had lower Jewish density were those in which either there were legal restrictions on Jewish settlement, or where restrictions had existed in the past and the right to settle was relatively new. Next, comparing employment commerce between the Pale and the rest of European Russia, where Jewish residence was generally banned, the regions that did not tolerate Jews were dramatically under-provided with commerce labor relative to the Pale, and even more so with rural commerce labor. The share of commerce workers in the Pale was roughly double its share in Inner Russia. However, the share of commerce workers among the non-Jewish labor force in the Pale was minuscule, and much lower than in Inner Russia. For example, the median district in the Pale had a ten times lower share of grain traders out of the non-Jewish labor force. An obvious explanation for these differences was the shortage and abundance of Jewish workers. Non-Jews were a poor substitute for Jews. The variation in Jewish density within the Pale was consistent with the congestion mechanism. Jewish density was strongly positively correlated with the total share of commerce workers and strongly *negatively* correlated with the share of commerce workers out of the Jewish labor force. Having more Jews implied having many more commerce workers overall, but since Jews crowded each other out of this sector, it also meant that relatively more of them had to opt for second-best options, particularly in manufacturing and personal services. On the other hand, there is some evidence that within the Pale Jews crowded out non-Jews from commerce, but it is not fully robust, possibly due to the negligible rate of remaining non-Jewish commerce workers.

Unlike the evidence on the cross-district distributions, there is no evidence at all of a town-level ethnic congestion. The distribution of town-level Jewish density ran all across the scale with no apparent equilibrium level: Some towns were almost entirely Jewish, whereas other had none. Similarly, conditional on Jewish-density at the district, town-level Jewish density was not correlated with the share of Jews employed in commerce. The implication is that even when Jews clustered in a particular town, they did not crowd each

[5] The Pale of Settlement nominally comprised only 15 provinces in the west of European Russia. In practice, the 10 provinces of Congress Poland were also considered as part of the Pale. In all the analysis I also include Courland province within the Pale. Courland, currently in western Latvia, was previously within the Pale but was removed from it in the early nineteenth century; however, it was adjacent and still had sizable Jewish communities.

other out of their preferred occupations, because the labor market that mattered was not confined to that town; it was regional, and what mattered was the share of Jews in the wider area. Neither is there much evidence that the labor market of the large cities was any different for Jews from that of small towns and villages; their occupational distribution was almost independent of the size of the locality, and unlike non-Jews they were only slightly more literate in the cities relative to villages and small towns. Where precisely they lived within the district mattered little for their occupational choices.

Finally, using the 1920 US census, I show how different the patterns of Jewish settlement in the US were in the early twentieth century. In stark contrast to the Pale of Settlement, American Jewish immigrants, who mostly came from the Pale, were more likely to be found in larger urban centers. This pattern was not due just to the growth of Jewish clusters in New York and a few other American metropolises; Jewish density rose monotonously and sharply all across the distribution of locality sizes. Neither could this pattern be explained as a part of a common experience shared with other "New Migrants" from the European periphery. Indeed, some of them were over-represented in urban settings, but never to the same extent as the Jews. It appears that Jews resigned at once from their role as a rural service minority, as Jewish rural commerce workers were mysteriously absent in the American countryside. A few of them indeed found their way there, but considering that this had been their occupational niche of choice for several centuries until the time of their departure, their numbers were puzzlingly low. I argue that on the basis of the patterns that I document for the Pale, the metropolization of Jewish American immigrants would have been hard to predict, that its transformative nature was not appreciated in the historical literature, and that standard explanations are insufficient. It is a puzzle begging for recognition and for a solution.

This paper is closely related and contributes to a number of recent strands of literature. First, there has been a growing interest in political economy and economic history in the role of inter-ethnic labor market complementarities in creating the conditions that enable minorities to co-exist peacefully under the prospects of cheap violence, as well as in the circumstances that could lead to hostility, to a break-up of the peaceful equilibrium, and to persecution and inter-ethnic violence. In fact, many of these studies deal with the case of European Jews from the Middle Ages to the early twentieth century (Anderson, Johnson, and Koyama 2017; Johnson, Koyama, and Jebwab 2017; Finley and Koyama 2018; Becker and Pascali 2019; Grosfeld, Rodnyansky, and Zhuravskaya 2013; Grosfeld, Sakalli, and Zhuravskaya 2019), while others deal with Hindu-Muslim relations (Jha 2013, 2014) or a broad set of cases from around the world (Jha 2018, including Sepharadi and Ashkenazy Jews). The contribution of this paper is in showing systematically how inter-ethnic complementarities can explain the long-run spatial distribution of a minority group.

Another strand of related literature studies the causes and the effects ethnic and racial clustering and

segregation, typically within localities and metropolitan areas (Massey and Denton 1993; Edin, Fredriksson, and Aslund 2003; Cutler, Glaeser, and Vigdor 2008; Boustan 2010; Shertzer and Walsh 2018; Eriksson 2018). This paper offers an analysis of an opposite phenomenon—ethnic dispersion—and of how it can occur as a result of market incentives, not forced relocation. Jews did cluster in particular localities *within* districts, but they dispersed *across* districts. This feature was by no means uniquely Jewish, and in particular it characterized other minorities that specialized in the provision of local non-tradable services and lived in scattered communities in a variety of civilizations, such as Roma people, Armenians, South Asia Chinese, and many more (Bonacich 1973; Slezkine 2004, Ch. 1). I advance the understanding of this phenomenon by framing and testing a theory that explains the spatial and sectoral distributions of a service minority.

Finally, this paper contributes to the attempts to understand the economic and demographic characteristics of the Jews. I follow up on the seminal work by Kuznets (1956, 1960, 2011), who proposed a theory that explained the occupational and geographic distributions of Jews as a small recent minority. In part, this paper confirms Kuznets's hypothesis, such as by testing the existence of the congestion mechanism. But I also show how Kuznets did not characterize correctly the old-country patterns, particularly of geographic dispersion and the attachment to the rural economy, and failed to see the fundamental transition that came with migration overseas. More recently, Botticini and Eckstein (2012) explained the Jewish concentration in urban occupations, localities, and economies over the period 70-1492, by a comparative advantage in human capital. I follow up on their thesis by showing how, at the end of the nineteenth century (and probably previously throughout the early modern period), the comparative advantages of East European Jews led them, in fact, to the countryside. This was where their skills were most scarce.

The paper proceeds as follows: In Section 2 I provide a brief survey of the historic and the historiographic background. Section 3 describes the data sources and demonstrates the patterns that motivate and justify the assumptions in the model. I test the predictions of the model in Section 4, and demonstrate the contrast between the Pale and the Jewish settlement of the American economy in 1920 in Section 5.

2 Background

2.1 A brief history

Since the Late Middle Ages, Jews had been settling the Kingdom of Poland and other East European territories that would become parts of the Polish-Lithuanian Commonwealth.[6] Under Polish kings and magnates, Jews were granted liberties and privileges unknown elsewhere in Europe (Goldberg 1999), and

[6] For a general history of Jews in late medieval and early modern Poland see Weinryb (1973) and Baron (1976).

by the early modern period Polish Jewry had become the world's largest Jewish community. Integrated within the Polish Second Serfdom economy alongside serfs, townsmen and noblemen, they formed symbiotic relations with the Polish nobility as a class of middlemen, merchants, and craftsmen. Since the middle of the sixteenth century, the Jewish settlement became closely associated with the Polish private town, the *miastezcko*, owned by Polish noblemen, in which Jews often formed a majority. They were designated as local centers of commerce and services for the surrounding villages, typically owned by the same ruling lord. Some of the roles Jews assumed within the Polish manorial system placed them in virtual villages, where Jews were not a rarity but a commonplace. There, they were traders and lessees of local manorial properties and monopolies: whole estates, mills, fisheries, and not the least, liquor distilleries and taverns. Whether in the private towns or in the villages, Jewish communities were a valuable asset for the magnates who ran the rural Polish economy, their economic activities an indispensable complement to the serfs' agricultural labor.[7]

In larger cities, on the other hand, Jews faced tougher restrictions and competition from burghers. Crown cities, directly owned by the King, rather than by a magnate, and therefore more independent and with greater political power in the hands of Christian townsmen and guilds, continuously campaigned to ban, restrict, and repel Jewish residence and economic activity. A number of these were able to secure a royal privilege to not tolerate Jews within them, the *privilegium de non tolerandis Judaeis* (Goldberg 1974). Other regulations occasionally restricted Jews to certain economic sectors or quarters of a city, and they were generally not allowed to be members of non-Jewish guilds.

During the partitions of Poland, the lion's share of the Commonwealth's territory fell under the tsars, including possibly as many as one-million Jews (Mahler 1958; Stampfer 1989). At first, the Russian bureaucracy allowed the old institutions to persist: magnates and gentry members kept their estates with their serfs and feudal privileges, restrictions on Jews in former crown cities could be prolonged, former Russian territories remained closed to Jewish settlement, and Jews maintained the rights to reside within the boundaries of the former Polish-Lithuanian Commonwealth, augmented by the regions of New-Russia and Left-Bank Ukraine. Thus, persistence gave birth to a new entity, the Pale of Settlement—1.2 million square kilometers between the Black and the Baltic Seas to which the Jewish population was confined.[8]

The early Russian intervention, partly hands-off with few direct anti-Jewish biases, favored the traditional Jewish economy and ushered in a "golden age" of prosperity for the Jewish towns (Petrovsky-Shtern 2014).

[7] For recent studies of Jews in the early modern Polish economy see Rosman (1990), Hundert (1992), Goldberg (1999), and Teller (2006, 2017). On the privileges that formed the judicial basis for the relations between Jewish communities and magnates see Goldberg (1985).

[8] On the formation of the Pale see Klier (1986). For general surveys of the history of Jews in Imperial Russia see Dubnow (1916), Baron (1976), and Bartal (2006).

However, within several decades this approach was replaced by efforts to crack down on the Polish feudal privileges, on the Jewish communal autonomy, and on Jewish presence in villages, as well as by not-so-benign policies to modernize Jews and make them more "useful" subjects (Stanislawski 1983). In particular, the Russian authorities sought to eradicate the traditional Jewish economic activities in the countryside, above all in the production and trade in alcohol.[9] The Russian reaction to the 1863 Polish rebellion had a further harmful effect on the conditions of the Jews, and by the late imperial period, the tsars and the bureaucracy increasingly turned to discriminatory policies and outright persecution, driven in part by implicit and explicit Judeophobic prejudices. Part of the regulations of the notorious May Laws of 1882 specifically targeted Jewish residence in rural localities, multiplying the devastation already wrought on countryside Jews by previous restrictions on the alcohol industry.[10]

At the same time, the Jewish population in the Pale experienced two streams of internal migration: one toward areas of new settlement, the other from small localities to urban centers (Stampfer 1995). The case of Odessa, by 1897 the Pale's second largest Jewish community, embodied both (Zipperstein 1985). Jews were officially banned from Warsaw until 1768, but by the turn of the twentieth century its 220 thousand strong Jewish community became the world's largest. Lodz, hardly more than a village with a handful of Jewish families at the beginning of the nineteenth century, became an industrial powerhouse—"Polish Manchester"—with almost one hundred thousand Jews. Hand in hand with the decline of the traditional rural manorial economy, that provided livelihood for so many Jewish households, Jews were legislated out of the villages and were squeezed in the formerly well-to-do shtetls. In turn, they opted for regions of new settlement, and within the regions of old settlement Jews became increasingly associated with truly urban environments; industrial labor, proletarization, and the rise of the Jewish labor movement, all featured as leading phenomena in the social-economic Jewish life at the turn of the century (Mendelsohn 1970; Kahan 1986; Peled and Shafir 1987; Lederhendler 2009). It appears the role of manufacturing relative to commerce had been increasing since the early modern period (Hundert 1987), and that this trend persisted through the nineteenth century. According to Kuznets (2011, Section III.1.b) and Kuznets (1975, p. 77), this shift was a result of the relatively rapid population increase of Jews, that reduced the opportunity for profit in trade, and reflected a deterioration in the standards of living rather than a beneficial move into more profitable pursuits.[11]

[9] On Jews in the liquor economy of the early imperial period see Petrovsky-Shtern (2014, Ch. 4).

[10] On the Jewish Question in imperial Russia during the reigns of the last three tsars see Rogger (1986) and Klier (1995, 2011). On the decline of the shtetl economy during the remaining two-thirds of the nineteenth century see Petrovsky-Shtern (2014, Conclusion chpater).

[11] I am not aware of any robust quantitative evidence that there was an absolute decline in the standard of living, or even a relative decline compared to non-Jews. According to height measures of conscripts in Warsaw (Kopczyński 2011), Jews were shorter than non-Jews in the early 1840s, and the gap widened by the end of the century. During the last two decades of the nineteenth century the stature of Jewish conscripts was declining.

Thus, by the end of the nineteenth century, the economic and demographic outlook of Jews had already begun to go through a transformation from rural to metropolitan. At the beginning of this process, in the eighteenth and early nineteenth century, Jews were still largely a minority of rural secondary- and tertiary-sector workers. At the end, after migration to the US, they would become hyper-metropolitan. The contention in this paper is that by the turn of the century, East European Jews were still near the rural starting point of this process.

2.2 Theories on the economics and demographics of the Jews

The seminal contribution to the understanding of the economics and demography of the Jews in the economic literature was a synthesis put forward in a long draft by Simon Kuznets in 1956, published in a short form in 1960, and in full in 2011. His overarching claim was that the economics of the Jews was a particular case of the economics of a small minority; one that was recent, in the sense that it had arrived to its current location when traditional economic positions had already been taken, and permanent, meaning that it was not expected to become a majority in the future. In response to discrimination and restrictions in the labor market, and driven by the preference for socially cohesive communities, such a minority would naturally cluster, both occupationally and geographically. Hence the over-representation in trade and in large cities. Some of Kuznets's observations are perfectly in line with the model proposed here. In particular, he argued that higher percentages of Jews among the non-agricultural labor force caused a larger share of them to spill over to occupations beyond those "to which they have easy access, which they prefer, and which they are likely to saturate first" (Kuznets 2011, Section II.3).[12] He tested that such negative correlation between Jewish density in the non-agricultural labor force and the share of Jews employed in commerce existed in a small interwar sample of countries. He later reiterated this point based on data on the four main regions of the Pale, and suggested that there were visible substitution effects between Jews and non-Jews, in the sense that Jews may crowd out non-Jews from typically Jewish occupations (Kuznets 1975, pp. 72–77).

The current paper picks up the question of how to explain the joint distribution of Jewish occupations and settlement in the Pale and in the US from the point at which Kuznets had left it decades ago. I am mainly able to go beyond Kuznets due to the availability of the disaggregated data from the 1897 census, but the current hypothesis also differs from Kuznets's in one important respect: Kuznets attempted to explain the Jewish tendency to cluster geographically in cities. He did not seem to regard a qualitative differences

[12] That greater Jewish density was associated with lower rates of commerce employment among Jews due to congestion was already suggested by Rubinow (1907), in reference to the lower share of commerce workers among Lithuanian Jews, relative to Jews in the southern regions. "In the northwest [...] the industrial occupations claim a much greater proportion of the employed than commerce [...]. This difference is significant in view of the greater congestion of the Jews in the northwest and their lower economic condition [...]" (p. 502).

between the old-country patterns in the Pale and the new patterns in the New World and in western Europe. I argue instead that there were radical differences. In the Pale, alongside the tendency to cluster in towns within the districts, there were in fact dominant centrifugal forces that dispersed settlement across districts. After migration, centripetal forces dominated, such that the Jews became a metropolitan minority absent from the countryside.

Botticini and Eckstein (2012) argued that the religiously-driven Jewish commitment to literacy can explain why, from the early Middle Ages to 1492, Jews thrived in commercial urban environments, and were unable to develop a viable and long-lasting presence in non-commercial rural economies. The costly educational requirements meant that over the long run, Jewish communities could only survive when Jews were able to exploit the occupational comparative advantage provided by literacy,[13] and that this could not occur in non-urbanized economies. Hence, Jews opted out of agriculture and away from the countryside, and chose cities and urban pursuits. I follow Botticini and Eckstein (2012) in seeing Jews as a minority with a particular occupational comparative advantage that could be regarded as exogenously given. On the other hand, I argue that the predictions of their model regarding the settlement distribution of Jews do not apply to the circumstances of early modern and nineteenth century Eastern Europe, which was an agrarian society that was nevertheless commercial. In this environment, the comparative advantage of Jews drew them to where their skills were scarce—not only to the cities, but equally, if not more, to the countryside.

According to Teller (2017, p. 577), "The relative paucity of research on Jewish economic history over the last sixty years means that it is difficult to identify a suitable theoretical framework within which to analyze eastern European Jewish Economic life." In particular, Teller considered middleman minority theory (Bonacich 1973) and dismissed its usefulness on the grounds that it is either too inclusive (almost any group in the Polish feudal society could pass as a minority) or too exclusive (it is doubtful that Jews qualify as a minority, other than in the religious sense). The premise of this paper is that the middleman minority theory is, in fact, a useful framework for economic analysis of east European Jews, simply because Jews were a distinct group with obvious labor-market complementarities relative to the rest of the population.[14] In that, I follow historical anthropologist Yuri Slezkine (2004) who characterized Jews, particularly Russian Jews, as a primary example of the wider human phenomenon of service minorities. These are mobile and literate groups, that specialize in trade and rural services and stand in social and economic contrast to the land-toiling majorities. In this sense this paper is an economic counterpart to his hypothesis.

The historical case study of one man by the name of Aharon Ya'akov Dukhan, laid out in Appendix C,

[13] This included the ability to create well-functioning contract-enforcement mechanisms and commercial networks, as in Greif (1989, 1993).

[14] A similar stand was taken by Grosfeld, Sakalli, and Zhuravskaya (2019).

exemplifies the story of the Jews as a rural service minority that the model generalizes. Dukhan was an entrepreneurial young Jew who grew up in a small town in the district of Bubroisk, in current day Belarus, where he came of age around 1870. Bubroisk was one of the most Jewish-dense districts in the Pale, and as a result it had one of the highest rates of commerce employment overall. Yet among Jews, it had one of the lowest rates. Instead of opting for another sector, such as manufacturing, Dukhan decided to migrate south, to New Russia. He settled in Bozhedarovka, a small village in the district of Verkhne-Dnieprovsk, which was the mirror image of his home district: few Jews and little commerce. Not surprisingly, the rate of commerce workers among Jews was extraordinarily high, one half. Dukhan became a grain trader and an agricultural estate manager, and for all we know he prospered there. Moving to the countryside to provide rural services within a region that had few Jews, was Dukhan's way to channel his skills to where they were most scarce. The contention is that centuries of similar decisions, explained by the comparative advantage of Jews as a rural service minority, have shaped the occupational and spatial distributions of the Jews in the Pale of Settlement.

2.3 Inter-ethnic complementarities

The role of inter-ethnic complementarities and substitution stands at the center of a number of recent studies in economic history and political economy. Jha (2013, 2014, 2018) showed how under certain conditions, historical labor market complementarities between ethnic groups help maintain a peaceful equilibrium, despite the access of the majority group to cheap violence and the temptation to expel and expropriate the minority in times of crisis. Other studies dealt specifically with the case of Jewish communities in Late Medieval, early modern, and early twentieth century Europe, while highlighting the complementary role of Jews as providers of financial services, primarily money-lending. From the Late Middle Ages until the 1600s, persecution of Jews was more likely during economic downturns, as the trade-off between immediate expropriation and extraction of future rents tilted towards the first. However, by the seventeenth century improvements in state capacity nullified the economic crisis-persecution nexus (Anderson, Johnson, and Koyama 2017). During the Black Death (1347–1350), pogroms were more likely when the rents that could be extracted by the Emperor from Jewish money-lending were potentially contested by a competing local ruler (Finley and Koyama 2018). When Jews were stronger complements (as when their number was larger or when the rates of plague mortality were higher), this reduced the probability that a crisis would lead to persecution (Jedwab, Johnson, and Koyama 2017). Becker and Pascali (2019) examined the long-run effects of the Protestant Reformation, which reduced the degree of complementarity between Jews and Protestants relative to the Catholics, due to the laxation of attitudes towards Christian money-lending. The result was

a relative rise in anti-semitic expressions among Protestants, and exactly in places in which Jews had been previously known to specialize in money-lending.

Grosfeld, Sakalli, and Zhuravskaya (2019), a very closely related study in terms of the data and the context, examined the relation between the occupational distribution of Jews, economic and political shocks, and the prospects of pogroms in the nineteenth and early twentieth centuries. They find that pogroms were triggered by a perfect storm of three elements: economic shock, political shock, and a large share of Jewish creditors—either grain traders or money-lenders. At the core of the mechanism stood the relations between Jewish creditors and non-Jewish debtors. These relations were based on the ability of creditors to commit to allowing a 'haircut' during economic shocks, based on the future value of the continuation of these relations. When economic shocks occurred together with a political crisis, this commitment ability was broken, because future transactions were not guaranteed. Creditors then had to demand immediate payment, and the relations collapsed with few checks to inhibit violence. Thus, pogroms required a joint political and economic shock (as was the case after the assassination of tsar Alexander II in 1881 and around the 1905 Russian Revolution), and then it was more likely to occur where more Jews were creditors. Other studies have shown that a historical connection between Jewish specialization in trade and in finance and anti-Semitic sentiments is a persistent force that affects anti-market attitudes to our days (Grosfeld, Rodnyansky, and Zhuravskaya 2013; D'Acunto, Prokopczuk, and Weber 2019). Similarly, Pascali (2016) linked current local financial development in Italy with a historical challenge posed to Jewish moneylender by Franciscan charitable loans during the Italian Renaissance.

The main theme in all of these studies is the role of inter-ethnic complementarities between Jews and non-Jews in creating the conditions that either prevent or enable persecution, or in affecting long-term anti-Semitic and anti-market sentiments. The contribution of the current paper is in bringing to the front another important outcome: the spatial distribution of the minority group. Contrary to the accepted wisdom, that minorities would tend to cluster and close ranks (Kuznets 1956), inter-ethnic complementarities led to the opposite outcome, dispersion across regions.

3 Data and basic patterns

3.1 Sources and structure of the data

The main source of data is the 1897 census of the Russian Empire (Troinitskii 1897, 1905).[15] It was the first and only Empire-wide census enumerating the entire population (Clem 1986; Bauer, Kappeler, and Roth

[15] In Section 5 I also make use of the 1920 US census (Ruggles et al. 2010).

1991).[16] I coded data from the sixty provinces (*guberniia*) of Congress of Poland (10) and European Russia (50). The Pale of settlement (Figure 1) officially comprised 15 provinces at the western parts of European Russia, but for all intents and purposes the 10 provinces of Congress Poland were also part of the Pale. Additionally, in the analysis I include the province of Courland, in current day Latvia, as a part of the Pale.[17] Thus, Poland and European Russia are divided in the analysis into the 26 provinces of the Pale, including Courland, and the remaining 34 provinces of *Inner Russia*.

The Pale was administratively divided into four regions: Poland, Lithuania (including much of current day Belarus), the southwest, and New-Russia that bordered the Black Sea in the south. Left-Bank Ukraine (the two eastern provinces of the southwest, Chernigov and Poltava) and New-Russia were previously frontier lands, and although not part of the former Polish-Lithuanian Commonwealth, they were exempted from the restrictions on Jewish settlement and formed part of the Pale, and thus Jewish settlement there was recent yet substantial. In some of the analysis I distinguish two areas within the Pale: provinces of the former Polish-Lithuanian Commonwealth, where Jewish settlement was old and dense, and the remaining provinces (Courland, Left-Bank Ukraine, and New Russia), where Jews were less numerous, either because their settlement was recent or because it was restricted.

The data are at the level of the district (*uezd*), of which there were 246 within the Pale and 343 in Inner Russia, and at the level of the administrative town, *gorod*. The gorod status was partly arbitrary; typically it was the largest town in the district, but some gorods were hardly larger than a village. Each district had at least one gorod, and occasionally two or more; in total there were 346 within the Pale and 389 in Inner Russia. I denote the area outside the gorods as *countryside*, a convenient misnomer. The "countryside" included not only villages, but also small and sometimes medium-sized towns, and effectively it meant different things for Jews and for non-Jews. Outside the gorods, as we shall see, Jews typically clustered in small towns whereas non-Jews populated the villages.

Two questions in the census were relevant for the classification of Jewish subjects: religion and mother tongue. In practice, the two categories overlapped almost perfectly: within the Pale (excluding Courland) there were 4.8 million native speakers of Yiddish, and 5 million Jews by religion. The small fraction of Jews native in another language reflected the early processes of Polonization and Russification in the largest urban centers, as well as in regions of new settlement and in inner Russia.[18]

[16] Previous papers that used disaggregated data on the Jews from the 1897 census are (Perlmann 2006; Spitzer 2019; Grosfeld, Rodnyansky, and Zhuravskaya 2013; Grosfeld, Sakalli, and Zhuravskaya 2019).

[17] Formerly a semi-independent duchy, Courland was adjacent to the Pale and although it had never been an integral part of the Polish-Lithuanian Commonwealth it had an established Jewish settlement and it had been part of the Pale earlier in the nineteenth century before being removed from it. In 1897 more than 5.6 percent of the population was Jewish.

[18] The shares of mother tongue-Jews to religion-Jews in Warsaw and Odessa were 0.84 and 0.89. In the other cities with more than 100 thousand inhabitants the shares were above 0.9. In Courland, one-quarter of the Jews were native German

Figure 1: The Pale of Settlement

Notes: The map represents the 25 provinces comprising the Pale of Settlement, with the addition of Courland province. The black and the gray lines demarcate the four main regions and the 26 provinces. The shaded provinces are areas of new or restricted settlement (Courland, Left-bank Ukraine, and New-Russia). The black dots represent the 346 gorods. The gray dots represent the remaining non-gorod localities, that were geolocated and where the size of the Jewish population in 1897 is known. Some towns fall out of the extent of the Pale due to imprecision in the provincial shapefiles Source: 1897 Russian census, localities volume.

The data collected from the provincial volumes of the census include district-level cross-tabulations by gender, age groups, ethnicity, and literacy; as well as tabulations of occupational distribution of Jews and of the total population across 65 occupations for each gorod and for each district. An additional volume among the census publications listed all of the empire's localities that had more than 500 inhabitants (Troinitskii 1905), from which I created the *shtetlach* data. For each town, the entries include the total population counts, and of each religious group that comprised more than 10 percent of the total population of the locality. Thus, we know the size of any significant Jewish community within any locality that had more than 500 inhabitants. By listing and geolocating all of the reported Jewish communities in the 60 provinces of the Pale and Inner Russia, the shtetlach maps 84 percent of the (religion defined-) Jewish population of the Pale down to the level of the locality. Jews not covered by this list resided either in villages, or in larger localities in which Jews were a small minority.[19]

speakers. In 93 percent of the gorods the share of Yiddish speakers to religion-defined Jews was at least 90 percent, and the coefficient of correlation between the share of mother tongue- and religion-defined Jews in the gorods was 0.969.

[19] Rowland (1986, p. 222) counted 226 localities within the 25 provinces of the Pale with more than 5,000 inhabitants that did not list a Jewish community.

Table 1: Occupational and residential specialization of Jews

Category	In category among: Jews (1)	In category among: Non-Jews (2)	Share Jews within (3)	Over-rep. of Jews (4)
Urban (> 10,000)	0.375	0.092	0.341	4.073
Countryside	0.519	0.891	0.069	0.583
Literacy (ages 20–60)	0.506	0.299	0.172	1.692
Labor force particip.	0.298	0.265	0.125	1.124
Sectors				
Agriculture	0.027	0.603	0.006	0.045
Commerce	0.300	0.013	0.765	22.771
Manufacturing	0.355	0.109	0.317	3.246
Professional services	0.047	0.025	0.209	1.850
Personal services	0.175	0.191	0.116	0.916
Transportation	0.031	0.017	0.206	1.816
Other	0.065	0.041	0.186	1.603
Population (1,000s)	4,843.1	38,165.0	0.113	

Notes: The table reports statistics over the entire population of (language-defined) Jews and non-Jews within the Pale. The Pale includes Courland province. Columns 1 and 2 report mean of category indicators within each ethnic group. Column 3 reports the share of Jews within each category. Column 4 reports the over-representation of Jews within each category. The urban indicator is for population living in Gorods with total population above 10 thousand. Countryside indicates population living outside Gorods. Literacy is the total rate of literacy (Russian, non-Russian, above-elementary education) at ages 20–60. In the rows reporting means of sector indicators, the shares in columns 1 and 2 are from among the labor force, not the total population (hence, shares sum up to 1).
Source: 1897 Russian Census, provincial volumes, Tables XV, XXI and XXII.

3.2 Descriptive statistics

Descriptive statistics presented in Table 1 seem to be consistent with the view that Jews were a quintessentially urban minority. Three-eights of the Jewish population resided in localities with more than 10 thousand inhabitants. In this group of towns Jews amounted to more than a third of the population, despite being hardly one-ninth of the overall Pale population, meaning that relative to non-Jews they were four times over-represented there. The opposite was true in the countryside, a category that includes all localities that were not Gorods (all villages, as well as many small towns), where 89.1 percent of the non-Jewish population resided and Jews were an under-represented minority of 6.9 percent. Although far from being universally literate (at least as far as the understanding of the census takers went), Jews had a wide literacy advantage. With approximately half of the working-age population (both females and males) recorded as being able to read, Jews were 70 percent more literate than non-Jews within the Pale.

In choosing occupations, Jews were above all non-farmers. Only 2.7 percent of them toiled the land, dwarfed by the rate of agricultural workers among non-Jews, who with over 60 percent, left Jews more than 22 times under-represented. The sector in which the largest number of Jews was employed was manufacturing,

a typically urban field, capturing 35.5 percent of the Jewish labor force. Second was commerce, with 30 percent. Put together with the tendency to cluster in towns and the higher rates of literacy, the supremacy of commerce and manufacturing and the near absence in agriculture seems to suggest that Jews were inherently urban agents, strongly preferring urban environments. In the literature on the economics of the Jews, manufacturing and commerce typically receive equal attention, commensurate with the similar shares within the Jewish labor force (e.g., Teller 2008). However, manufacturing was a sector in which a large number of non-Jews were employed as well. Over-represented more than three times, Jews did not yet dominate manufacturing, where still more than two-thirds of workers were non-Jews.[20] In contrast, commerce was a field that was entirely dominated by Jews. As only 1.3 percent of the non-Jewish population took part in it, Jews were more than three-quarters of all commerce workers, over 22 times over-represented. In sum, judging by their over-representation relative to the rest of the population, Jews had a strong inclination toward commerce and an overwhelming aversion to agriculture. Manufacturing was a field in which they shared ground and competed with their non-Jewish neighbors.[21]

Going beyond the aggregated occupational sectors, what were the most typically-Jewish occupations? Jews were indeed a nation of tailors and shoemakers. Out of the 65 occupations listed in the census, the most frequent was manufacturing of clothes, with almost 16.6 percent of all workers. Adding to that 2.9 percent that were listed under "textile industry", almost one in five Jewish workers was employed in this branch of manufacturing (for the complete list of occupations and their statistics, see Appendix Table A.1). Textiles was a major manufacturing sector, and quite a few non-Jews were also employed in it. Jews were almost eight times over-represented in clothes manufacturing, but no more than that.

The top-12 occupations in terms of Jewish over-representation are reported in Table 2. The occupation in which Jews were by far best represented was trade in grains. Nine out of ten grain traders were Jews, who were 62.5 times more likely to practice it relative to non-Jews. A distant second was employment as a non-Christian clergyman (39.9 times over-represented). With no more than a slight exaggeration, being a grain trader was more typically-Jewish than being a rabbi. With the exception of a single light manufacturing industry (tobacco), all remaining ten occupations of the top 12 most over-represented by Jews were in commerce, each reflecting over-representation of 20–32 times. Among them was the general category of trade in unspecified agricultural produce, covering 9.74 percent of the Jewish labor force, as well as other branches that were entirely or mostly rural: cattle; furs and leather; and structural material and fuel, which

[20] Over-representation is measured as the ratio of the likelihoods of Jews and non-Jews to be included in a category. Formally, it is $r_{ij} = (N_{ij}/N_j)/(N_{ij-}/N_{j-})$, where N_{ij} and N_{ij-} are the numbers of Jewish and non-Jewish workers in category j, and N_j and N_{j-} are the total numbers of Jewish and non-Jewish workers.

[21] On Jewish commerce in early modern Poland see Hundert (1987). The over-representation in trade and in finance was a feature of Jewish occupational distribution in virtually all European countries that had a significant Jewish population (Kuznets 2011, Section II.2, Table 2).

Table 2: Occupational specialization of Jews: 12 most typically-Jewish occupation

Rank	Occupation	Category	Percent among Jews (1)	Percent among Non-Jews (2)	Share Jews within (3)	Over-rep. of Jews (4)
1	Trading in Grain	Commerce	3.32	0.05	0.90	62.49
2	Clergymen, non-Christian	Prof. Services	0.39	0.01	0.85	39.89
3	Trading in Furs, Leather, etc.	Commerce	0.83	0.03	0.82	32.03
4	Trading in Structural Material and in Fuel	Commerce	1.84	0.06	0.81	29.71
5	Trading in Textile and Clothing	Commerce	2.78	0.10	0.80	27.59
6	Commercial Middlemen	Commerce	1.06	0.04	0.78	24.15
7	Trading in Metal Goods, Machinery, and Arms	Commerce	0.45	0.02	0.77	23.80
8	General Commerce	Commerce	6.36	0.27	0.77	23.72
9	Peddlers and Hucksters	Commerce	1.27	0.06	0.76	22.44
10	Cattle Trading	Commerce	1.09	0.05	0.75	21.00
11	Trading in all other Agricultural Products	Commerce	9.74	0.49	0.74	19.81
12	Tobacco, and Tobacco Manufactures	Manufacturing	0.53	0.03	0.73	19.21

Notes: The table reports statistics over the entire population of (language-defined) Jews and non-Jews within the Pale, including Courland province. It lists the 12 most typically-Jewish occupations out of a total list of 65. Columns 1 and 2 report percentages of occupation indicators within each ethnic group. The percentages are from among the labor force, not the total population (hence, shares sum up to 1). Column 3 reports the share of Jews within each category. Column 4 reports the over-representation of Jews within each category. The ranking is according to the order in columns 3 and 4.
Source: 1897 Russian Census, provincial volumes, Tables XXI and XXII. The categorization to occupation groups and the translated English titles are from Rubinow (1907, pp. 498–499).

covers the timber trade.[22]

The other end of the distribution, the occupations with the proportionately least Jewish representation, features the opposite pattern. Second from the bottom was farming. Although a non-negligible share of the Jewish labor force was working on the land (2.2 percent), this was 26 times less than non-Jews.[23] The only occupation which Jews were relatively less likely to hold than farming was Christian Orthodox clergy, and the gap between the two was not particularly overwhelming.[24] Near the bottom there were two other agricultural occupations (cattle raising and sericulture), as well as two of the main heavy industry sectors (metal smelting and mining). Additionally, among the bottom 12 there were five occupations in the civil service,[25] where Jews were under-represented not least due to official or implicit discrimination.

It is hard to interpret these statistics as anything else but that Jews truly had a uniquely strong advantage in employment in commerce, particularly rural commerce. The cases of the grains and cattle sectors are particularly telling: there was a virtual vertical segregation in the countryside—non-Jews produced, and Jews traded. In fact, in 42 out of the 246 districts of the Pale, each with a population in the range of 60–

[22] Interestingly, within the textiles industry Jews were far more over-represented in trade (27.59) than in production (7.86). For a discussion of particular commercial occupations of Jews in the Pale in light of the 1897 census data, see Rubinow (1907, pp. 553–566), Kahan (1986), and Kuznets (2011, Section III.1).

[23] For a full list of occupations see Appendix Table A.1.

[24] It is unclear how many of the 179 Orthodox clergymen and the 83 non-Orthodox Christian clergymen that reported Yiddish as mother-tongue were actual converts who became priests and how many of them were erroneously printed in the census books.

[25] These were Administration; justice and police; railroad; post, telegraph, and telephone; and municipal and local civil service.

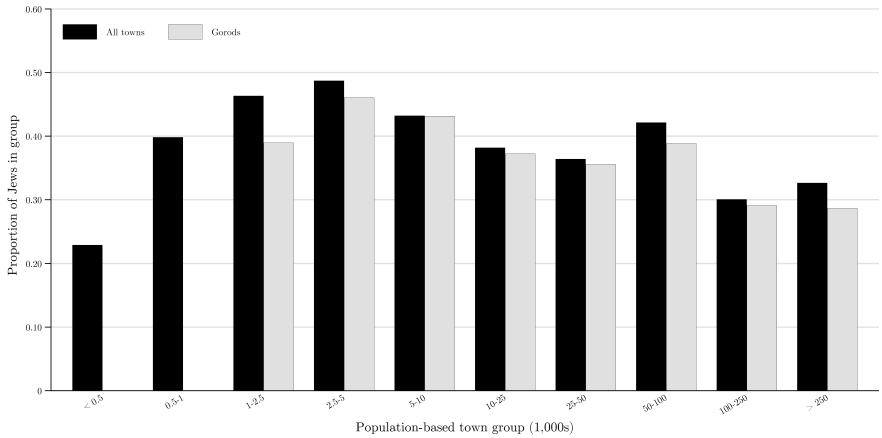


Figure 2: Jewish density by town size-based groups

Notes: Each pair of bars represents a population size-based group of towns within the Pale (population is in thousands). The height of each bar is the proportion of Jews within the group, weighted by population (not by towns). The dark bars pertain to all 1,981 towns within the Pale with a known Jewish community (total population greater than 500, share of Jewish population greater than 10 percent). A small number of towns that do not answer the criteria are also included. The gray bars pertain to all 346 administrative towns (Gorods) within the Pale. Counts of Jewish population are based on religion in the sample of all towns, and on mother tongue in the sample of administrative towns; hence differences within the pairs of bars are due to both the different composition of towns and to the different counting criterion. There was only one Gorod under 1,000, and it is omitted from the figure. The towns with more than 250 thousand inhabitants were Warsaw, Odessa and Lodz.
Sources: 1897 Russian census, localities volume and Provincial volumes, Table XXI.

350 thousand, not a single grain trader spoke a native tongue other than Yiddish![26] Within-ethnic vertical integration is often mentioned as a means for a minority to protect itself from discrimination, and take advantage of within-ethnic networks.[27] But the most Jewish occupations involved constant interaction with the workers of the least Jewish occupations. A perfect vertical division of labor along ethnic lines existed despite this proximity, and despite the alleged advantages in protection from discrimination and vertical networks. Jews and non-Jews were therefore unusually strong complements in the rural economy.

3.3 Jewish population in urban localities

As discussed above, Jews were largely absent in villages. Less than 16 percent of the Jewish population of the Pale lived in localities with fewer than 500 inhabitants, and the true figure must have been lower,[28] compared to at least 38.6 percent of non-Jews. Yet outside the villages, were Jews more likely to dwell in larger urban centers, relative to non-Jews? The answer appears to be no.[29]

In Figure 2, towns within the Pale were grouped to bins by ranges of total population. The black bars

[26] On average, these districts had 94.7 grain traders, all Jewish. In the same districts, there were on average 101 Jewish and 19,568 non-Jewish agricultural workers.

[27] See Kuznets (1956) and Bonacich (1973), and a detailed discussion of the advantages of vertical ethnic integration in the Pale in Kahan (1986, pp. 10–16), referring to fields in which Jews were employed in both production and distribution, such as textiles.

[28] This figure is an upper bound because it is based on the localities data, that as explained above does not count Jewish communities under 10 percent of the town population.

[29] The discussion in this sections follows up on Rowland (1986).

represent the share of Jews among the population of each group of towns. Jews were increasingly represented up to the group of 2,500–5,000 inhabitants, where 48.7 percent of the population were Jews. Beyond this group, however, towns that were larger did not have more Jews in them, quite possibly they had fewer.[30]

One of the traditional explanations for the concentration of Jews in smaller cities is that they were restricted from some of the largest urban centers of the Russian Empire. The two capitals were beyond the Pale, and while they had significant communities of privileged and other semi-legal Jewish residents, the settlement restrictions were severely binding.[31] Another large city, Kiev, was situated within the Pale, but was exempted from it for various historical reasons.[32] The constant attempts to enforce the restrictions on Jewish settlement in Kiev were at least partly successful, such that only 13 percent of the city's quarter-million residents were Jews. The Crimean city of Sevastopol, from which Jews were banned and expelled during the reign of tsar Nikolai I, is another case in point; only 7 percent of the population was native Yiddish speaking. But in almost all other large cities in the Pale where Jewish settlement was unrestricted. Among the remaining six cities above 100 thousand inhabitants, Jews comprised 34.5 percent of the population. Highly over-represented, to be sure, but significantly less so than in towns under 10 thousand.

Since these statistics are based on the localities data, from which localities with Jewish communities under 10 percent of the total population are supposed to be excluded. This surely somewhat biases downward the share of Jewish population within each group. The bias might be stronger among the groups of smaller localities if a greater proportion of them had no Jewish communities, compared to larger towns, thus potentially tilting downwards the trend of Jewish density with respect to town size.[33] To address this concern, the gray bars in Figure 2 represent the share of Jews, this time defined by mother-tongue, only in the Gorods, where data on the size of the Jewish community exists whether or not the Jewish community was greater than 10 percent. As the figure clearly shows, the pattern is almost identical. In Appendix F, I further show that the non-increasing trend in Jewish density relative to the size of the town in localities above 5,000 inhabitants is not due to variation in geographic characteristics or in the dispersion of the Jewish population across districts.

In short, among the population of townsfolk within the Pale, Jews were not more urban than non-Jews,

[30] The coefficient of correlation between the proportion of Jews and the log of total population is -0.157 among towns with more than 2.5 thousand inhabitants. The OLS coefficient is -0.043, significant at 1 percent.

[31] On these communities see Nathans (2002).

[32] On the Jewish community of Kiev see Meir (2010).

[33] The statistics of Jewish density by town size produced by Rowland (1986) were augmented by a list of all 226 localities above 5 thousand inhabitants that had no Jewish community listed in them. This method generated a bias in the other direction: Above 5 thousand, the total population was fully counted, whereas the Jewish population was only partly counted.

in the sense that they were not better represented in larger localities. Since there were few restrictions on mobility across towns of different sizes, the revealed preference indicates that Jews had no particular comparative advantage in more urban settings. As we shall see in section 5, in the US after migration this pattern completely broke down.

4 Results

4.1 Spatial dispersion

I now turn to testing the predictions of the model, starting the prediction that the distribution of Jews was relatively uniform across districts, but not across localities. Plot 3a is a histogram of the districts in the Pale, ordered by Jewish density. Not a single district out of the Pale's 246 had a Jewish majority, or even a Jewish density of over 30 percent.[34] Ninety-five percent of the districts had under 20 percent Jews. This is despite the fact that Jews amounted to more than one ninth of the total population, which would have enabled them to become majority in at least some districts. This was clearly an outcome of the Jewish absence in agriculture. In a pre-industrial economy, agricultural labor would dominate within each given area that is not just an urban center, and Jews could not become a majority without picking up the plow.

Curiously, the distribution in Plot 3a has two distinct peaks, and it appears to be bimodal. The two different shades show that in reality, it merged two different distributions: districts in the former Polish-Lithuanian Commonwealth, and districts in the regions of new or restricted settlement. Former Commonwealth districts were on average much more Jewish-dense (12.5, as opposed to 5.8 percent), with a rather restricted dispersion, a standard deviation of only 4.3 percent. Furthermore, the left tail of the former Commonwealth districts is bounded below at a rate of 3.7 percent.[35] The interpretation of these patterns is that within the regions of old and unrestricted settlement, Jews expanded to fill up the area with a relatively uniform distribution. That they avoided clustering suggests that there were district-level diminishing returns to Jewish labor. Similarly, that there was no Jewish vacuum in regions of old settlement is consistent with the notion that Jews had no close substitutes. If they had, one would expect to see that at least in some districts Jews would be absent and replaced by other groups. The difference in the distributions between the regions of old and new settlement suggests that the migration to the frontier was a protracted process, and in terms of

[34] The outlying district on the right end of the distribution was Bialystok, in Grodno province. An interaction between two facts explains why it was an outlier. First, this district had among the highest shares of urban population, with 36.3 percent of the population living in the city of Bialystok and the remaining smaller three gorods, a figure greater than 95 percent of the districts. Second, Bialystok itself had a rather high proportion of Jews for a town of its size (62 percent).

[35] There are two outlying districts on the right tail of the distribution of the new settlement regions. These are the districts that contain the large cities of Odessa and Kishinev, and the large proportion of Jews reflects the unusually large share of the city population out of the entire district population.

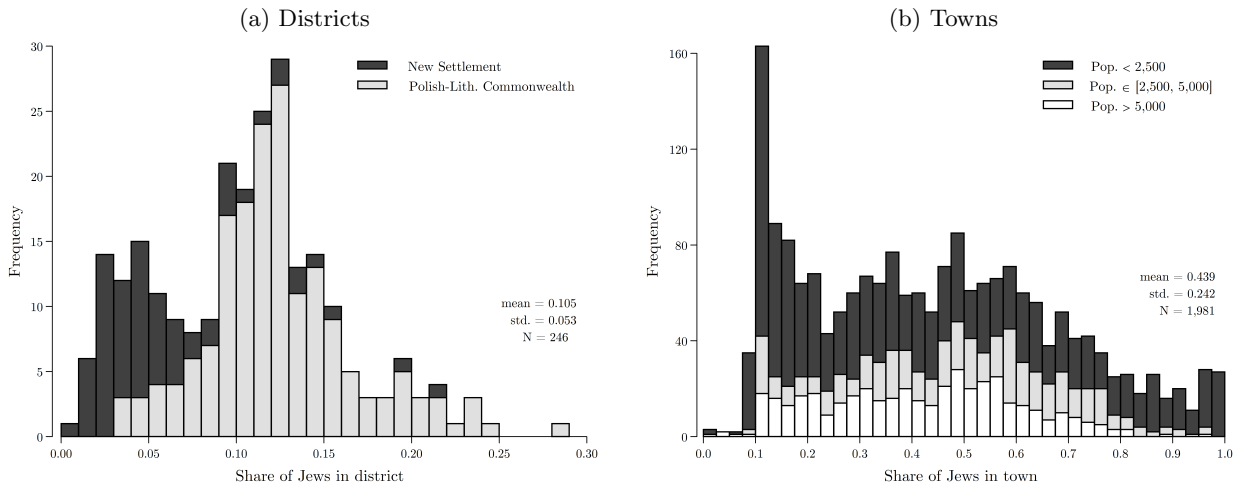


Figure 3: Distribution of Jewish densities

Notes: Part (a) Each observation in the histogram is a district in the Pale of Settlement, including Courland province. The height of the bars represent the frequency of districts within each Jewish density group. The districts of the former Polish-Lithuanian Commonwealth are stacked over the districts of new settlement, such that the height of each bar represents the total count. Districts of new settlement are the 72 districts of the provinces of New Russia (Bessarabia, Kherson, Yekaterinoslav, and Taurida), of Left Bank Ukraine (Chernigov and Poltava), as well as Courland province. Districts of the former Polish-Lithuanian Commonwealth are all 174 remaining Pale districts. Part (b) Each observation in the histogram is a single town. The height of each bar represents the number of localities within each bin. All Pale towns with total population greater than 500 and with share of Jewish population greater than 10 percent are included. A small number of towns that do not answer the criteria are also included. Each bar stacks three town size-based groups of localities. Sources: 1897 Russian census, localities volume, and Provincial volumes, Tables XXI and XXII.

the model, the 1897 snapshot shows a state of partial equilibrium in which the frontier still posed a relative attraction.

Does the town-level distribution of Jewish density look like that of the district level? This does not appear to be the case. Plot 3b shows a histogram of towns in the Pale by Jewish density (recall that the sample is partly left-truncated, as towns with less than 10 percent Jews are not supposed to be included in it). The average locality in this sample had 43.9 percent Jews, and the distribution was very much dispersed, with a standard deviation of 24.2 percent. There were towns where nearly all of the population was Jewish. As can be seen by the lighter parts of the bars, that report separately towns above 2,500 and above 5,000 inhabitants, the right end of the tail is mainly composed of very small localities. But even towns over 5,000 inhabitants were on average 41.6 percent Jewish with a standard deviation of 18.4 percent, and 10 percent of them were over two-thirds Jewish. There seems to have been little ethnic congestion effects at the level of the town. Turning to the left tail, there is no drop in density as the 10 percent cutoff is approached; in fact, quite the contrary. Moreover, the *anti-shtetls* (for lack of a better term), the 226 towns of more than 5,000 inhabitants that were excluded from the data because they did not list a Jewish community, would have surely filled up much of the dent at the left side of the distribution around the range of 0-10 percent,

had they been included. In sharp contrast to the district-level distribution of Jewish density, anti-shtetls existed alongside towns that were almost entirely Jewish.

While the district-level distribution of Jewish density had a clear and narrow bell shape with a peak around an "equilibrium" level of 10-15 percent (for towns of the former Polish-Lithuanian Commonwealth), one would be hard pressed to find a similar peak at the town level. If there were meaningful congestion effects under a rate of 70 percent or, conversely, a shortage of Jewish labor at the lower end of the distribution, this histogram would look different. This is consistent with the assumption that the labor market in which congestion occurred was not at the town level, but in the wider district. Jews dwelling in towns provided services to the surrounding environment, and competed not only with each other but also with other Jews living in different localities, and therefore the proportion of Jews in the town itself was not a good indicator to the degree of Jewish congestion in the labor market. What mattered was the Jewish density in the environment as a whole, which is better captured at the district level.

4.2 Commerce labor in the absence of Jews

If Jews had a comparative advantage in commerce, one of the predictions of the model is that a lower share of Jews at the district will be correlated with a lower share of commerce workers overall. Another prediction is that when Jews are present, non-Jews will be crowded out of this sector. Despite the obvious differences between the two regions, it is useful, first, to compare the share of commerce workers between the Pale and Inner Russia. If any of the predictions of the model apply, they should be particularly visible when comparing the Pale as a whole with the region from which Jews were banned. Furthermore, it could be that the specialization of Jews and the absence of non-Jews in commerce was partly based on a division of labor that was established during a long historical interaction between Jews and other groups, and that in regions that did not have a history of Jewish presence non-Jews would have had enough time to develop skills in this niche.

The histograms on Figure 4 report the distribution of the share of commerce workers at the district level, within the Pale and beyond it in Inner Russia. Panel 4a shows the distribution out of the total labor force. Clearly, the Pale was much more provided by commerce workers; their share of the labor force was on average almost double than in Inner Russia (4.27 and 2.25 percent), nearly one and a half standard deviations more. The bottom percentile of the distribution in the Pale was equal to the median beyond it (1.92 and 1.97 percent). In rural trade specifically, the differences were even starker: on average there were more than twice as many rural commerce workers in the Pale (or more than two standard deviations); and in grain trade two

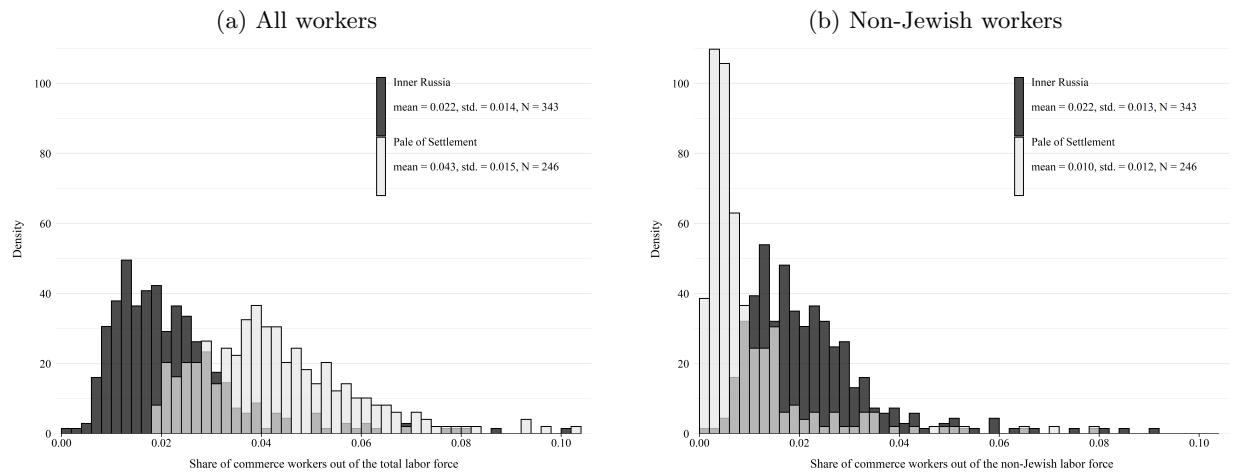


Figure 4: Commerce within and beyond the Pale

Notes: The plots represent the distribution of the share of commerce workers in the district out of the entire labor force (a) and out of the non-Jewish labor force (b). The dark bars in each plot are the districts of Inner Russia, and the light bars are the districts of the Pale, including Courland province. The horizontal axis represents the share of commerce workers. The vertical axis represents the density within each bin relative to the number of districts in the respective region (e.g., the areas of the dark bars in each of the plots sum to one). Sources: 1897 Russian census, Provincial volumes, Tables XXI and XXII.

and a half times more.[36]

Of course, part of this difference could be ascribed to geographic, institutional, cultural, or other causes. Could it be that the Pale was a region more conducive to commercial activities, and that this caused all workers to be more likely to become employed in this sector? However, non-Jews were far less likely to be employed in commerce within the Pale, such that the difference between the Pale and Inner Russia is entirely explained by the presence of Jews, at least in accounting terms. This can be seen in plot 4b, which has the distributions of commerce workers within and beyond the Pale, among the non-Jewish labor force. This is a mirror image of plot 4a: In the average district, the probability of a non-Jew to be employed in commerce within the Pale was less than half as much as in Inner Russia (1.00 and 2.21 percent). The bottom percentile in Inner Russia was roughly equal to the median in the Pale (0.57 and 0.59 percent). Again, in rural trade the gaps were even greater. For example, in the median Pale district, the share of non-Jews in grain trade was ten times less than in Inner Russia (0.01 and 0.11 percent; see Appendix Figure B.2). Notwithstanding differences in the economic fundamentals of the two regions, it is clear that the Pale was much more commercial, that this was entirely accounted for by the presence of Jews, and there is little doubt that Jews crowded out some potential non-Jewish would-be commerce workers.[37] It is beyond the scope to

[36] Rural trade is trade in the following categories: cattle, grain, structural material and fuel, and all other agricultural products. See Appendix Figure B.2 for histograms and statistics on rural trade and grain trade.

[37] Contemporary observers noted that beyond the Pale the prices and the profits from commerce were indeed higher: "It has been acknowledged by many investigators that the average profit of the Jews on the purchase of grain and like products is much smaller than the profit of the Russian middleman in the interior of Russia in similar transactions, and that the

provide conclusive evidence that these differences are simply a result of a large causal effect. However, a powerful lesson still stands: not only the patterns are consistent with the model, but also alternative causes should have an unusually large effect to risk the conclusion that Jews substantially increased commercial activity and crowded other groups out.

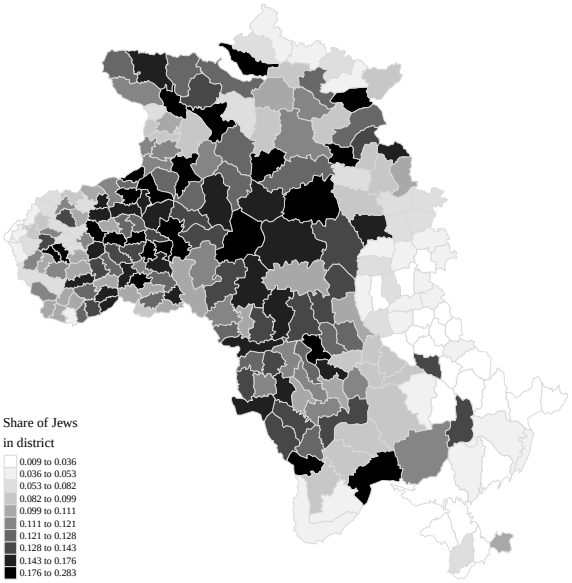
4.3 District-level congestion

Turning the focus to variations within the Pale, Figure 5 shows maps with the spatial district-level distribution of the four variables of interest. All else being equal, the model predicts that the share of Jews in the district (5a) would be positively correlated with the share of commerce workers out of all workers in the district (5b); negatively correlated with the share of commerce workers among Jews (5c); and negatively correlated with the share of commerce workers among non-Jews (5d). Superficially, it appears that there was indeed a positive correlation between Jewish density and the share of commerce workers overall (the upper two maps), and that similarly there were negative correlations between Jewish density and the share of commerce workers within each of the two groups (the bottom two maps).[38] The correlations could be seen clearly in the scatter plots in Figure 6. In particular, the first two coefficients of correlation, between Jewish density and the share of commerce workers are very large: 0.576 for commerce in the total labor force, and -0.555 for commerce in the Jewish labor force. It is weaker, though still substantial, for the non-Jewish labor force (-0.241), where the rates are very close to zero through much of the support, yet there is a noticeable unexpected rise at the top decile. In sum, the correlation are almost exactly those that the model would predict.

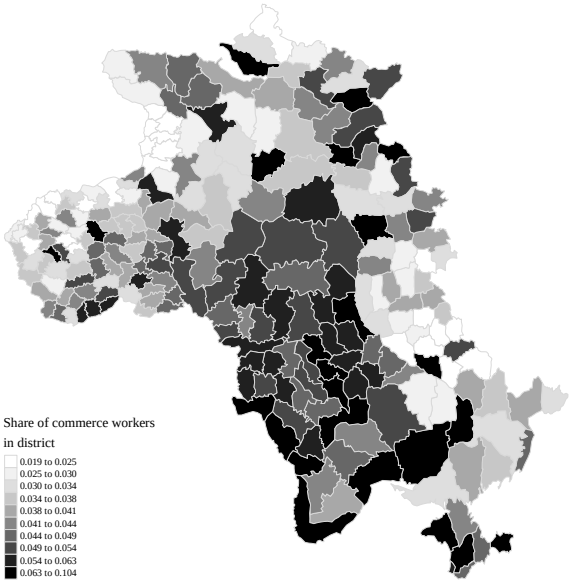
However, it is also clear from the maps in Figure 5 that in part, the correlations were cross regional, and it is harder to see whether they applied within regions as well. This raises the obvious suspicion that they could be better explained by local fundamentals rather than by a causal effect of Jewish density. Since a plausible instrumental variable is unlikely in this context, the approach I take is to control as much as possible for observed characteristics, and document that the correlations are not qualitatively changed by this. Table 3 reports district-level OLS regressions in which the dependent variable is the share of employment in commerce; in Panel A., this share is out of the entire labor force (both Jews and non-Jews), and in Panels B. and C., it is out of the Jewish and out of the non-Jewish labor force. Column 1, is a simple univariate regression, corresponding to the plots in Figure 6. The interpretation of the coefficient in Panel A. (0.168) is

general level of prices on manufactured articles in the cities of the Pale is much lower than in the Russian towns." (Rubinow 1907, p. 560).

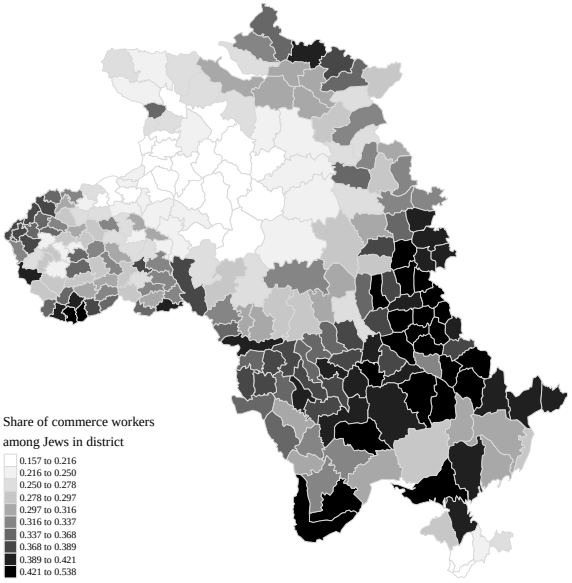
[38] For example, Left-Bank Ukraine at the southeast and New Russia at the South had a low share of Jews; parts of it had low share of commerce workers; and in most of it both Jews and non-Jews were more likely to be in commerce.On the other hand, the districts of current-day Belarus (north of the Pale's center) had the highest Jewish density, a high rate of commerce labor, and the lowest rate of commerce labor within each group.



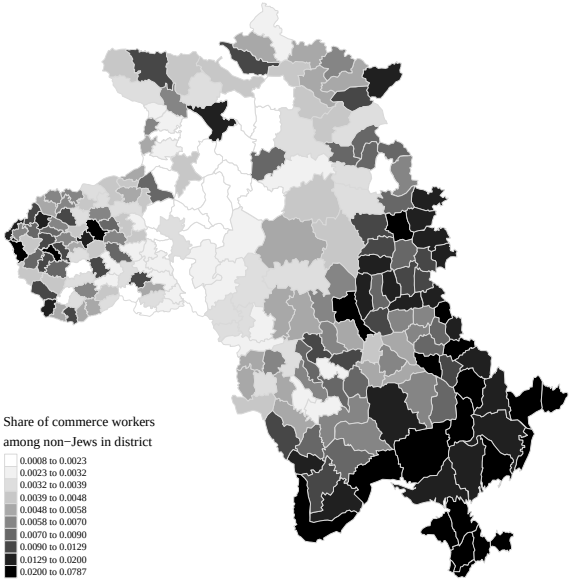
(a) Share of Jews in population



(b) Share of commerce workers in total labor force



(c) Share of commerce workers in Jewish labor force

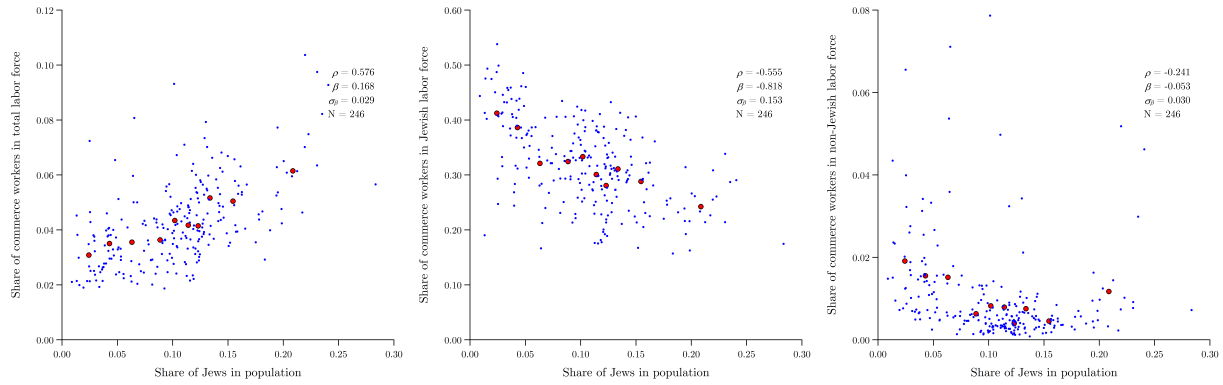


(d) Share of commerce workers in non-Jewish labor force

Figure 5: Spatial distribution of Jews and commerce workers in the Pale of Settlement

Notes: These district-level maps of the Pale of Settlement represent the share of Jews out of the total population (a), and the share of commerce workers out of the labor force of the different groups (panels b-d). Jews are subjects whose mother tongue is Yiddish. Occupations are included in the commerce sector according to the classification in Appendix Table A.1. Each shade represents a decile of the respective measure of each sub-figure. Courland province is not included in this map, for technical reasons. Sources: 1897 Russian census, Provincial volumes, Tables XXI and XXII.

that an increase of one standard deviation in Jewish density (5.26 percentage points) is associated with an increase of 0.88 percentage points in the share of commerce, relative to an average base level of 4.27 percent.



(a) Total labor force (b) Jewish labor force (c) Non-Jewish labor force

Figure 6: Commerce and Jews: Correlations

Notes: These district-level scatter plots present the correlation between the share of Jews out of the total population and the share of commerce workers out of the labor force (a), out of the Jewish labor force (b), and out of the non-Jewish labor force (c), in the Pale of Settlement (including Courland). Jews are subjects whose mother tongue is Yiddish. Occupations are included in the commerce sector according to the classification in Appendix Table A.1. The large markers represent the means of the deciles of Jewish density. The statistics are the coefficients of correlation, the coefficients from univariate OLS regressions of the share of commerce workers on Jewish density, and the standard errors clustered by province. Sources: 1897 Russian census, Provincial volumes, Tables XXI and XXII.

Column 2 adds geographic controls,[39], as well as the rate of literacy, which following Botticini and Eckstein (2012) is likely to be correlated positively with commerce (as indeed it is). The coefficient of Jewish density increases, and then further increases as regional and then provincial fixed effects are introduced in columns 3 and 4. In the baseline regression in column 4, the coefficient is 0.262 (throughout the estimates are strongly statistically significant, with standard errors clustered by province). Thus, a one-standard deviation increase in the share of Jews (5.26 percent), is associated with a 1.38 percentage points increase in commerce, almost one third of the average rate.

Was the contribution of Jews to the commercial labor force a simple outcome of their absence in agriculture, in the sense that they raised the share of labor in all non-agricultural sectors equally relative to agriculture? Or was commerce more reactive to their presence or absence relative to other non-agricultural sectors? To test this, I follow Simon Kuznets's approach by restricting the view to the non-agricultural labor force.[40] Columns 5–8 explores this option by repeating the same regressions in columns 1–4, while excluding the agricultural labor force. Technically, both the share of Jews and the share of commerce workers is out of all workers outside of agricultural.[41] The results are identical to the first four columns: Jews were associated

39 Geographic controls are indicators for proximity to the sea and to a large river (at least one town less than 10 km. away), and region-specific elevation, longitude, and latitude.

40 This is following Kuznets (2011, Section II.3, Table 3) who conducted a test of cross-country correlations between the share of Jews *within the non-agricultural labor force* and the proportion of Jews employed in various sectors. Similarly, elsewhere Kuznets (1975, pp. 76–77) argued that the correct variable indicating Jewish congestion was not the share of Jews among the total population, but among the urban population.

41 I.e., the share of Jews is defined as the share of Jews within the non-agricultural labor force, and the share of commerce workers is the number of commerce workers divided by the number of non-agricultural workers.

with a massive increase in commerce labor also relative to manufacturing and the other non-agricultural sectors.[42]

Panel B. reports similar regressions where the dependent variable is the share of employment in commerce among Jews alone. They are meant to assess the within-ethnic congestion effects: Do Jews crowd each other out of commerce? As in Figure 6b, the univariate regression in column 1 shows a remarkably strong and statistically significant correlation. When the share of Jews in the district is 1 percentage point greater, the share of employment of Jews in commerce *decreases* by 0.818 percentage points, relative to an average of 32.0 percent. The coefficient is somewhat attenuated as literacy and geographic controls are added, but even with provincial fixed effects, it is still −0.586. To illustrate the implication of the coefficients in column 4, consider an average district in which 10.51 percent of the population is Jewish, and 4.27 percent of the workers and 32.03 percent of the Jewish workers are in commerce. A one-standard deviation increase in Jewish density is associated with a reduction in the share of commerce workers among Jews by almost ten percent (3.08 percentage points). Another way to assess the within-ethnic congestion, is to consider the effects of the marginal incoming Jew: An inflow of one Jewish worker, in an average district, would add only 0.259 Jewish commerce workers, compared with a Jewish commerce share of 0.320.[43] In columns 5–8, the non-agricultural labor force is excluded. The coefficients appear to be much smaller, but this is a purely mechanical outcome of the redefinition of the dependent and the independent variables.[44] Repeating the same exercise as above based on column 8, an additional Jewish non-agricultural worker raises the number of Jews in commerce by 0.288 workers,[45] relative to an average of 0.330, which is almost identical to the outcome based on column 4.

Is there strong cross-district evidence that Jews crowded out non-Jews from commerce, as appears to be the case from the comparison between the Pale and Inner Russia in Section 4.2? The patterns in Panel C. on the correlations between Jewish density and non-Jewish commerce are more nuanced. As in Figure 6c, the raw correlation (column 1) is in line with the prediction of the model, with weak statistical significance. However, adding controls reverses the sign, and in the benchmark specification (column 4), the statistically significant coefficient of 0.048 implies that a one-standard deviation increase in Jewish density raises the

[42] Notice that the effect could come from two different channels: Jews crowding out non-Jews from commerce to other non-agricultural sectors; or Jews crowding out non-commerce and non-agriculture workers into agriculture, such that they are not counted in the denominator.

[43] Let P^J be the share of Jews in the district, P_c^J be the share of commerce among Jewish worker, and $\beta = \partial P_c^J / \partial P^J$ be the estimated coefficient of the effect of Jewish density on the share of Jews in commerce among Jews. Then the number of Jewish commerce workers added when the number of Jewish workers increases by 1 is $\beta P^J + P_c^J$. Plugging the district averages, this is $-0.586 \cdot 0.105 + 0.320 = 0.259$.

[44] Taking shares relative to the non-agricultural labor force, rather than the total population and the total labor force, multiplies the measure of the share of Jews in the labor force by 2.5, but hardly affects the share of commerce within the Jewish labor force, since only a small fraction was in agriculture. Note that in Panel A., this is not the case since the group of interest is both Jews and non-Jews, and both variables are inflated by similar proportions.

[45] This is $-0.157 \cdot 0.266 + 0.330 = 0.288$.

Table 3: Commerce and Jews: District-level regressions

	Out of entire labor force				Out of non-agr. labor force			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. *All workers*	mean = 0.043, std. = 0.015				mean = 0.105, std. = 0.035			
Jews	0.168^a	0.231^a	0.249^a	0.262^a	0.184^a	0.227^a	0.258^a	0.274^a
	(0.029)	(0.019)	(0.019)	(0.020)	(0.034)	(0.025)	(0.016)	(0.018)
Literacy		0.036^a	0.027^a	0.020^c		0.005	0.003	−0.028
		(0.010)	(0.009)	(0.011)		(0.026)	(0.019)	(0.025)
Constant	0.025	0.094			0.056	−0.010		
	(0.004)	(0.053)			(0.009)	(0.089)		
R-squared	0.332	0.767	0.808	0.832	0.420	0.773	0.829	0.871
P-val. (F)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
B. *Jewish workers*	mean = 0.320, std. = 0.078				mean = 0.330, std. = 0.078			
Jews	-0.818^a	-0.695^a	-0.630^a	-0.586^a	-0.193^b	-0.227^a	-0.186^a	-0.157^c
	(0.153)	(0.086)	(0.078)	(0.110)	(0.093)	(0.070)	(0.063)	(0.085)
Literacy		−0.060	0.057	0.041		−0.102	0.027	−0.047
		(0.077)	(0.042)	(0.063)		(0.086)	(0.077)	(0.083)
Constant	0.406	0.212			0.381	−0.065		
	(0.020)	(0.400)			(0.028)	(0.421)		
R-squared	0.308	0.638	0.737	0.773	0.095	0.547	0.654	0.718
P-val. (F)	0.000	0.000	0.000	0.000	0.047	0.000	0.000	0.000
C. *Non-Jewish workers*	mean = 0.010, std. = 0.012				mean = 0.026, std. = 0.020			
Jews	-0.053^c	0.028^b	0.041^a	0.048^b	-0.079^a	−0.013	0.000	0.006
	(0.030)	(0.012)	(0.013)	(0.018)	(0.025)	(0.012)	(0.010)	(0.013)
Literacy		0.054^a	0.041^a	0.040^b		0.050^a	0.043^a	0.033^c
		(0.014)	(0.011)	(0.017)		(0.011)	(0.012)	(0.017)
Constant	0.016	0.054			0.047	0.004		
	(0.004)	(0.059)			(0.009)	(0.063)		
R-squared	0.058	0.698	0.766	0.782	0.231	0.732	0.757	0.781
P-val. (F)	0.095	0.000	0.000	0.000	0.004	0.000	0.000	0.000
Geog. controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Fixed-effects			Reg.	Prov.			Reg.	Prov.
Observations	246	246	246	246	246	246	246	246

Notes: The table reports regressions of the share of commerce workers on the share of Jews. The dependent variables in columns 1-4 are the share of commerce workers within the group (all ethnicities/Jews/non-Jews), defined as the total number of workers in the group in commercial occupations, divided by the total number of workers in the group. In columns 5–8, the share of commerce workers is relative to the size of the non-agricultural labor force. In columns 1–4 *Jews* is the share of (mother tongue) Jews within the district, and in columns 5-8 it is the share of Jewish workers out of the non-agricultural labor force. Each observation is a district within the Pale, including Courland Province. *Literacy* is the rate of total literacy (Russian, non-Russian, and above-elementray), for all ages and genders, within each group. Geographic controls are indicators for proximity to the sea and to a large river, and region-specific elevation, longitude, and latitude. Standard errors, in parentheses, are clustered by province. Significance: $^a : p < 0.01$; $^b : p < 0.05$; $^c : p < 0.1$. Source: 1897 Russian Census, provincial volumes, Tables XV, XXI and XXII.

share of non-Jewish workers in commerce by 0.25 percent, equivalent to 0.22 standard deviations. When focusing on the non-agricultural labor force (columns 5–8), the coefficients of the controlled regressions are economically and statistically zero. The straight forward interpretation is that the prediction of the model fails at this point, simply because Jews were more attracted to districts that were more conducive to non-agricultural activity (though not necessarily to commercial activity per se). Nevertheless, it is important to remember that the rates of non-Jewish commerce labor were extremely low in the Pale, even relative to Inner Russia (Figure 4b). For example, the median number of non-Jewish grain traders in a district was 4, compared with 99 Jews.[46] A more favorable interpretation, consistent with the evidence in Section 4.2, is that at these rock-bottom levels almost all non-Jewish workers likely to compete with Jews in commerce were already ousted from the market, leaving only unrepresentative few in small sub-niches in which Jews posed lesser competition. In other words, the adverse effects of Jews on non-Jewish commerce workers were quickly exhausted when only a small number of Jews were present, and are not discernible across the support of actual Jewish density in the Pale.

4.4 Town-level congestion

What was the scope of the labor market in which Jews competed? Were there town-level congestion effects, or did they exist only at the level of the district? If there was town-level correlation between the share of Jews and the share of Jewish commerce, that would be consistent with a model in which the scope of the market for commerce workers was the locality. On the other hand, if within districts there was no systematic correlation between Jewish density and Jewish commerce, that would be consistent with the view of the proposed model, that Jewish commerce workers served a wider area beyond the locality itself, and Jews living anywhere in this area were substitutes competing over the same positions.

Table 4 repeats the previous exercise (in Panel B., Table 3), using the data on the occupational distribution in the gorods, by regressing the share of commerce workers among Jews on the share of Jews in the population of the town, not the district. The coefficient of the uncontrolled regression (column 1) is indeed negative (-0.113), but an order of magnitude lower than in the district-level regression in Table 3. Column 2 adds control for the share of Jews in the district. In this horse race, the district-level measure of Jewish density clearly trumps: its coefficient is 12 times greater and highly significant (-0.489) than the town-level measure, which is insignificant and close to zero. Adding controls for town size, geographic charachteristics, and regional and provincial fixed effects (columns 2–5) completely eliminates the coefficient on the town-level Jewish density. The district-level coefficient remains negative but is weakened and becomes statistically

[46] See Appendix Figure B.2d.

insignificant.[47] In column 6, I take advantage of the 171 gorods in the 71 districts that had more than one gorod, and control for district-fixed effects. The coefficient on town-level Jewish density remains practically zero.[48]

In sum, in sharp contrast to the finding on the district level, within districts the share of Jews in the town did not matter for their propensity to be employed in commerce. This is a strong indication that there were no town-level within-ethnic congestion effects. Even when the share of Jews in the town was very high, often reaching a majority, they did not crowd each other out of commerce, because they were providing services to the larger area. The shtetls may have been the arenas where Jewish economic activity took place, but as a labor market it was part of the rural economy, not an independent enclave.

Table 4: Commerce and Jews: Town-level regressions

	Jewish workers in commerce (mean = 0.295, std. = 0.078)					
	(1)	(2)	(3)	(4)	(5)	(6)
Jews in town	-0.113^{c}	-0.042	0.012	0.002	0.007	-0.014
	(0.060)	(0.068)	(0.035)	(0.034)	(0.037)	(0.107)
Jews in district		-0.489^{a}	-0.234^{b}	-0.193^{c}	-0.120	
		(0.156)	(0.111)	(0.109)	(0.108)	
Town population (log.)			-0.014^{a}	-0.016^{a}	-0.016^{a}	-0.013
			(0.004)	(0.004)	(0.004)	(0.010)
Constant	0.341	0.366				
	(0.031)	(0.031)				
Geog. controls	No	No	Yes	Yes	Yes	Yes
Fixed-effects				Reg.	Prov.	Dist.
R-squared	0.074	0.161	0.556	0.591	0.647	0.888
P-val. (F)	0.070	0.003	0.000	0.000	0.000	0.000
Observations	346	346	346	346	346	346

Notes: Each observation is a gorod within the Pale, including Courland Province. The dependent variable is the share of Jewish commerce workers out of the Jewish labor force. The expalantory variables of interest are the share of Jews out of the population of the town and of the district. Jews are defined by mother tongue (Yiddish). Geographic controls are indicators for proximity to the sea and to a large river (< 10 km.), and region-specific elevation, longitude, and latitude. Standard errors, in parentheses, are clustered by province. Significance: $^{a}: p < 0.01$; $^{b}: p < 0.05$; $^{c}: p < 0.1$. Source: 1897 Russian Census, provincial volumes, Tables XXI and XXII.

4.5 Town size, occupational composition, and literacy

The model does not make a prediction regarding the correlation between the size of the town and its occupational composition. But if towns were a separate economic sphere for the Jews, one would expect to see a shift in the occupational composition in larger urban settings. This could go in either direction: a greater emphasis on commerce, in the spirit of Botticini and Eckstein (2012), or perhaps a larger share

[47] That it is weaker than in column 4 of Table 3 suggests that the allocation of commerce workers between gorods and other towns and villages was not random, and may have dependent on local characteristics.

[48] The outcomes remain the same when restricting the measures to the non-agricultural labor force; see Appendix Table A.2.

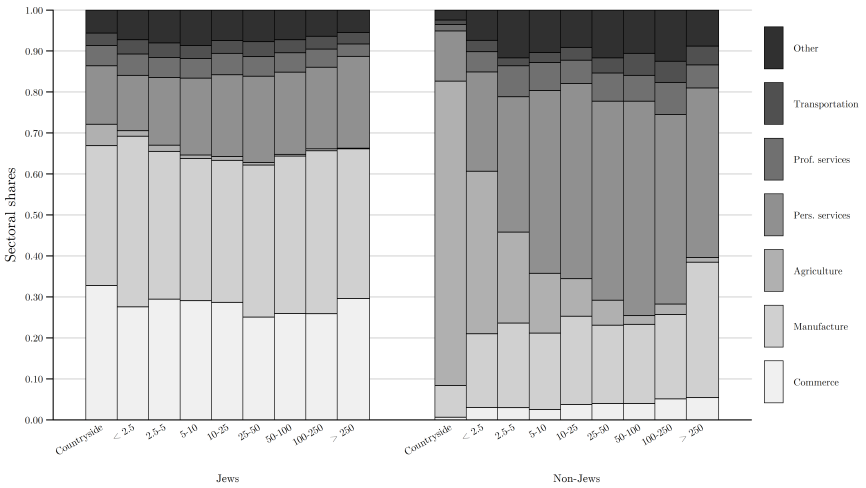


Figure 7: Sectoral composition by town size

Notes: Each column of stacked bars represents the sectoral distribution of the labor force within the Pale in a size-based bin of gorods separately for the two group, Jews and non-Jews. The ranges of total population size are in thousands. Each shade represents an occupationl sector (see Table A.1 for details). Source: 1897 Russian census, Provincial volumes, Table XXII.

of manufacturing and industrial workers.[49] Is there any evidence that the occupational composition in the urban centers was any different?

Judging by the coefficient of log.-town population in Table 4, there were fewer Jewish commerce workers in larger towns, but the difference was small.[50] Figure 7 illustrates this with greater detail. On the left-hand side, the occupational distribution of Jews is plotted by town-size bins. The share of commerce was significantly *higher* outside the gorods, 32.8 percent compared with 29.1 and 27.3 percent in gorods under and above 10 thousand. On the other hand, the share of personal services was rising, from 14.3 to 18.1 and 20.7 percent in those places.[51] Otherwise, there was no dominant trend across town size, and on average the occupational distribution of Jews was almost independent of it. This is in contrast to the non-Jewish patterns, on the right-hand side. As the town grew larger, fewer non-Jewish workers were found in agriculture, and more in other sectors, primarily manufacturing and personal services.[52] Moreover, in the largest cities the share of non-Jewish manufacturing workers was much higher.[53]

This sheds a new light on the pattern of stability, or mild decline, in the share of Jews relative to town size. Since the share of non-Jewish agricultural workers was substantial in small towns, the share of Jews out of

[49] Naturally, it could be that the two effects exist, but offset each other.

[50] Taking the the coefficient in column 5 (−0.0157) as a benchmark, doubling the city size reduces the prediction of the share of Jews in commerce by 1.09 percent.

[51] See statistics in Appendix Tables A.3 and A.4.

[52] That the change in the composition of the non-Jewish labor force was driven by the transition out of agriculture, and not by a change in the relative shares of the other sectors, can be seen in Appendix Figure B.3: excluding the agricultural sector, the shares in the remaining sectors were mostly stable.

[53] In cities above 250 thousand, this share was 33 percent, compared with 18–21.5 percent in all other bins other than the countryside.

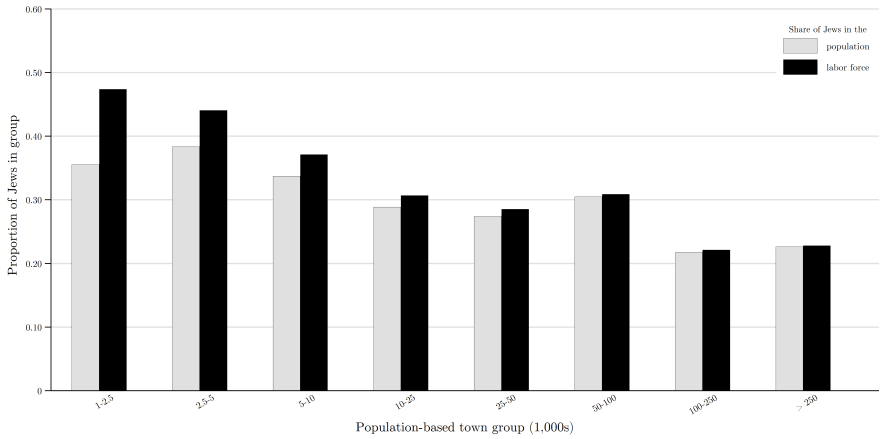


Figure 8: Share of Jews in total and in non-agricultural labor force, by town size

Notes: Each group of bars represents a population size-based group of gorods within the Pale (population is in thousands). The height of each bar is the proportion of Jews within the group (total labor force and non-agricultural labor force), weighted by individuals (not by towns). Counts of Jewish population are based on mother tongue. There was only one Gorod under 1,000, and it is omitted from the figure. The towns with more than 250 thousand inhabitants were Warsaw, Odessa and Lodz.
Sources: 1897 Russian census, provincial volumes, Tables XXI-XXII.

the non-agricultural labor force was in fact much higher there relative to larger localities. The outcome can be seen in Figure 8, where the light and the black bars represent the shares of Jews in the total labor force and in the non-agricultural labor force. There was an almost monotonous decline in the share of Jews in the non-agricultural labor force, such that in towns above 100 thousand it was *half* its rate in towns below 5 thousand (22–23 percent vs. 44–47 percent). This meant that Jews were not alone in their niche in large cities; in towns under 10 thousand, Jews were around 85 percent of commerce workers, as opposed to roughly 60 percent in towns above 100 thousand (see Appendix Table A.4).

Another way to see the greater importance of Jewish commerce workers in small localities is to compare the share of commerce workers between the Pale and Inner Russia by town size. Figure 9 plots the ethnic composition of commerce employment within population-based bins of towns within and beyond the Pale. It shows where precisely Jewish commerce workers were "missing": In the big cities of Inner Russia, the gap in commerce between the two regions was small, meaning that non-Jews substituted more easily for the absence of Jews. In the countryside and in towns under 5 thousand, the absence of Jews came with a significantly reduced share of commerce workers.[54]

More related evidence comes from the data on literacy. According to Botticini and Eckstein (2012), from Late Antiquity to the Late Middle Ages the exogenously high rate of literacy among Jews attached them to cities and employment in commerce. Contrary to popular belief, Jewish literacy in 1897 was far from

[54] Recall that the countryside category included the vast majority of the population, and that it included small towns that were not gorods.

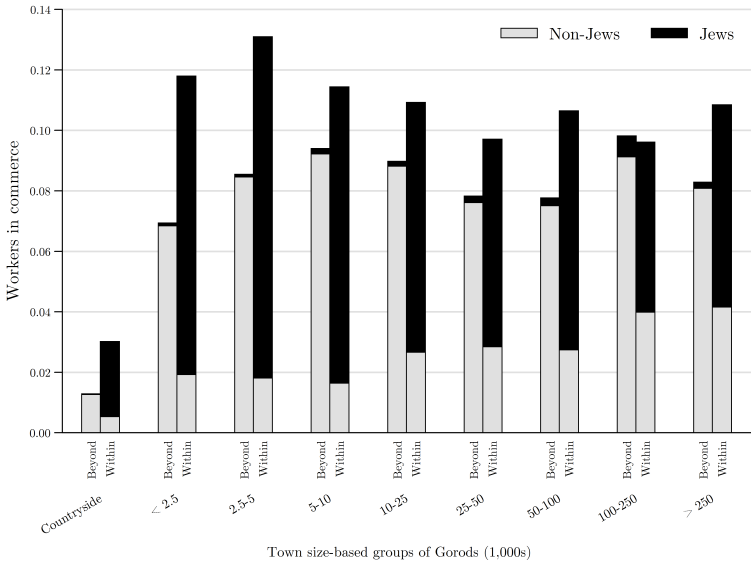


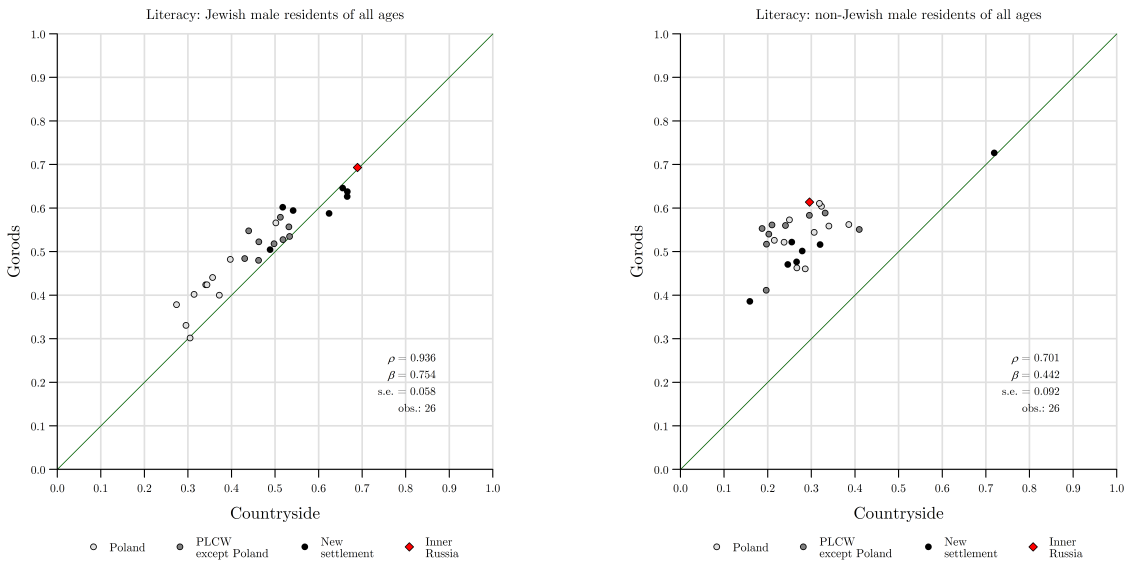
Figure 9: Ethnic composition of commerce workers by town size, within and beyond the Pale

Notes: Each bar represents a group of Gorods either within or beyond the Pale, grouped by the total population of the town (in thousands). The height of each bar represents the share of commerce workers out of all workers in the Gorods of each group. The different shades within each bar represent the share of the commerce workers belonging to each of the two ethnic groups: Jews and non-Jews. The Pale includes Courland province. Countryside captures all the population dwelling outside Gorods; some countryside residents may live in populated towns that are not Gorods. Sources: 1897 Russian census, localities volume, and Provincial volumes, Tables XXI and XXII.

universal even among adult males, and though many of them were commerce workers women were generally illiterate.[55] If literate workers were more attracted to commerce and larger cities, one might expect to see an urban literacy premium, both for Jews and non-Jews. The coefficients on literacy in Panel B. of Table 3, seen above, do not show a consistent positive and significant relation between Jewish literacy and commerce at the district level.

Unfortunately, the census does not provide locality- or gorod-level data on literacy, but it does have aggregate province-level tabulations for the gorods and for the countryside separately. For the Jewish population this effectively enables a rough comparison of literacy in the larger towns with literacy in the smaller towns. The basic pattern are presented in Figure 10a. Each bullet represents a single province in the Pale, and the diamond-shaped marker stands for all Inner Russia put together. The vertical and horizontal axes stand for literacy of Jewish males of all ages in the gorods and in the countryside. Jewish literacy in the gorods was on

[55] Several generations of demographers, starting with the first scholars that analyzed the Jewish data soon after the census was published (Lestschinsky 1906; Brutskus 1909; Shabad 1908), tended to discard the Jewish literacy data and deem them unreliable. More recent critique, based on a wide range of sources, pointed out that although complete illiteracy among adult Jewish males was not unheard of, it was nevertheless rare (Stampfer 1987; Corrsin 1999). It is clear that basic Jewish literacy, a condition in which Jews were able to read the *siddur* (the standard book of prayers), but their reading and writing capacity hardly went beyond that, was discounted and perceived as illiteracy either by the census takers or by Jews themselves. If so, Jewish literacy was measured using a higher threshold, and since the criteria were vague there must have been some noise caused by inconsistencies. However, this does not mean that the literacy data are uninformative, particularly when comparing within Jewish populations. Perlmann (1996) showed that figures in the 1897 census were in line with the figures from the 1926 Soviet census when comparing within birth cohorts, and concluded that the 1897 literacy data reflected a reality and should not be dismissed.



(a) Jews (b) Non-Jews

Figure 10: Male literacy, gorods vs. countryside

Notes: The plots report the rates of Jewish and non-Jewish male literacy in the gorods and in the countryside. The measures include all age groups, counting together literacy in Russian, literacy in another language, and higher education. Each bullet represents a province within the Pale (including Courland). The red marker representing all remaining provinces of European Russia. The vertical axis represents the rate of literacy in all the gorods. The horizontal axis represents the rate of literacy in the remaining localities of the province, which may include sizable towns. The provinces of the Pale are separately represented in three groups: Congress Poland, former Polish-Lithuanian Commonwealth except Poland, and provinces of new settlement (including New Russia, Left Bank Ukraine, and Courland). The line is the 45-degrees diagonal. Source: 1897 Russian census, Provincial volumes, Table XV.

average 4.5 percent higher than in the countryside, much less than the equivalent non-Jewish gorod premium of 24 percent (Figure 10b).[56] However, the most striking feature of this plot is that the variation in literacy rates was almost entirely across provinces, while the gorod-countryside gaps were secondary.[57] Moreover, there was a clear regional ordering of literacy rates: Inner Russia and the provinces of new settlement clearly dominated those of old settlement, with the Polish provinces mostly clustered at the bottom. This suggests again that within regions and provinces, Jews tended to distribute rather evenly across urban and non-urban localities.[58]

In sum, Jews looked very much the same wherever they lived, in terms of their literacy and occupational distribution; if anything, they were more prone to commerce in the countryside, where commerce labor was scarce. On the other hand, non-Jews were much more likely to be literate in towns, and their propensity for non-agricultural pursuits was rising with town size. Together with the stable or gradually declining share of

[56] Restricting the literacy measures to adult males only, or to any specific age group, shifts the distribution but it does not changes the conclusion.

[57] The coefficient of correlation between gorod literacy and countryside literacy was 0.936 (compared with 0.701 for non-Jews).

[58] The reasons for the old settlement-new settlement gap is beyond the scope here, but one possible explanation is that the new settlement premium reflected the attraction that the Jewless and under-commerced frontier posed particularly to the educated and capable Jews.

Jewish population with respect to town size, this meant that relative to other townsfolk, Jews specialized in small rural towns, in which they had fewer close substitutes, and not in large urban clusters.

5 Jews in the United States

5.1 How would Jews settle?

By 1920, around one third of the Pale's Jewish population had immigrated to the US, where the standards of living were immeasurably better than in the Pale.[59] The question is, did Jews continue to follow the rural service minority model in their new country?

As is well known, and as will be demonstrated in detail below, Jews immediately became a metropolitan minority in the US, and they remained so ever since. The economic history of American Jewry is a neglected field of study (Katzenelson 2012), but by and large, the American patterns of Jewish settlement were almost taken for granted by scholars of American Jewry. Explanations would run along the following lines: Jews had lived in urban centers in the Pale, therefore they were urban types with preferences for cities, and it is natural that they should settle in the metropolises. Jews had been employed in urban occupations, hence they opted for the large American cities, where there was demand for these types of labor. In particular, one-fifth of the Jews had formerly been textile workers, and New York was a textile manufacturing center, so Jews chose the place where they could employ their existing skills.[60] Jewish immigrants arrived to the US through the large port cities of the East Coast, therefore by default they clustered there (e.g., Kahan 1978, p. 241).[61] Furthermore, Jews preferred to cluster in cohesive large communities,[62] partly because of their precarious condition as a minority, and partly because keeping up the institutions of a Jewish community had substantial fixed costs. Another view, following Sombart (1913), assigned this to a particular Jewish aversion to assimilation.[63] Finally, Jews were not the only minority of recent immigrants from the European periphery with a newly-found preference for the cities. They were similar in that to groups such as Poles, Italians, and Irish; settling in the big city was an immigrant thing to do.

On the basis of their experience in the Pale, one would make the following predictions: After migration, Jews would continue to do what they did since the early modern period. Using their comparative advantage,

[59] For recent surveys and histories of the Jewish migration to the US see Alroey (2008) and Lederhendler (2009). On the economics of these migration see Kuznets (1975), Boustan (2007), and Spitzer (2015, 2019).

[60] See, for example, Kuznets (2011, p. II.8). On the labor market outcomes and occupational distribution of American Jews see Goldberg (1945), Kuznets (2011, Section III.2), and Chiswick (1991, 1992). For a critical discussion on the specialization in manufacturing see Perlmann (2000).

[61] The main Atlantic ports of entry were in the largest eastern cities of New York, Boston, Philadelphia, and Baltimore. Other gateways for Jews were the Canadian border and Galveston (Marinbach 1983).

[62] According to Kuznets (2011, Section II.8.a), this would be a typical preferences of any minority of recent immigrants.

[63] See discussion in Katzenelson (2012, pp. 15–19).

they would tend to distribute evenly across space. Many would go to the large metropolises, but not disproportionately so. At first they may cluster in major ports of entry, whence they would move in equal measures to the large, medium, and small towns, with no special preference for industrial regions. To be sure, the US was an industrialized economy, which created new opportunities. Yet the countryside was still vast—30.4 percent of Americans still lived on farms in 1920. Being a far smaller minority in the new country,[64] unlike in Russia it would have been virtually impossible to keep up a Jewish community in every single county. But at the very least one would expect to see a thriving small-town Jewish economy as a dominant form of settlement.[65] Since local congestion should not have occurred, there would be no problem of Jews crowding each other out of commerce, and the occupational distribution would shift towards more commerce relative to the Pale.

In reality, very little of this came to be.

5.2 Jews reinvented as a metropolitan minority

In Figure 11, the cumulative distribution of various American ethnic groups are plotted across the range of locality sizes (note the logarithmic scale on the horizontal axis).[66] The metropolitan nature Jewish American immigrants could not be more pronounced: The median American lived in a locality with a population of 2,500. The median Jewish American immigrant, simply put, lived in New York City. Ninety percent of them lived in cities above 100 thousand, contrasted with hardly one-quarter of all Americans, while more than 76 percent were in the top-ten cities, compared with only 14 percent.

Other recent immigrants did show highly urban preferences, but none as much as Jews did. In fact, Irish, Poles, and Italians were distributed almost identically to one another. More than 15 percent resided in localities under 500, as opposed to 1.5 percent of the Jews. Their medians lived in cities between 100–250 thousand. In short, the metropolization of Jews was above and beyond that of other city-oriented "new migrants". Norwegians, for comparison, were on the other end of the scale. Their typical farm-to-farm migration is reflected by a close replication of the All-US pattern of settlement, with an even somewhat greater preference for smaller localities.[67]

[64] Yiddish speakers were 0.94 percent of the US 1920 total population and 1.33 percent of the labor force.

[65] There is no reason to suspect that small Jewish communities would be less viable than larger ones, as the hundreds of small Jewish communities in the Pale could testify. More than half of all Jewish communities in the Pale (1,149) had fewer than one thousand Jews, and more than a third (760) had fewer than 500.

[66] The data are from the one-percent sample of the 1920 US Census (Ruggles et al. 2010). The ethnic groups are of first generation only, defined either according to mother tongue or to country of birth. East European Jews and Poles can only be properly identified by mother tongue (Yiddish, for Jews). This mixes Russian Jews with other east European Jews from Romania and the Habsburg Empire. Furthermore, it excludes non-east European Jews, particularly those of German background, which were the main bulk of pre-1880s immigrants.

[67] For recent studies on the Norwegian immigration see **Abramitzky2012-2**Abramitzky, Boustan, and Eriksson (2012).

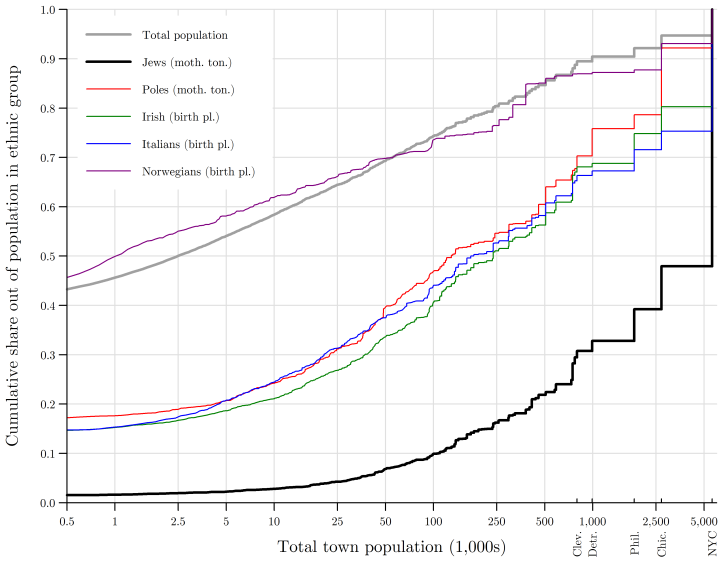


Figure 11: Cumulative distribution of ethnic populations by town size, US 1920

Notes: The plot represents the cumulative distribution of Jews and non-Jews across localities by town size in the 1920 US census. Individuals are assigned to ethnic groups based on either their birth place or their mother tongue. The language identifying Jews is Yiddish. The horizontal axis represents the population of the locality in thousands (the scale is logarithmic). The curves are left-truncated at 500 inhabitants. The vertical axis represents the share of individuals within each group that live in localities that are no larger than the measure on the horizontal axis. Source: IPUMS's 1 percent sample of the US 1920 census.

The metropolitan preference of Jews cannot be attributed to just a few particular cases of very large cities, such as New York, or to the centrality of the ports of entry. Had none of these cities existed, the general picture would have remained unaltered. In the histogram on Figure 12, the over-representation of Jews is separately indicated for each town size-based group of localities (note the logarithmic scale on the vertical axis), with Italians plotted alongside for comparison. Jews were ten times over-represented in New York City relative to their weight in the total population. Sliding down the scale, the representation of Jews decreases sharply and steadily all the way down to the lowest groups, reaching 28 times *under*-representation in localities under one-thousand. The preference for larger localities existed all across the board. While Italians also showed a trend of increasing preference for larger localities, its curve was nowhere as steep as that of Jews. In New York they were 4.6 times over-represented, less than half as much as Jews, and at the other end of the scale, their lowest rate of representation was 30 percent.

The Jewish aversion to the American countryside can bee seen through another lens, by how their representation varied across the rural-urban scale. As against the rather uniform dispersion of Jews across Pale districts, Jews were virtually absent in the vast majority of American counties.[68] Of the 3,062 US counties, only 206 had at least one Jew in the one-percent sample. In part, this would have been natural to expect

[68] US counties were on average half the area of an average Pale district, and thus the nearest comparable administrative unit.

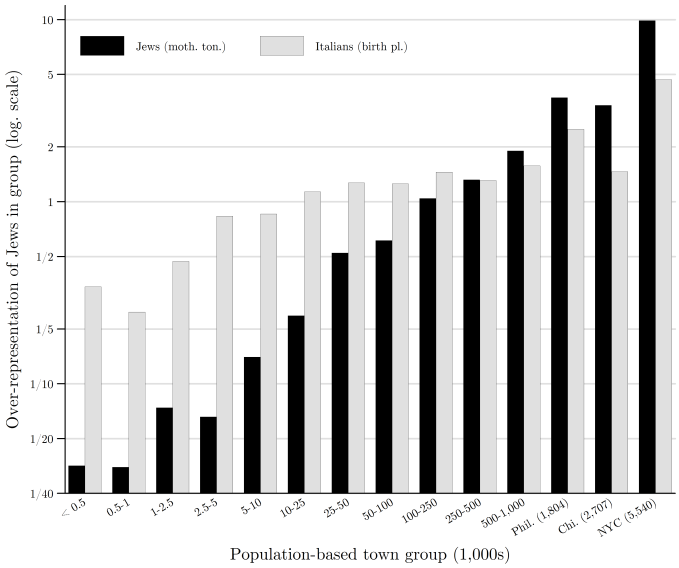


Figure 12: Over-representation of Jews and Italians by town size-based groups

Notes: The plot reports the over-presentation of Jews and Italians in the 1920 census relative to the total population, within population size-based groups of localities (e.g., 2 means twice as likely to reside in localities within the group compared to an average US inhabitant). Jews are subjects whose mother tongue is Yiddish. Italians are subjects whose place of birth is Italy. The vertical axis is represented in logarithmic scale. Each of the top 3 groups comprise only one city. Source: IPUMS's 1 percent sample of the US 1920 census.

given the lower share of Jews out of the total population, but the Jewish representation across counties was much more clustered than that of other immigrant groups of comparable sizes. In Figure 13, the bars report the over-representation of Jews (and of Italians, for comparison), in bins of US counties grouped by the share of non-farm households in the 1920 census sample. Consistent with the finding on the localities, Jews were almost three times over-represented in counties in which more than 95 percent of the inhabitants lived in non-farm households. These 114 counties, put together, had 92 percent of all American Jews. The rate of over-representation plummeted to a small fraction in counties that were even mildly rural. While more than one-quarter of Americans lived in 1,680 counties in which more than half the population lived in farms, the one-percent sample has only 22 Jews living there, more than 120 times under-represented. Strong rural aversions were also typical for Italians, Irish and Poles, but again, nowhere near as much as among Jews.[69] The disengagement of Jews from the countryside and from the rural economy could not have been more complete.

5.3 Remnants of the rural service minority

It remains to examine briefly the occupational choices of Jews in the and its geographical variation. In the US, 50.4 percent of the Jewish labor force was employed in manufacturing and 30.8 percent in commerce.

[69] Their rates of under-representation in mostly-farm counties were: Italians (b.p.), 20.6; Irish (b.p.), 9.9; Poles (m.t.), 10.2.

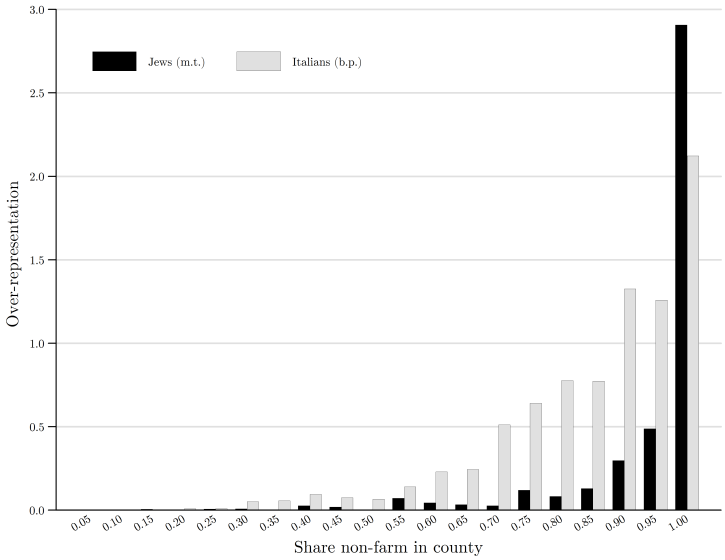


Figure 13: Over-representation of Jews and Italians by share non-farm in county

Notes: The figure reports the over-presentation of ethnic groups relative to the total population, by groups of counties ordered by the share of non-farm households. (e.g., 2 means twice as likely to be living in a county within the given range of non-farm households compared to an average US inhabitant). The sample includes 1,049,007 individuals in 2,959 counties, after 103 counties with fewer than 25 individuals in the sample were omitted. Over-presentation is weighted by individuals, not by counties. The labels below the bars report the upper-bound of each 5-percent range. Individuals are assigned to ethnic groups based on either their birth place or their mother tongue. Source: IPUMS's 1 percent sample of the US 1920 census.

To the extent that the two categories are comparable between the Russian and the American censuses, this implies a massive shift toward manufacturing. This "disappearing petty tradesman syndrome" is well known as a fundamental feature of the Jewish migration (Kuznets 1975; Kahan 1978; Perlmann 2000; Lederhendler 2009). The receiving economy was also different in important respects. First, only 25.4 of the labor force was in agriculture. Correspondingly, there was no vacuum in commerce, with 10.4 percent of the total population employed in this sector, more than twice as much as among the total population of the Pale, and ten times as much as among non-Jews thereof. The two economies were surely so different that the comparison to the Pale has too many limitations, but moving to an over-representation of "only" 3 times in commerce must have been a transformation, not an adaptation.

But did the petty tradesman virtually disappear? Diner (2015) documented how the Jewish countryside peddler was a fixture of the Jewish migration experience everywhere, including the US. Morawska (1996) followed the evolution of the Jewish community of Johnstown, PA, which is exactly the case the prediction above would envision as the quintessentially Jewish form of settlement in the US: a provincial, countryside-serving, and prosperous community of shopkeepers and traders. Figure 14 suggests that vestiges of the rural service minority model did survive the migration. The bars in the histogram indicate the over-representation

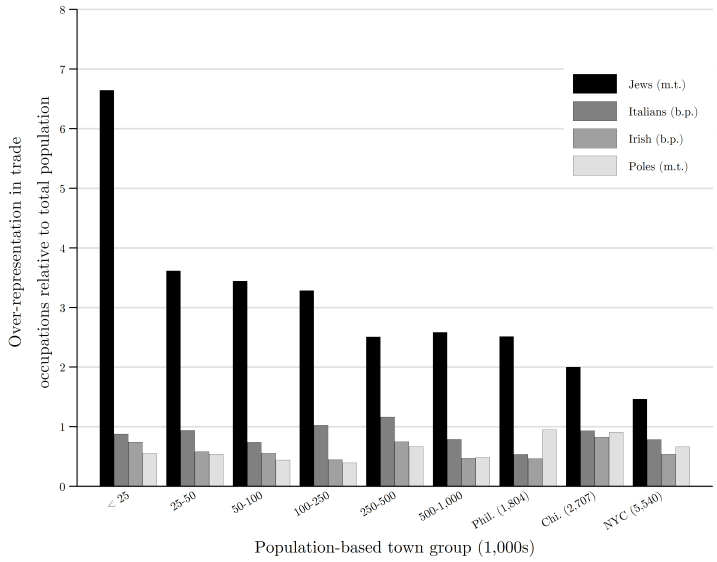


Figure 14: Over-representation in trade by ethnicity and town size, US 1920

Notes: The figure reports the over-presentation of ethnic groups in trade occupations relative to the total population, by town size-based groups of localities in the 1920 census (e.g., 2 means twice as likely to be employed in trade compared to an average US inhabitant within the group of localities). Individuals are assigned to ethnic groups based on either their birth place or their mother tongue. Source: IPUMS's 1 percent sample of the US 1920 census. The categorization of occupations to occupational sectors is based on IPUMS's 1920 Occupation Codes (see https://usa.ipums.org/usa/volii/92occup.shtml).

of ethnic groups of immigrants within trade occupations, relative to their share in the population.[70] This pattern resonates with the old one from the Pale: The very few Jews who opted for the smaller provincial localities were almost seven times over-represented in trade. Similarly, the greater was the locality, the weaker was the specialization in trade. Furthermore, Jews again stood out relative to their fellow immigrants of other ethnicities: Irish, Poles, and Italians were under-represented in commerce, and there was no trend in the rates of their representation with respect to locality size. So the few Jews who shunned the cities continued to specialize in the niche of rural and small town trade, but their numbers were surprisingly negligible.

6 Conclusion

In this paper I proposed a framework that explains the joint distribution of occupational and settlement choices of Jews in the Pale of settlement. Based on the observation that the comparative advantage of Jews was in rural services, it explains a battery of stylized facts of the economics and the demography of the Jews, some of which were well known, but others were not previously observed, or were observed yet misinterpreted. The Jewish population tended to approach a relatively uniform distribution across districts, such that there

[70] Trade workers could be defined in two ways in the IPUMS data—by occupational groups and by industry branches. Both measures yield a nearly identical pattern.

were neither Jewish vacuums nor Jewish majorities at any given districts. Regions from which the Jewish population was banned had much less employment in commerce, particularly rural commerce. In Regions of new or partly restricted settlement Jewish density was lower. The lower was the Jewish density, the more Jews and non-Jews were likely to be commerce workers, although the cross-crowding effect of Jews over non-Jews was not found to be robust. There were no town-level congestion effects in Jewish niches, suggesting that Jews did not belong to a detached urban economy, but were part and parcel of the countryside. Jews, commerce, and literacy, came together, but unlike the earlier pattern documented by Botticini and Eckstein (2012), this did not imply a link to the urban economy. On the contrary, relative to the non-Jewish non-agricultural labor force, Jews specialized in smaller localities, and their trade was indispensable to the countryside where their skills were most scarce and they had no substitutes. Jews clustered, in the sense that within small regions they came together in the same localities. But unlike the common characterization (such as Kuznets 2011), their tendency to disperse across labor markets was a defining feature of their spatial distribution. All in all, the application of a theory of inter-ethnic complementarities, in line with the recent literature on coexistence and persecution of minorities, appears to be a powerful tool in explaining the joint occupational and geographic distribution of one rural service minority—the Jews.

In this light, I argue that the patterns of occupation and settlement in the US were, in fact, radically more different from past patterns than was previously understood. Migration brought to an abrupt end a centuries-old tradition by which Jews settled the east-European frontier. In the US, Jews became the metropolitan minority par-excellence, and this was not a just a New York tale, but a phenomenon observed all across the board. Jews favored larger cities in the US, whereas in the Pale of Settlement they did not. Neither can this metropolization be attributed only to a wider pattern of recent immigrants that tended to settle large cities—Jews were metropolitan above and beyond their fellow New Migrants. I argue that traditional explanations are insufficient in accounting for this transition. One possible explanation could be the greater precariousness of the niche of rural service in the US. Jews would have wanted to provide rural services, but the niche was no longer empty in their absence. Unlike in Russia, in the commercialized American economy Jews did have close substitutes. Resolving this issue is beyond the scope here, and I leave this for future research. It is sufficient to argue that the "disappearing petty tradesman syndrome" is in fact a great puzzle.

Finally, returning to Lestschinsky's evaluation, that East European Jews were urban people, his claim had a subtle point. The rural-urban distinction ought to be expanded to a three-way rural-urban-metropolitan classification. In eastern Europe prior to 1900, he argued, Jews were urban, but they had little metropolitan experience (Lestschinsky 1961, pp. 72–73). The lesson I wish to bring out is that the rural-urban distinction

was blurred at best, and that in as far as their distributions across space and occupations are concerned, Jews were still a thoroughly rural service minority.

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A Appendix tables

Table A.1: Occupational specialization of Jews—disaggregated descriptive statistics

Category	Percent in category among: Jews (1)	Non-Jews (2)	Share Jews within (3)	Over-rep. of Jews (4)
Agriculture				
Agriculture	2.22	58.21	0.005	0.038
Agriculture and Sericulture	0.00	0.04	0.015	0.108
Cattle Raising, etc.	0.14	1.70	0.011	0.081
Forestry and Forest Industries	0.22	0.24	0.116	0.923
Fishing and Hunting	0.13	0.14	0.121	0.965
Prof. Services				
Administration, Justice and Police	0.05	0.71	0.010	0.073
Municipal and Local Civic Service	0.11	0.29	0.051	0.380
Private Law Practice	0.07	0.05	0.166	1.394
Clergymen, Orthodox	0.01	0.41	0.004	0.030
Clergymen, other Christian	0.01	0.08	0.010	0.070
Clergymen, non-Christian	0.39	0.01	0.851	39.889
Persons Serving about Churches, etc.	0.95	0.07	0.660	13.610
Teachers and Educators	2.39	0.52	0.398	4.635
Science, Literature, and Art	0.15	0.08	0.227	2.064
Medical and Sanitary Work	0.57	0.33	0.197	1.721
Pers. Services				
Army and Navy	2.44	5.76	0.057	0.424
Service for Charitable Organizations	0.01	0.02	0.089	0.688
Personal and Domestic Service	11.82	11.86	0.125	0.997
Hotel and Restaurant Keepers	0.69	0.21	0.321	3.317
Dealers in Spirituous Liquors	0.84	0.21	0.361	3.959
Cleanliness and Hygiene	0.60	0.41	0.170	1.436
Indefinite Occupations	1.11	0.65	0.198	1.725
Manufaturing				
Mining	0.07	0.48	0.020	0.140
Metal Smelting	0.00	0.05	0.006	0.045
Manufactures of Animal Products	2.31	1.42	0.188	1.622
Manufactures of Wood	1.43	0.27	0.434	5.373
Textile Industry	2.89	1.14	0.265	2.525
Manufactures of Metal	2.80	1.53	0.207	1.830
Pottery and Ceramic Industry	0.36	0.37	0.123	0.979
Chemical Industry	0.45	0.13	0.335	3.534
Production of Spirituous Liquors	0.26	0.14	0.209	1.851
Production of other Beverages	0.16	0.01	0.614	11.138
Production of Foods, Animal and Vegetable	3.12	0.85	0.343	3.656
Tobacco, and Tobacco Manufactures	0.53	0.03	0.733	19.205
Printing and Paper Industries	0.96	0.09	0.598	10.442
Scientific Instruments, Watches, and Toys	0.37	0.03	0.633	12.091
Jewelry, Painting, Articles of Luxury, etc.	0.38	0.07	0.436	5.413
Manufacture of Clothing	16.59	2.11	0.529	7.859
Building Industry	2.58	1.72	0.177	1.504
Carriage and Wooden Ship Making	0.02	0.09	0.024	0.171
All other Persons Employed in Manufacturing Industry	0.20	0.38	0.068	0.513
Transport				
Transportation by Water	0.13	0.14	0.123	0.979
Railroad Employees	0.11	0.87	0.018	0.129
Carting and Draying	2.60	0.47	0.441	5.523
All other Means of Communication and Transportation	0.23	0.07	0.310	3.152
Post, Telegraph, and Telephone	0.02	0.15	0.019	0.138
Commerce				
Institutions of Credit and Insurance	0.16	0.04	0.341	3.631
Commercial Middlemen	1.06	0.04	0.775	24.154
General Commerce	6.36	0.27	0.772	23.716
Cattle Trading	1.09	0.05	0.750	20.998
Trading in Grain	3.32	0.05	0.899	62.489
Trading in all other Agricultural Products	9.74	0.49	0.739	19.809
Trading in Structural Material and in Fuel	1.84	0.06	0.809	29.713
Trading in various Goods for Domestic Use	0.39	0.02	0.705	16.783
Trading in Metal Goods, Machinery, and Arms	0.45	0.02	0.773	23.802
Trading in Textile and Clothing	2.78	0.10	0.797	27.590
Trading in Furs, Leather, etc.	0.83	0.03	0.820	32.025
Trading in Articles of Luxury, Science, Arts, etc.	0.20	0.03	0.477	6.400
Trading in other Goods	0.51	0.05	0.606	10.772
Peddlers and Hucksters	1.27	0.06	0.762	22.440
Other				
Living on Income from Capital or Supported by Relatives	3.86	1.95	0.221	1.983
Supported by the Treasury or by Charitable Institutions	1.32	1.49	0.112	0.886
Prisoners and Convicts	0.23	0.23	0.126	1.008
Prostitutes	0.09	0.03	0.282	2.756
Occupations Unknown	0.99	0.35	0.286	2.813

Notes: The table reports statistics over the entire population of (language defined) Jews and non-Jews within the Pale. The Pale includes Courland province. Columns 1 and 2 report percentages of occupation indicators within each ethnic group. The percentages are from among the labor force, not the total population (hence, shares sum up to 1). Column 3 reports the share of Jews within each category. Column 4 reports the over-representation of Jews within each category.
Source: 1897 Russian Census, provincial volumes, Tables XXI and XXII. The categorization to occupation groups and the translated English titles are from Rubinow (1907, pp. 498–499).

Table A.2: Commerce and Jews in non-agricultural labor force: Town level

	Jewish workers in commerce (mean = 0.298, std. = 0.078)					
	(1)	(2)	(3)	(4)	(5)	(6)
Jews in town	−0.081	−0.000	0.052	0.041	0.037	−0.006
	(0.058)	(0.057)	(0.036)	(0.033)	(0.037)	(0.082)
Jews in district		−0.166^{b}	−0.183^{b}	−0.180^{b}	−0.093	
		(0.080)	(0.076)	(0.065)	(0.078)	
Town population (log.)			−0.017^{a}	−0.018^{a}	−0.017^{a}	−0.014
			(0.003)	(0.003)	(0.004)	(0.013)
Constant	0.328	0.342				
	(0.026)	(0.029)				
Geog. controls	No	No	Yes	Yes	Yes	Yes
Fixed-effects				Reg.	Prov.	Dist.
R-squared	0.037	0.068	0.563	0.600	0.649	0.888
P-val. (F)	0.171	0.111	0.000	0.000	0.000	0.000
Observations	346	346	346	346	346	346

Notes: Each observation is a gorod within the Pale, including Courland Province. The dependent variable is the share of Jewish commerce workers out of the Jewish non-agricultural labor force. The expalantory variables of interest are the share of Jews out of the non-agricultural labor force of the town and of the district. Jews are defined by mother tongue (Yiddish). Geographic controls are indicators for proximity to the sea and to a large river (< 10 km.), and region-specific elevation, longitude, and latitude. Standard errors, in parentheses, are clustered by province. Significance: ^{a} : $p < 0.01$; ^{b} : $p < 0.05$; ^{c} : $p < 0.1$. Source: 1897 Russian Census, provincial volumes, Tables XXI and XXII.

Table A.3: Occupational specialization of Jews, by locality type

Category	In category among: Jews (1)	In category among: Non-Jews (2)	Share Jews within (3)	Over-rep. of Jews (4)
A. *Rural*				
Agriculture	0.052	0.743	0.006	0.070
Commerce	0.328	0.006	0.824	56.911
Manufacturing	0.341	0.078	0.265	4.384
Professional services	0.049	0.016	0.206	3.150
Personal services	0.143	0.122	0.087	1.167
Transportation	0.030	0.011	0.183	2.725
Other	0.057	0.025	0.159	2.306
Population (1,000s)	2,514.4	33,988.9	0.069	
B. *Small town*				
Agriculture	0.010	0.165	0.031	0.061
Commerce	0.291	0.026	0.857	11.329
Manufacturing	0.351	0.190	0.495	1.850
Professional services	0.049	0.069	0.272	0.705
Personal services	0.181	0.421	0.186	0.431
Transportation	0.033	0.024	0.422	1.379
Other	0.085	0.106	0.299	0.805
Population (1,000s)	511.6	660.7	0.436	
C. *Urban*				
Agriculture	0.005	0.042	0.043	0.125
Commerce	0.273	0.045	0.686	6.113
Manufacturing	0.369	0.239	0.356	1.548
Professional services	0.044	0.063	0.201	0.706
Personal services	0.207	0.467	0.137	0.444
Transportation	0.032	0.044	0.206	0.729
Other	0.069	0.102	0.194	0.674
Population (1,000s)	1,817.0	3,515.4	0.341	

Notes: The table reports statistics over the entire population of (language-defined) Jews and non-Jews within the Pale, for three categories of places: A. Rural (non-Gorods and Gorods with fewer than 1,000 inhabitants); B. Small town (Gorods with 1,000-10,000 inhabitants); C. Urban (Gorods with more than 10,000 inhabitants). The Pale includes Courland province. Columns 1 and 2 report mean of category indicators within each ethnic group. Column 3 reports the share of Jews within each category. Column 4 reports the over-representation of Jews within each category. In the rows reporting means of sector indicators, the shares in columns 1 and 2 are from among the labor force, not the total population (hence, shares sum up to 1).
Source: 1897 Russian Census, provincial volumes, Tables XXI and XXII.

Table A.4: Commerce and Jews by town size-based groups

Group (1,000s)	Units (1)	Population (1,000s) (2)	Shares			
				Commerce		
			Jews (3)	Among Jews (4)	Among Non-Jews (5)	Jews in commerce (6)
Countryside	246	36,503	0.069	0.328	0.006	0.824
< 2.5	21	35	0.394	0.275	0.030	0.837
2.5-5	62	241	0.461	0.294	0.029	0.862
5-10	121	897	0.432	0.291	0.025	0.857
10-25	93	1,425	0.373	0.286	0.037	0.756
25-50	27	902	0.356	0.251	0.039	0.707
50-100	15	980	0.389	0.259	0.039	0.742
100-250	4	624	0.291	0.259	0.051	0.585
> 250	3	1,402	0.287	0.296	0.054	0.617

Notes: Each observation is a group of geographic units within the Pale (including Courland province). The town size-based units are all the Gorods, grouped by the size of their total population. The countryside aggregates all the population outside the Gorods, reported separately in each district. The proportion of Jews is out of the total population. The share of commerce workers among Jews and non-Jews are out of the total number of workers within the ethnic group. Jews in commerce is the share of Jews out of all commerce workers in the group. Shares are weighted by individuals, not by units. Source: 1897 Russian Census, provincial volumes, Tables XXI and XXII.

B Appendix figures

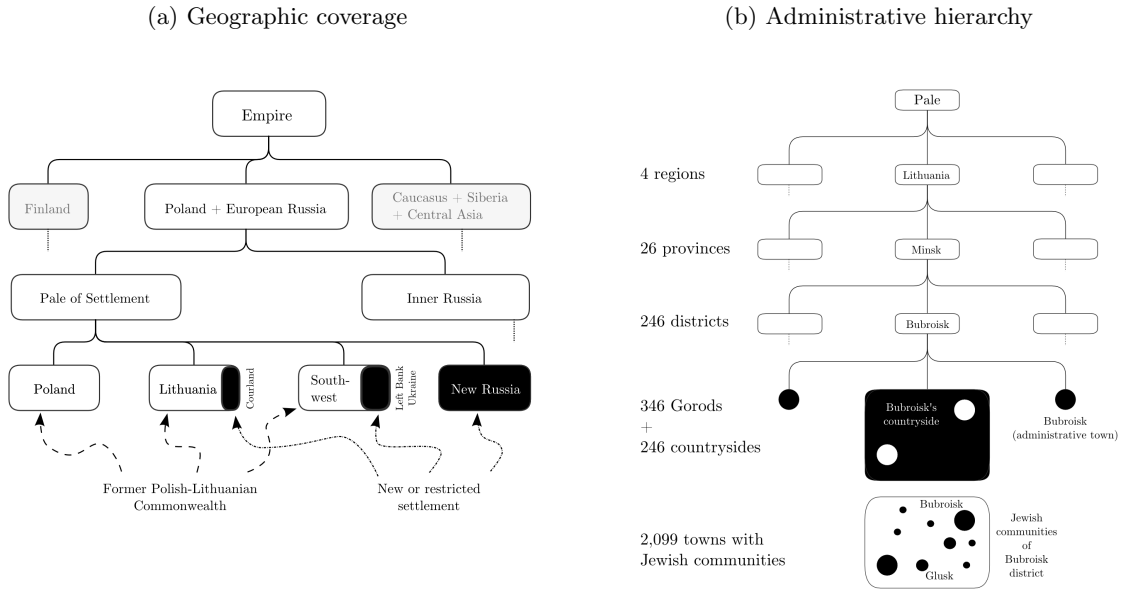


Figure B.1: Structure of the 1897 census data

Notes: Diagram a. The diagram describes the geographic coverage of the data from the 1897 Russian census that is used in the paper. The classification within the Pale to former Polish-Lithuanian Commonwealth and to new (or restricted) settlement is not based on administrative classification, but on historical categories. Courland province was included within the region of Lithuania, although it was administratively part of another region and officially not part of the Pale of Settlement. The provinces of Left Bank Ukriane are Chernigov and Poltava.
Diagram b. The diagram describes the administrative hierarchy of the 1897 Russian census data. The town of Glusk (Bubroisk district, Minsk Province) is used as an example.

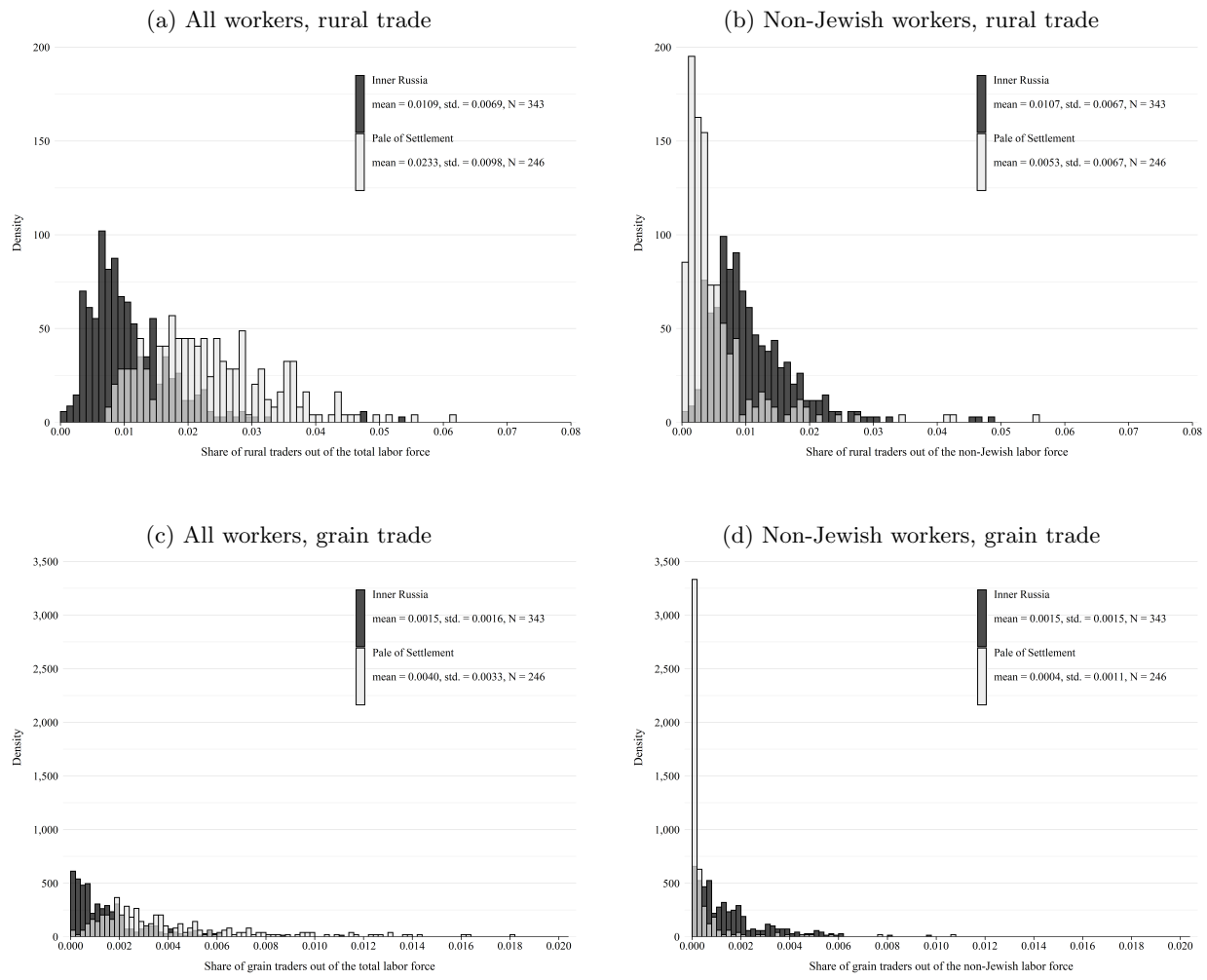


Figure B.2: Share of workers in rural trade and in grain trade by district

Notes: The plots represent the distribution of the share of workers who are employed as rural traders (a, b) and grain traders (c, d) in the district out of the entire labor force (a, c) and out of the non-Jewish labor force (b, d). The dark bars in each plot are the districts of Inner Russia, and the light bars are the districts of the Pale, including Courland province. The horizontal axis represents the share of rural or grain traders. The vertical axis represents the density within each bin relative to the number of districts in the respective region (e.g., the areas of the dark bars in each of the plots sum to one). Rural traders include traders in cattle, in grain, in structural material and fuel, and in all other agricultural products. Sources: 1897 Russian census, Provincial volumes, Tables XXI and XXII.

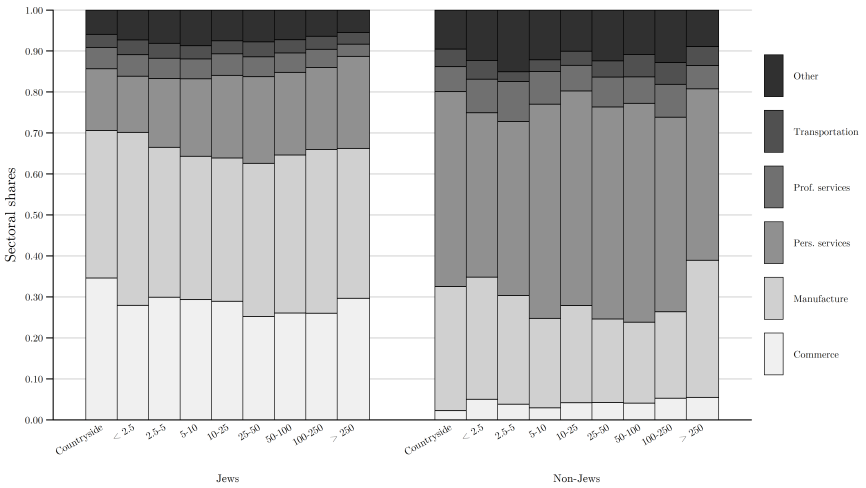


Figure B.3: Sectoral composition of the non-agricultural labor force by town size

Notes: Each column of stacked bars represents the sectoral distribution of the non-agricultural labor force within the Pale in a size-based bin of gorods separately for the two group, Jews and non-Jews. The ranges of total population size are in thousands. Each shade represents an occupationl sector (see Table A.1 for details). Source: 1897 Russian census, Provincial volumes, Table XXII.

C Case Study: A Jewish-Russian Frontier Man

Aharon-Ya'akov Dukhan was born in the early 1850s in Glusk, a small town in Belarus. Glusk was a typical Lithuanian shtetl, a local market town of 5,328 inhabitants (in 1897),[71] and it was crowded with Jews that comprised more than 70 percent of its population. As Aharon-Ya'akov came of age, he migrated south. He established himself in the province of Yekaterinoslav, and settled first in the town of Verkhne-Dnieprovsk (pop. 6,701), on the banks of the Dniepr. While Jews were 30 percent of the population of this town, in the entire district of Verkhne-Dnieprovsk (of which the town of the same name was the administrative center), Jews were still a rather small minority. In the town, more than two-fifths of all Jewish workers were employed in commerce, a relatively high rate. Among the district's Jews residing outside the main city, this rate was even higher, 55.2 percent.

At the end of the century, Aharon-Ya'akov moved again with his growing family and settled in Bozhedarovka, a small village situated 50 kilometers further south. Bozhedarovka was a new settlement that grew together with a railway station of the same name, built in 1881 along the new Kazanka-Yekaterinoslav railway line. It had a few agricultural warehouses and mills, a handful of Jewish families trading in agricultural produce, and in total less than 500 inhabitants.[72] During harvest, dozens of rail cars were loaded daily with wheat and were shipped to the markets. Aharon-Ya'akov traded there in grains and in addition was employed by a local Russian landlord widow as a manager of her estates. Fully versed in traditional Jewish learning, he taught himself German and Russian, a language in which he worked and in which he enjoyed conversing for hours on end with his trusting aristocrat mistress. Dukhan (incidentally or not, the Hebrew word for a stall) and his household prospered in Bozhedarovka, "God's gift" in Russian. According to the memoirs of his grand-daughter Leah Dukhan-Landau, life was peaceful, livelihood was plenty, and food was cheap. By the time of his death in 1904 he had fathered 16 children, of whom 12 had reached adulthood.[73]

Aharon-Ya'akov was an educated man, mobile, hard working, talented, entrepreneurial, and engaging both culturally and economically across ethnic boundaries. In short, he was a decent representative of the the

[71] Henceforth, all figures are according to the 1897 Russian census, unless stated otherwise.

[72] It is not listed in the localities volume of the 1897 census, where all localities with more than 500 inhabitants were listed. See more details on Section 3.

[73] The description of Bozhedarovka and Aharon-Ya'akov's life is mostly based on the memoires of Leah Dukhan-Landau, *Mah beyn Bozhedarovka ve'Kakhovka* (Between Bozhedarovka and Kakhovka, memories from the summer of 1918), on leahlandau.net.

ideal type of a Jewish economic agent, an example of a service minority (Slezkine 2004). But strange enough, he was not an urban dweller but a rural frontier man. Rather than moving to Warsaw, Odessa, London, or New York, he moved to a tiny railroad village in the provincial countryside. He even skipped the regional urban center of Yekaterinoslav, only 80 kilometers to the east, a bustling and rapidly growing commercial city, favoring Bozhedarovka instead.

What Aharon-Ya'akov did was to move from where Jews and their services were abundant to where they were scarce. Table C.5 shows how his place of birth and his place of death were different from one another. Bobruisk district, in Minsk Province, was in the midst of historical Lithuania, where Jews had been established for several centuries. The Jewish population was 19.2 percent of the total. In contrast, Verkhne-Dnieprovsk district, part of Yekaterinoslav Province, was an area of new Jewish settlement. Having been part of the New-Russia region, despite not being part of the historical Polish-Lithuanian Commonwealth, Russia exempted it from the restrictions on Jewish settlement. The recently established Jewish communities still comprised only 2.6 percent of the district's population. Migrating from Bobruisk to Verkhne-Dnieprovsk was a move from the Pale's 94th percentile of Jewish density, in terms of the share of Jews in the district, to the 7th percentile.

Since Jews occupied particular occupational niches and were absent in others, the two labor markets were also very different. Aharon-Ya'akov sought employment in commerce, and in Bobruisk 6.3 percent of all workers were employed in this sector. In contrast, in Verkhne-Dnieprovsk only 2.5 percent of all workers were in commerce, and clearly his skills were relatively scarce there. The two districts were at the 90th and at the 12th percentile of the distribution of total employment in commerce in the Pale. This difference was directly related to the difference in Jewish density. While in the southern district a greater share of non-Jewish workers was employed in commerce (0.9 as against 0.4 percent), this hardly compensated for the low number of Jews.

Moreover, in Bobruisk, the share of Jewish commerce workers out of all Jewish workers was only 21.6 percent (11th percentile). Evidently, the supply of commerce workers was so large that Jews in Bobruisk were crowded out and spilled over to other occupational sectors in which, as we shall see, they had a lesser comparative advantage, mainly manufacturing and personal services. In sharp contrast, in the southern district the share of Jews in the population was so low that there seems to have been little restriction on Jews to opt for commerce. With every second Jewish worker employed in commerce, Verkhne-Dnieprovsk exceeded all but one of the remaining Pale's districts.

Table C.5: Bobruisk and Verkhne-Dnieprovsk
Aharon Ya'akov Dukhan's migration

District	Province	Jews	Employed in commerce		
			All	Jews	Non-Jews
		(1)	(2)	(3)	(4)
Bubroisk	Minsk	0.194	0.063	0.216	0.004
Verkhne-Dnieprovsk	Yekaterinoslav	0.026	0.025	0.499	0.009

Notes: The share of commerce workers for each ethnicity is the total number of workers in the group in commercial occupations, divided by the total number of workers in the group in all occupations in the district.
Source: 1897 Russian Census, provincial volumes, Tables XXI and XXII.

In this paper I argue that the case of Aharon-Ya'akov Dukhan, the Jewish rural frontier man, was not all that strange after all. Rather, it was emblematic of the economic ecology practiced by Jews in the Pale of Settlement during the late imperial period. Jews responded to local congestion either by spilling over to occupations beyond their preferred niches, or by migrating to areas that were less dense with Jewish settlement, where traditional Jewish occupations were relatively more profitable. Aharon-Ya'akov made the second out of the two choices. The dispersed spatial distribution of Jews in the Pale of Settlement was thus

the outcome of a centuries-old tradition of Jewish frontier settlement, of which Dukhan was among the last bearers.

D Model

This section describes a simple model of a partly ethnically-segregated labor market, in which Jews have comparative advantage in commerce. The model predicts the effects of changes in the share of Jews in the district on the occupational distribution of the ethnic groups.

D.1 Basic Setup

The total output of district d is produced using capital and labor (K and L, where in the context of the Pale capital mainly means land) under a given technology A, in a production function Y:

$$Y_d = Y(A_d, K_d, L_d). \tag{D.1}$$

For simplicity, the formal model presented here omits manufacturing from the occupational choice. In this two-occupations model, when Jews are crowded out of commerce they relocate to agriculture. Had manufacturing been included in the model as a third separate occupational category, then the analogous case to the historical reality would be that Jews' comparative manufacturing skills will stand in between commerce and manufacturing, such that under congestion Jews would spill from commerce mainly to manufacturing and not to agriculture. One can think of agricultural employment in this two-occupations model as encompassing both agriculture and manufacturing, notwithstanding the differences between these two types of labor.

Labor, then, comes in two occupations—agricultural and commerce—denoted a and c. Together, agriculture and commerce form the joint effective labor of the district, which is an aggregation of labor from the two occupations according to a differentiable CRS function that is independent of technology and capital:[74]

$$L_d = L(L_{da}, L_{dc}). \tag{D.2}$$

Each worker i inelastically supplies one unit of labor-time that can be put into effect either as e_{ia} units of agricultural labor or e_{ic} units of commerce labor. There are two types of workers in a partly ethnically-segregated district-level labor market: Jews and non-Jews, denoted by J and N. The total population is a continuum of I workers, of which $I_J = pI$ are Jews and $I_N = (1-p)I$ are non-Jews, such that p is the share of Jews within the labor force. For simplicity, the labor efficiency in agriculture is fixed within each ethnicity, whereas the labor efficiency in commerce varies across individuals within each ethnicity. In particular, the labor efficiencies of worker i in the two occupations a and c are:

$$e_{ia} = \begin{cases} 1 & \text{if} \quad i \in N, \\ \delta & \text{if} \quad i \in J. \end{cases} \tag{D.3}$$

and

$$e_{ic} = \begin{cases} x_i & \text{if} \quad i \in N, \\ \delta x_i & \text{if} \quad i \in J. \end{cases} \tag{D.4}$$

where $\delta > 0$, and $x_i > 0$ for all $i \in \{N, J\}$. The variable x_i thus represents the comparative advantage in commerce of worker i, in the sense that he can substitute one unit of agricultural labor for x_i units of commerce labor. The parameter δ is an ethincity-specific efficiency shifter—the larger it is, the greater is

[74] For example, this could be a Cobb-Douglas production function with a CES function aggregating labor: $Y = AK^{\alpha}L^{\beta}$ and $L = (\gamma L_a^{\rho} + (1-\gamma)L_c^{\rho})^{1/\rho}$. This is in line with the literature on the skill premium and wage inequalities, as in Katz and Murphy (1992), Katz and Autor (1999), Card and Lemieux (2001), Card and DiNardo (2002), and Autor, Katz, and Kearney (2008).

the efficiency advantage of Jews in both agriculture and commerce, while keeping the degree of comparative advantage in commerce fixed.

D.2 Labor Supply and Demand

The labor market is competitive, in the sense that workers are paid their marginal product of labor and they are free to choose their occupation, depending on where their wage would be higher. The wage of worker i in occupation $s \in \{a, c\}$ is therefore

$$w_{is} = e_{is}\text{MPL}_s \tag{D.5}$$

$$= e_{is}\frac{\partial Y}{\partial L}\frac{\partial L}{\partial L_s}. \tag{D.6}$$

Since capital and technology are not occupation-specific and do not influence how labor is aggregated (that is, L is only a function of L_a and L_c), the decision on where to allocate labor is independent of A and K, as well as of the functional form of Y. Thus, each worker will choose to put his labor in the commerce sector if his comparative advantage in commerce is greater than the prevailing marginal rate of substitution between commerce and agricultural labor: $x_i > \text{MRTS}^L_{a,c} = \frac{\partial Y/\partial L_a}{\partial Y/\partial L_c} = \frac{\partial L/\partial L_a}{\partial L/\partial L_c}$. Under the assumption that the function L is CRS, the marginal contributions of sector-specific labor to the joint labor $\partial L/\partial L_a$ is a function of the ratio of the quantities of labor in the two sectors, $l_c \equiv L_c/L_a$. Hence, it follows that for any given ratio l_c, there exists a reservation degree of comparative advantage $\tilde{x}(l_c)$ such that all workers with comparative advantage $x_i < \tilde{x}$ will seek work in agriculture, and workers with comparative advantage greater than $\tilde{x}$ will be employed in commerce. Denote the function of this reservation degree with respect to the ratio l_c by

$$\tilde{x}(l_c) \equiv \text{MRTS}^L_{a,c}(l_c), \tag{D.7}$$

and note that it is increasing in l_c.

The ethnic segregation of the labor market is driven by different distributions of degrees of comparative advantage in commerce within the two ethnicities:

$$x_i \sim \begin{cases} F_N(x) & \text{if} \quad i \in N, \\ F_J(x) & \text{if} \quad i \in J, \end{cases} \tag{D.8}$$

where F_N and F_J are cumulative distribution functions with finite means over the positive support, $x \in (0, \infty)$. These distributions, together with the share of Jews in the labor market p, determine the aggregation of the individual supply of labor to district-level labor supply as a function of $\tilde{x}$.

D.3 Equilibrium in the Labor Market

The aggregate quantities of labor inputs in the two sectors are themselves functions of the reservation degree of comparative advantage $\tilde{x}$, of the size of the population I, and of the share of Jews in the district p. In agriculture this would be $L_a = pI\delta F_J(\tilde{x}) + (1-p)IF_N(\tilde{x})$ and in commerce $L_c = \int_{\tilde{x}}^{\infty} \left(pI\delta x f_J(x) + (1-p)Ix f_N(x)\right) dx$, where f_J and f_N are the densities of the corresponding distribution functions. The ratio l_c is thus a function of p and of $\tilde{x}$, but not of I:

$$l_c(\tilde{x}, p) = \frac{\int_{\tilde{x}}^{\infty} \left(p\delta x f_J(x) + (1-p)x f_N(x)\right) dx}{p\delta F_J(\tilde{x}) + (1-p)F_N(\tilde{x})}, \tag{D.9}$$

Clearly, keeping p fixed, $l_c(\tilde{x}, p)$ is decreasing in $\tilde{x}$.

An equilibrium in the labor market is a pair $\{l_c^*(p), \tilde{x}^*(p)\}$, such that given the share of Jews p it solves both equations D.7 and D.9. That is, $\tilde{x}(l_c^*) = \tilde{x}^*$ and $l_c(\tilde{x}^*, p) = l_c^*$. Under ordinary conditions, the equilibrium

exists and it is unique.[75]

Intuitively, in equilibrium two mechanisms that relate the reservation degree of comparative advantage to the share of commerce-to-agriculture labor are balanced. Equation D.9 is a simple accounting identity—the higher the reservation degree of comparative advantage above which a worker would choose commerce, the lower is the share of commerce labor. Equation D.7 reflects the negative feedback mechanism, where fewer commerce workers are associated with higher wages in commerce, thus making commerce labor relatively more attractive, which reduces the reservation degree of comparative advantage. If the reservation degree went above the equilibrium level, there would have been fewer commerce workers, which would have increased the relative wages in commerce, thus attracting commerce labor from workers with lower comparative advantage in commerce.

D.4 Jewish Comparative Advantage in Commerce

In this setup, the relation between the two distributions F_N and F_J determines the comparative advantage of Jews in commerce.[76] In particular, I make the following assumption:

Assumption D.1 (Comparative advantage of Jews in commerce)**.** *The distribution F_J first-order stochastically dominates F_N. That is,*

$$\forall x \in (0, \infty), \quad F_J(x) < F_N(x). \tag{D.10}$$

Under this assumption, the following claim holds:

Claim D.1 (Jews increase the reservation degree of comparative advantage)**.** *The reservation degree of comparative advantage is an increasing function of only the share of Jews in the district. That is, there exists an increasing function $\tilde{x}^*(p)$ such that for any district $d \in \mathcal{D}$, the district's reservation degree of comparative advantage is $\tilde{x}_d = \tilde{x}^*(p_d)$.*

Proof. See Appendix E.1. □

Since the equilibrium shares of commerce workers among Jews and among non-Jews are $1 - F_J(\tilde{x})$ and $1 - F_N(\tilde{x})$, it follows directly that within each ethnicity, the proportion of workers employed in commerce is a decreasing function of the share of Jews in the total population. Although it also follows that the share of commerce-to-agriculture labor l_c increases, it does *not* follow, however, that the share of commerce-to-agriculture workers must also increase when the share of Jews in the population increases.[77] Before imposing more assumptions on the distributions F_N and F_J, one cannot rule out extraordinary cases in which some Jews have extremely high levels of efficiency in commerce, such that when the share of Jews in the district increases, they can crowd out a much greater number of former commerce workers than they themselves comprise.

D.5 Within-Ethnicity Congestion

A simple additional outcome that follows is that there exist within-ethnic group congestion effects, in the sense that the share of Jews has more adverse effect on the Jewish average wages than on non-Jewish average wages. Denote the equilibrium average wage of ethnic group $g \in \{N, J\}$ by

$$w_g \equiv w_a \int_0^{\tilde{x}(p)} e_{ia} f_g(x) dx + w_c \int_{\tilde{x}(p)}^{\infty} e_{ic} f_g(x) dx, \tag{D.11}$$

[75] It is unique because $\tilde{x}(l_c)$ is continuous and strictly decreasing, and $l_c(\tilde{x}, p)$ is continuous and strictly increasing in $\tilde{x}$.

[76] For example, if $\mathbf{E}_J(x) > \mathbf{E}_N(x)$ then $\mathbf{E}(e_c^J/e_a^J) > \mathbf{E}(e_c^N/e_a^N)$, meaning that on average Jews can substitute one unit of agricultural labor for more units of commerce labor than non-Jews.

[77] Note the distinction between the quantity of labor and the number of workers—the former counts effective units of labor, which weights the number of workers by their effeciency, whereas the latter counts the unweighted number of persons employed.

where the wage in occupation s is the marginal productivity of an efficiency unit of labor in that occupation: $w_s \equiv \frac{\partial Y}{\partial L}\frac{\partial L}{\partial L_s}$. Denote the wage elasticity of group g with respect to the share of Jews by $\eta_g \equiv \frac{\partial w_g(p)}{\partial p} / \frac{w_g(p)}{p}$. Assumption D.1 then implies the following:

Claim D.2 (Within-ethnicity congestion)**.** *The within-ethnicity wage elasticity is lower than the cross-ethnicity wage elasticity. That is, given A and K, for all $p \in [0,1]$*

$$\eta_J(p) \leq \eta_N(p) \tag{D.12}$$

Proof. See Appendix E.2. □

In words, when the share of Jews in the population increases, the wage of Jews is more negatively affected than that of non Jews. Note that it could still be the case that for a given p, an increase in the share of Jews increases the average wages of Jews (e.g., $\eta_J > 0$), but this increase would be less than for non-Jews.

D.6 Discussion

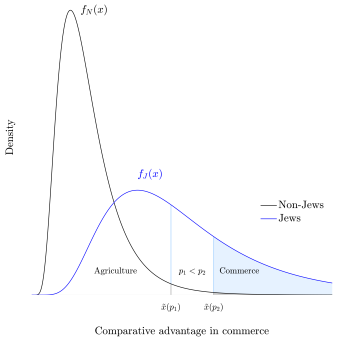
The diagrams in Figure D.4, based on a simulation, illustrate the comparative statics predicted by this model. In diagram D.4a, the curves f_N and f_J represent the densities of comparative advantage in commerce of Jews and of non-Jews, satisfying the first-order stochastic dominance assumption.[78] When the share of Jews is p_1, all workers to the right of the reservation degree $\tilde{x}(p_1)$ are employed as commerce workers, and the rest in agriculture. When Jews' share increases to p_2, the reservation degree increases to $\tilde{x}(p_2)$, and the mass of workers between $\tilde{x}(p_1)$ and $\tilde{x}(p_2)$ are now employed in agriculture rather than in commerce. This results in the curves that are illustrated in diagram D.4b. As the share of Jews increases, the share of commerce workers within each ethnicity decreases. Additionally, under the specification of this simulation, the total share of commerce workers out of all subjects increases, though as mentioned above, this may not happen in certain cases.

Diagram D.4c exemplifies the congestion effects predicted in Claim D.2. Normalizing the average wage of Jews and of non-Jews in the economy to 1 at the starting point of zero Jews ($p = 0$), a growth in Jewish density reduces average Jewish wages, as a result of the increase in the supply of prospective commerce workers. At the same time, the average wage of non-Jews slightly increases. Without further restrictions on the distributions and on the functional forms, one cannot determine that the two curves would indeed evolve in opposite directions.[79] However, to the extent that the example represents the ordinary cases, the rapidly declining wages of Jews would explain the inclinations of Jews to uniform dispersion across districts—districts with very few Jews would offer significant wage advantages specifically to Jews, whereas high congestion will be associated with low income.

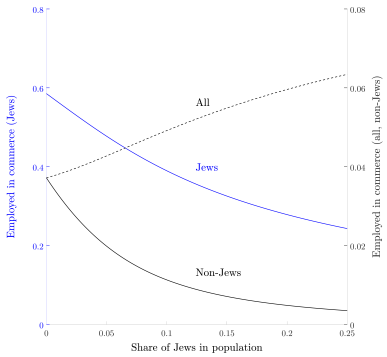
[78] In particular, both probability functions are log-normal, with the same variance parameter and greater mean parameter for Jews: $F_N(x) = \Phi((\log(x) - \mu_N)/\sigma)$, $F_J(x) = \Phi((\log(x) - \mu_J)/\sigma)$, with $\mu_N = 0, \mu_J = 1$, and $\sigma = 0.5$. The specification of the aggregation function and the production function are $Y = AK^{\alpha}L^{1-\alpha}$ and $L = (\gamma L_a^{\rho} + (1-\gamma)L_c^{\rho})^{1/\rho}$, with $\alpha = 1/3$, $\gamma = 0.9$, and $\rho = 0.5$. The Jewish labor efficiency is $\delta = 0.6$.

[79] For example, if the Jewish efficiency δ is extraordinarily low, the increase in Jewish density would mainly entail a decline in the total supply of effective labor of all types, thus increasing average wages of both Jews and non-Jews. Nevertheless, according to Claim D.2 it will always be the case that the Jewish curve will be tilted downwards relative to the non-Jewish curve.

(a) Distributions of comparative advantage



(b) Commerce employment by Jewish density



(c) Average wages

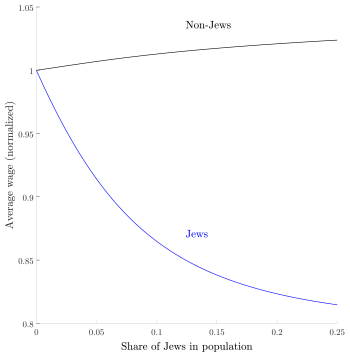


Figure D.4: Simulation

Notes: (a) The diagram illustrates how the change in the proportion of Jews in the district is positively associated with the reservation degree of comparative advantage, above which workers choose to be employed in commerce. The blue and the black curves represent the probability distribution functions of comparative advantage among non-Jews and Jews. The reservation degree as a function of Jewish density is $\tilde{x}(p)$. (b) The curves illustrate the functions of the share of commerce workers among Jews, non-Jews, and the the total population, given Jewish density in the district. (c) The curve represent the average wages of Jews and of non-Jews as a function of the share of Jews in the population, keeping capital and technology fixed. Both curves are normalized to equal 1 at $p = 0$. The curves are based on the following functional and parametric assumptions, in terms of the model in Section D: $L = (\gamma L_a^{\rho} + (1-\gamma)L_c^{\rho})^{1/\rho}$, $\gamma = 0.9$, $\rho = 0.5$, $\delta = 0.6$, $F_N(x) = \Phi((\log(x) - \mu_N)/\sigma)$, $F_J(x) = \Phi((\log(x) - \mu_J)/\sigma)$, where Φ is the cumulative normal distribution function, with $\mu_N = 0, \mu_J = 1$, and $\sigma = 0.5$.

The model does not explicitly deal with cities as distinct from the districts in which they are located. The underlying assumption is that Jews living in urban settings take part in a district-wide labor market, competing with other Jews and non-Jews in the wider environment rather than within their towns. One could think of a similar model in which cities have independent labor markets. The same predictions that previously were applied to the district-level correlations would follow, such that one would expect to see few towns without Jews or with a Jewish majority, as well as correlations between the share of Jews and the share of workers in commerce discussed above. I test the predictions of such an alternative urban model in Section 4, and I find no support for an assumption that there were town-specific labor markets. Additionally, another alternative assumption would be that Jews are metropolitan types, meaning that they have comparative advantage in larger urban settings, in the sense that their labor is relatively more efficient there. The prediction that would follow from this assumption would be that Jews would be increasingly over-represented in larger cities. In Section 4 I show that this was not the case in the Pale of Settlement. However, as I show in Section 5, Jews did became a metropolitan minority in their new country.

The assumption that the labor markets are at the level of the district, and not at the level of a subdivision of the districts (that is nevertheless greater than a locality), is an arbitrary one, motivated by the availability of the data. I reality, it is quite plausible that Pale districts, whose average area was roughly twice as large as an average US county, were wider than the effective labor market for most occupations. To the extent that districts were indeed aggregations of smaller markets, the empirical analyses in this paper that apply to districts would in fact bundle several units together, which means that some useful variation would be averaged out, yet the general patterns should still pass through.

In this rather simplistic benchmark model, the share of commerce workers among Jews and among non-Jews is *only* a function of the share of Jews in the labor market, and not a function of the level of capital or total factor productivity in the district. To the extent that the model holds in reality, there is no reason to suspect that the endogeneity of the share of Jews would bias the relation found between the share of Jews in the district and the share of commerce workers within each ethnicity. That is, the share of Jews in the economy may be endogenous, in the sense that Jews may be more attracted to districts with better TFP

or higher wages, but the relation predicted by the model is independent of that. Endogeneity would be a problem if, for example, there would have been occupation-specific labor-embodied capital or technology.[80] In such a case, the correlation between Jewish density and the share of commerce workers among Jews would potentially be affected by the availability of better commercial technology and commercial capital.

E Proofs

E.1 Proof of Claim D.1

First, I show that given a reservation degree $\tilde{x}$, the share of commerce-to-agriculture labor $l_c(\tilde{x}, p)$ is increasing in the share of Jews p among the population of workers. Define q, the share of Jews adjusted to their absolute efficiency advantage, as $q \equiv \frac{p\delta}{p\delta+1-p}$. Clearly, q is a strictly increasing function of p. Rewrite equation D.9 as

$$l_c(\tilde{x}, q) = \frac{\int_{\tilde{x}}^{\infty} \left(qxf_J(x) + (1-q)xf_N(x)\right) dx}{qF_J(\tilde{x}) + (1-q)F_N(\tilde{x})}, \tag{E.13}$$

by dividing both the numerator and the denominator by $p\delta + 1 - p$. The derivative of the denominator with respect to q is $F_J(\tilde{x}) - F_N(\tilde{x}) < 0$ for all $\tilde{x} \in (0, \infty)$, where the inequality is assumption D.1. The derivative of the numerator in equation E.13 with respect to q is

$$\frac{\partial}{\partial q} \int_{\tilde{x}}^{\infty} \left(qxf_J(x) + (1-q)xf_N(x)\right) dx = \int_{\tilde{x}}^{\infty} xf_J(x)dx - \int_{\tilde{x}}^{\infty} xf_N(x)dx \geq 0, \tag{E.14}$$

where the inequality follows from first-order stochastic dominance (assumption D.1). To see that, define $F_J^{\tilde{x}}$ such that $F_J^{\tilde{x}}(x) = F_J(\tilde{x})$ for all $x \in [0, \tilde{x})$ and $F_J^{\tilde{x}}(x) = F_J(x)$ for all $x \geq \tilde{x}$, and similarly define $F_N^{\tilde{x}}$ using F_N. It follows that $F_J^{\tilde{x}}(x) \leq F_N^{\tilde{x}}(x)$ for all $x \in [0, \infty]$ (that is, weak first-order stochastic dominance is preserved), and therefore $\mathbf{E}_{F_J^{\tilde{x}}}(x) \geq \mathbf{E}_{F_N^{\tilde{x}}}(x)$. Since $\mathbf{E}_{F_J^{\tilde{x}}}(x) = \int_{\tilde{x}}^{\infty} xf_J(x)dx$, and similarly for N, the inequality in equation E.14 holds.

Since the numerator in equation E.13 is decreasing in q, and the denominator is weakly increasing, it follows that $\partial l_c(\tilde{x}, q)/\partial q > 0$, and therefore that $\partial l_c(\tilde{x}, p)/\partial p > 0$.

Finally, since the equilibrium $\{l_c^*(p), \tilde{x}^*(p)\}$ is set at the intersection of the increasing $\tilde{x}(l_c)$ curve and the decreasing $l_c(\tilde{x}, p)$ curve, the fact that an increase in p shifts the latter outwards implies that $\partial l_c^*(p)/\partial p > 0$ and $\partial \tilde{x}^*(p)/\partial p > 0$. ■

E.2 Proof of Claim D.2

Denote the marginal productivity of aggregated labor by $w = \frac{\partial Y}{\partial L}$, and the marginal contribution of labor in occupation $s \in \{a, c\}$ to aggregated labor by $\hat{w}_s = \frac{\partial L}{\partial L_s}$, such that the wage in occupation s is $w_s = w\hat{w}_s$. Given K and A, both elements of the multiplication are functions of $\tilde{x}(p)$.

Using these notations (while omitting the equilibrium symbols, as well as the dependence of w, $\hat{w}_a$, and $\hat{w}_c$ on $\tilde{x}$, and of $\tilde{x}$ on p, for clarity), and following equation D.11, the average wage of ethnicity g is

$$\begin{aligned} w_g(p) &= w\left(\hat{w}_a \int_0^{\tilde{x}} e_{ia} f_g(x)dx + \hat{w}_c \int_{\tilde{x}}^{\infty} e_{ic} f_g(x)dx\right) \\ &= e_g w\left(\hat{w}_a F_g(\tilde{x}) + \hat{w}_c \int_{\tilde{x}}^{\infty} xf_g(x)dx\right) \\ &= e_g w_c\left(\tilde{x}F_g(\tilde{x}) + \int_{\tilde{x}}^{\infty} xf_g(x)dx\right) \end{aligned} \tag{E.15}$$

[80] An example in which there is a sector-specific labor embodied technology is when labor is aggregated according to $L = (\gamma(A_aL_a)^\rho + (1-\gamma)(A_cL_c)^\rho)^{1/\rho}$.

where $e_g = 1$ for non-Jews and $e_g = \delta$ for Jews, and the last equality follows from equation D.7 (in equilibrium, the reservation wage equals the MRTS, the ratio of marginal contributions of labor in the two occupations: $\tilde{x} = w_a/w_c$).

Using equation D.11 to derive the elasticity η_g, and employing the notations $\eta_{w_c} = \frac{\partial w_c}{\partial p} / \frac{w_c}{p}$ and $\eta_{\tilde{x}} = \frac{\partial \tilde{x}}{\partial p} / \frac{\tilde{x}}{p}$, we have[81]

$$\begin{aligned}\eta_g(p) &= \eta_{w_c} + p\frac{\partial \tilde{x}}{\partial p} \cdot \frac{F_g(\tilde{x}) + \tilde{x}f_g(\tilde{x}) - \tilde{x}f_g(\tilde{x})}{\tilde{x}F_g(\tilde{x}) + \int_{\tilde{x}}^{\infty} x f_g(x)dx} \\ &= \eta_{w_c} + \eta_{\tilde{x}} \cdot \frac{\tilde{x}F_g(\tilde{x})}{\tilde{x}F_g(\tilde{x}) + \int_{\tilde{x}}^{\infty} x f_g(x)dx}. \end{aligned} \tag{E.16}$$

The last element, that could be interpreted as the share of labor income earned in agriculture by ethnicity g, satisfies for all $\tilde{x} \in (0, \infty)$

$$0 \leq \frac{\tilde{x}F_J(\tilde{x})}{\tilde{x}F_J(\tilde{x}) + \int_{\tilde{x}}^{\infty} x f_J(x)dx} \leq \frac{\tilde{x}F_N(\tilde{x})}{\tilde{x}F_N(\tilde{x}) + \int_{\tilde{x}}^{\infty} x f_N(x)dx}, \tag{E.17}$$

since $\int_{\tilde{x}}^{\infty} x f_J(x)dx \geq \int_{\tilde{x}}^{\infty} x f_N(x)dx$ (see proof within Appendix E.1), and $\tilde{x}F_J(\tilde{x}) < \tilde{x}F_N(\tilde{x})$ (by Assumption D.1). Since $\eta_{\tilde{x}} > 0$ (following Claim D.1), we have that for all $p \in [0, 1]$

$$\eta_J(p) \leq \eta_N(p). \tag{E.18}$$

■

F Town size and Jewish density: Regressions

In Figure 2, it appears that the share of Jews within the locality is a diminishing (or at least not an increasing) function of its size, beyond a small size of 2,500–5,000 inhabitants. The evidence is based on plain descriptive statistics. However, it could be, for example, that smaller towns were more prevalent in areas where the overall share of Jews was smaller, or that otherwise given town characteristics (other than size), Jews were conditionally more represented the larger it was.

Table F.6 addresses these issues. Column 1 in panel A. reports the coefficient of a regression of Jewish density on the log of the total population of the town. The sample includes all towns in the shtetlach data that have at least 5,000 inhabitants. The coefficient (-0.037, significant at 1%) implies that a doubling of the size of the city is associated with a reduction in the share of the Jewish population by 2.57 percentage points, about one-tenth of a standard deviation. This is a reflection of the slight downward trend above 5,000 seen in Figure 2, as well as in the non-parametric regression in Figure F.5.

The remaining columns add controls to the equation. Adding geographic controls and then province-fixed effects (columns 2 and 3) reduces the coefficient to an economic and statistical zero. Adding control for the share of Jews in the district, which is possibly the most important factor affecting the share of Jews in the town, increases again the absolute magnitude of the coefficient (-0.023, not statistically significant). The final column adds district fixed effects. Noting that on average there are less than 2 towns above 5,000 in a district, yielding a very large number of fixed effects relative to the number of observations, the result is still the same—zero correlation between the size of the town and the share of Jewish residents. Panel B. repeats the same specifications, but for the sample of gorods only, still above 5,000. The purpose is to address the problem of selection into the sample based on the 10% cutoff of Jewish population. The results are identical.

In sum, there is no evidence whatsoever that beyond the class of small towns, Jews had a greater degree of over-representation as towns grew larger. The downward trend may or may not have been a result of regional or geographic variation, but there certainly was no upward trend.

[81] It is useful to recall here that the elasticity of multiplied functions is the sum of their elasticities.

Table F.6: Town size and Jewish density

	Share of Jews in town				
	(1)	(2)	(3)	(4)	(5)
A. *All towns* $> 5,000$ (mean = 0.439, std. = 0.242)					
Town population (log.)	-0.037^a	-0.013	-0.006	-0.023	-0.000
	(0.011)	(0.011)	(0.012)	(0.015)	(0.026)
Jews in district				1.051^a	
				(0.328)	
Constant	0.760	1.870			
	(0.104)	(0.501)			
Observations	424	424	424	424	424
R-squared	0.022	0.393	0.476	0.505	0.723
P-val. (F)	0.002	0.000	0.000	0.000	0.000
B. *Gorods* $> 5,000$ (mean = 0.407, std. = 0.187)					
Town population (log.)	-0.037^a	-0.012	-0.017	-0.042^c	0.009
	(0.013)	(0.015)	(0.016)	(0.024)	(0.123)
Jews in district				1.009^b	
				(0.419)	
Constant	0.754	0.929			
	(0.133)	(0.710)			
Observations	263	263	263	263	263
R-squared	0.029	0.554	0.675	0.703	0.933
P-val. (F)	0.009	0.000	0.000	0.000	0.000
Geog. controls	No	Yes	Yes	Yes	Yes
Fixed-effects			Prov.	Prov.	Dist.

Notes: Each observation is a town within the Pale with at least 5,000 inhabitants. In Panel A., all towns in the shtetlach data are included, and the Jewish population is measured by relgion. In Panel B., only gorods are included and the Jewish population is measured by mother-tongue. Geographic controls are indicators for proximity to the sea and to a large river, and region-specific elevation, longitude, and latitude. Standard errors, in parentheses, are clustered by province.
Significance: $^a : p < 0.01$; $^b : p < 0.05$; $^c : p < 0.1$.
Source: 1897 Russian Census, localities volume and provincial volumes, Table XXI.

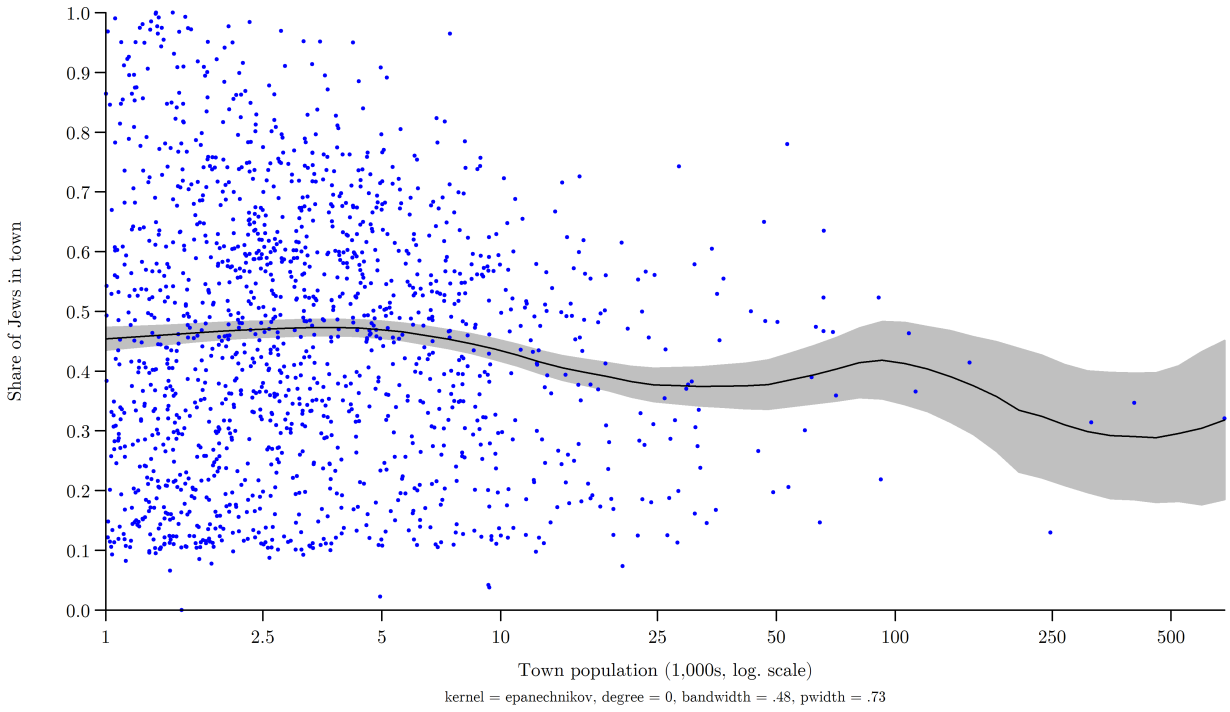


Figure F.5: Town size and Jewish density: non-parametric regression

Notes: The figure depicts a local polynomial regression of the share of Jews in the town on the population of the town. Each dot represents a single town in the shtetlach data with population above 1,000 (1,510 towns). Notice that in general, towns that have less than 10% Jewish population are not included in the shtetlach data. The line represents the local polynomial smoothing, and the shaded area is the 95% confidence interval. Jews are defined by religion.