Pale in Comparison

The Economic Ecology of the Jews
as a Rural Service Minority[*]

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Abstract

The five million Jews who lived in the Pale of Settlement at the turn of the century were overwhelmingly over-represented in towns and in cities. They specialized in seemingly urban occupations, were relatively literate, and were almost absent in agriculture. This pattern persisted overseas where one third of them would eventually immigrate. Hence, Jews were typically characterized as an urban minority. I argue that the opposite was true. The economic ecology of the Jews, the patterns of choices of occupation and location, are described in a model in which Jews were countryside workers with a comparative advantage in rural commerce, complementing agricultural workers, and without comparative advantage in denser urban settings. Using data from the 1897 census, I show that the cross-sectional patterns across districts and localities were consistent with all the predictions of this model. When the share of Jews in the population grew, Jews spilled across two margins—occupational, as manufacturing workers, and geographic, as rural frontier men. Non-Jews were imperfect substitute for Jews, rendering the latter indispensable to the countryside economy. No evidence of urban advantage is evident in the data. Turn of the century Pale of Settlement Jews ought to be understood as rural workers, in and of the countryside. In this light, the patterns exhibited in the US after immigration appear as a sharp break from, rather than a continuation of, old country economic tradition.

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1   Introduction

Jews are typically considered to have been a quintessentially urban minority. Since the Early Middle Ages, in almost every country and period in which they developed significant communities, Jews clustered in urban environments, specialized in urban occupations, and were only rarely directly employed in agricultural labor.[1] 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 in which Jewish residence was generally allowed—that was home to five million Jews, more than half of world Jewry at that time. In the words of Jacob Lestschinsky, arguably 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).

I propose to modify this consensus, by asking whether Jews were really urban or rural agents. From a narrow economic perspective, I suggest to view Pale of Settlement Jews as a rural service minority. I show that explaining the patterns of settlement and occupation—the *economic ecology*— practiced by Jews in the Pale of Settlement during the late imperial period, requires thinking of them as a rural, not an urban, organism, the countryside its habitat.[2] This economic ecology had been qualitatively different from the metropolitan nature the Jewish communities 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 rural district and showed no particular preference for larger urban environments. I explain the economic ecology of Pale of Settlement Jews using a model of an ethnically segregated labor market in a partial spatial equilibrium. This model considers Jews as complementary labor force to the non-Jewish largely agricultural labor within a local rural economy. The model predicts a number of empirical patterns that characterize the Jewish economic ecology; some of these patterns were hitherto unknown, unnoticed, or merely speculated due to lack of data. I use newly coded data from the 1897 Russian Census to motivate and justify the assumptions of the model, and to test its predictions.

In this model, two ethnicities, Jews and non-Jews, live in a rural economy that uses labor of two types of occupations: agriculture and commerce. Agricultural labor and commerce labor are imperfect substitutes. The primary underlying assumption is that Jews on average have comparative advantage in commerce and comparative disadvantage in agriculture, such that as a result, Jewish and non-Jewish workers are effectively themselves imperfect substitutes. Within each ethnicity, there is heterogeneity in the individual degree of comparative advantage in commerce, and in equilibrium these distributions of comparative efficiency between the two occupations determine the labor supply.

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[1]   On the historical process that brought about this specialization, see Botticini and Eckstein (2012).

[2]   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.

Labor of both occupations exhibits decreasing returns to scale. Workers choose an occupation freely within a district-level labor market, according to where their marginal productivity of labor is higher. Jews can migrate across districts, but migration is costly. Thus Jews face two margins: an occupational frontier and a geographical one. When the marginal productivity of commerce labor declines, Jews are increasingly likely to opt out of commerce, or to migrate to another district. The model describes a state of partial equilibrium, in the sense that each worker chooses the occupation that maximizes his income within the district, but differences in wages across districts may exist. Migration across districts is not formally incorporated into the model, but it is useful to think of broadly-defined costs of migration that enable differences in wages to persist across districts. Some migration does take place gradually over time, flowing from districts of lower wages to districts of higher wages. For Jewish workers, this would mainly imply migration from districts in which Jewish density is high, and thus commerce wages are low, to districts in which Jewish density is low and commerce wages are higher. Non-Jews also face the occupational margin; despite being disadvantaged in commerce, when the marginal productivity in commerce is sufficiently high, a larger minority of non-Jews opts for commerce.

This simple model of Jews as a rural service minority makes several non-trivial testable predictions. First, 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 immigration for sufficient amount of time, and to the extent that the costs of migration are not prohibitively high, higher wages in commerce will attract Jews, such that all districts will have a sizable Jewish minority. Cases of relatively low Jewish density will occur in regions in which the option to settle is new, and will reflect a state of partial equilibrium, with the density gap gradually offset by immigration from high density regions. Everything 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 model does not include cities as separate labor markets. This has two important implications, that are at odds with a view of Jews as a metropolitan minority, or one that places Jews in a town-level labor market, rather than a regional one. Thus, it is agnostic on whether Jews would choose to cluster in large cities. A competing model, one that would describe Jews as a metropolitan minority with comparative advantage in greater urban centers, would have predicted that Jews would be increasingly over-represented in larger cities. Furthermore, since in the model I propose the labor markets are at the level of the district, it does not predict patterns reflecting Jewish congestion at the level of the locality. The correlation between Jewish density and the total, Jewish, and non-Jewish shares of commerce workers will not exist at the level of the town, conditional on the degree of Jewish density in the district. The correlations will be found only at the level of the district.

This implies that there could exist "anti-shtetls"—small towns with hardly any Jews—without necessarily having extraordinarily high wages in commerce that would attract Jews. Similarly, there could exist towns that are almost entirely Jewish, without necessarily causing congestion effects in Jewish occupations that bring down Jewish wages.

I use the data from the 1897 Russian census to test these predictions. The volumes of this census provide the most detailed data source available on the world's largest Jewish community at that time. It describes in great detail the distribution of Jews and other ethnicities at the district-level, and on some dimensions also at the locality-level. I particularly make use of the fine-resolution data on the occupational distribution of Jews and non-Jews. The census provides a cross-sectional snapshot of the Pale of Settlement, with its 26 provinces, 246 districts, and 346 administrative towns, as well as thousands of smaller localities.[3] 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. Since most of the predictions of the model pertain to cross-sectional comparisons across provinces, districts, and towns, the empirical strategy of the paper is to test for the existence of cross-sectional correlations predicted by the model using OLS regressions and graphic representations of patterns in the data. The distributions and correlations tested in the empirical section are overwhelmingly consistent with the predictions of the model cited above.

A few clarification of terms are required here. As we shall see, in reality Jews were rarely employed in agriculture, and when outside of commerce they were typically seen in manufacturing occupations (and to a lesser extent, in personal and professional services). For simplicity, the two-occupations model presented in Section 3 bundles all non-commerce employment under "agriculture". The historical analog to bear in mind, however, is that when Jews opted out of commerce they became manufacturing workers, an occupational category in which they had less of a comparative advantage, and in which they competed with non-Jews on an equal footing. Also, while considering comparative advantage in certain occupations, I remain agnostic as to what is the source of this comparative advantage—be it literacy (as in Botticini and Eckstein (2012)), persistence of old traditions that were based on historical specializations and restrictions, or alternatively, a matter of cultural or religious tastes and preferences.[4] I take the approach of documenting that these observed preferences indeed existed, and taking them henceforth as given. While applying terms such as *preference* or *aversion* to occupational and residential choices throughout the paper, I intend it only in terms of observed behavior, without making statements about innate individual, ethnic, or cultural dispositions.

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[3] 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 was previously within the Pale but was removed from it in the early nineteenth century; however, it was adjacent to the Lithuanian provinces of the Pale and it still had sizable Jewish communities.

[4] If the over-representation of Jews in commerce and their under-representation in agriculture reflected preferences that are independent of, or in addition to, actual comparative advantage in productivity terms, then the model would be somewhat altered. The main predictions would still follow.

To be clear, the rural-urban distinction used here is a narrow one, referring only to the labor market in which Jews take part, as reflected by their joint choices of occupation and place of residence. Jews in the model are non-urban in the sense that they are not more productive in larger urban centers, and that they take part in a labor market whose extents are greater than that of their locality of residence. They are rural in the sense that although they are not employed in agriculture, they are part and parcel of the rural economy, and the labor input they provide enters the production function of a small rural region. As a simple example, consider a small rural region in which the primary form of capital are lands on which grains could be produced. In order to produce the final goods using the land, certain types of labor are required: agricultural laborers who till the soil; grain traders who bring in seeds and transfer yields from the field to the market; craftsmen who produce and repair basic tools, clothes, and consumer goods; and peddlers and shopkeepers who provide staples and consumer goods in the villages and in the local market. Jews prefer to trade, to keep shops, and to peddle. When these occupations are crowded, many of them will become tailors, shoemakers, and blacksmiths. In any case, their labor goes into to the production function of the small region, joint with agricultural labor, both interacting with land to produce the final output.

A traditional explanation rationalizes the close association between Jews and towns on economies of scale that are not necessarily related to the labor market. True, keeping up the basic institutions of a Jewish community may have been harder in small clusters, and larger communities could offer a wider variety and quality of Jewish amenities. This is a possible explanation, though not the only one, for why Jews were less likely to live in villages than in cities. But the evidence suggests that economies of scale were quickly exhausted. As opposed to the customary description of Jews as an inherently urban ethnicity, a description that was supported by some previous readings of the 1897 Russian census, and strengthened by the experience of twentieth century patterns of settlement, I find little evidence that Jews, on the whole, were lured by truly urban environments. Some of them surely were, and indeed the trend had already been shifting toward metropolization before the turn of the century, but they were not representative of the larger pattern. In fact, the opposite may have been true.

Finally, I show how different the patterns of Jewish settlement in the US were in the early twentieth century. The overseas migration was truly dominated by the American metropolitan frontier, not the rural frontier as in the Pale. This was a radical break away from past patterns, whose dimensions should be reconsidered. American Jews not only avoided the villages, they also avoided the countryside as a whole. Jews were more likely to be found in larger urban centers, and this pattern was not due just to the main Jewish clusters in New York and the other American metropolises—it was strikingly persistent and monotonous all across the distribution of locality sizes. Neither could this pattern be explained as a part of a common experience shared by other groups of recent immigrants from the European periphery. Jewish rural commerce workers were mysteriously absent in the rural American frontier. A few of them indeed found their way there, but their numbers

were puzzlingly low. Turning their back on a centuries-old tradition that still dominated their economic ecology in the old country, American Jews resigned at once from their role as a rural service minority, vigorously moving against the current of comparative occupational advantage.

I argue that on the basis of their behavior in Russia, the transition of Jewish migrants to the American patterns would have been hard to predict, and that retrospective standard explanations of the metropolization of American Jewry leave a large unaccounted-for residual. I suggest to put more weight on the different substitution patterns between Jewish and non-Jewish labor in the US, compared to those that prevailed in Russia. The absence of Jews from the American countryside and small towns was not due to the Jews being inherently metropolitan. They were not. The same model I suggest for the economic ecology of Jews in Russia may propose a partial answer for the radical changes in their settlement in the US. It may well be that these rural areas and small towns would have been their natural habitat in the US as well, but unlike in Russia, their roles had already been taken there.

I proceed as follows: In Section 2 I provide a brief survey of the historic and the historiographic background. Section 3 presents a formal model, Section 4 describes the data sources, and Section 5 demonstrate the patterns in the demographics of the Pale of Settlement that motivate and justify the assumptions in the model. I test the model empirically in Section 6, applying to the Pale of Settlement. As a contrast to the patterns observed in the data on the Pale, The American patterns of Jewish settlement and occupation are presented in 7. Finally, Section 8 concludes.

2 Background

2.1 A Brief History

Since the late Middle Ages, Jews had been settling the Kingdom of Poland and other eastern European territories that would become parts of the Polish-Lithuanian Commonwealth.[5] Under the Polish kings, Jews were granted liberties and privileges unknown elsewhere in Europe, and by the early modern period Polish Jewry had become the world's largest Jewish community. Integrated within the Polish feudal economy alongside serfs, townsmen and noblemen, they formed symbiotic relations with the Polish nobility as a class of middlemen, merchants, and craftsmen. The Jewish settlement was closely associated with the Polish private town, the *miastezcko*. These were countryside localities, owned by Polish magnates or lesser members of the nobility, 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 noblemen. Within these towns, Jews had privileges, but also duties. All were intended to augment the riches of the private estates by

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

invigorating the economic activity and generating tax revenues.[6]

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. Above all, they were lessees of agricultural estates and of local manorial monopolies: mills, fisheries, and not the least, liquor distilleries and taverns. In the grain-producing pre-modern Polish economy, the propination laws made the production and the provision of alcohol a manorial privilege of importance as a source of rent extraction—there was no taxation without intoxication. Jews were the agents on the ground, operating, managing, and assuming the risks on behalf of the principals. 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.

In larger cities, on the other hand, Jews faced tougher restrictions and competition from the Polish and German 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 townsmen and guilds, had centuries-long traditions of continuous attempts to ban, restrict, and repel Jewish residence and Jewish economic activity. A number of these were able to secure a royal privilege to not tolerate Jews within them.[7] If not banned from the city as a whole, such privileges and other regulations often restricted Jews to particular sectors or quarters of the 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 (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-Lithuania Commonwealth, augmented by the provinces of New Russia and Left Bank Ukraine.[8] 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.[9]

The early Russian bureaucratic intervention, partly hands-off with few direct anti-Jewish biases, favored the traditional Jewish economy and ushered in a "golden age" for the Jewish towns (Petrovsky-Shtern 2014). Under the new political circumstances, the shtetls became prosperous

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[6]   The pioneering work on the early social-economic history of Polish Jews by scholars such as Ignacy Schiper and Raphael Mahler has been recently augmented by studies such as Rosman (1990), Hundert (1992), Goldberg (1999), and Teller (2006). On the privileges that formed the judicial basis for the relations between Jewish communities and magnates see Goldberg (1985).

[7]   This was the *Privilegium de non tolerandis Judaeis*. This privilege was granted to some of the larger cities in Poland that by the end of the nineteenth century would be fully settled by Jews, such as Warsaw, Krakow, and Vilna. At least eighteen such privileges were documented for the period 1520–1600 (Baron 1976b, p. XX).

[8]   See details on the areas of new settlement in Section 4.

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

centers of local and international trade, in which Jews and non-Jews shared ground and often collaborated. 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.[10] 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.[11] 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.[12]

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.[13] The case of Odessa, the Pale's second largest Jewish community, embodied both.[14] 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 100 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, both for cities and for small towns, even for some agricultural settlements. 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.[15] From scant information on the occupational distribution of east-European Jews from the early nineteenth century, it appears that throughout the course of this century there has been a significant shift away from trade and into crafts. 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.[16]

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[10]   On the period of Tsar Nikolai I (1825–1855) see Stanislawski (1983).

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

[12]   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).

[13]   On the internal migration of Russian Jews see Stampfer (1995).

[14]   On the the Jewish community of Odessa see Zipperstein (1985). By 1897 Odessa had 140 thousand Jews, more than one third of the total population, and almost one-fifth of all Jews living in the region of New Russia.

[15]   See Mendelsohn (1970), Peled and Shafir (1987), and Lederhendler (2009).

[16]   The view that the standards of living of Pale Jews deteriorated over the course of the nineteenth century is a commonplace in the literature, but I am not aware of any robust quantitative evidence to suggest that there was

Thus, by the end of the nineteenth century, the economic and demographic outlook of Jews had already begun to go through the transformation from rural to metropolitan. At the beginning of this process, in the eighteenth and early nineteenth century, Jews were still undeniably 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 Quantitative Studies of the Pale

The modern scholarly attempts to understand the economics and the demography of the Jews in the Pale of Settlement using modern quantitative methods date back at least to the pioneering work initiated by the Polish convert and financier Jan Gottlieb Bloch (Minc 2004). Bloch founded in the 1880s a private statistical bureau, hired scholars,[17] conducted surveys, and issued a series of publications that amounted to an "economical statistical apologia of the Russian Jews" (Sokolow 1996, p. 348). The most significant advances in terms of collection of data on the Jews of the Pale came with the 1897 Russian census, whose publications appeared gradually until 1905, and with a special survey conducted by Baron Hirsch's Jewish Colonization Association (JCA).[18] The latter was a very detailed report that partly overlapped with the census, but also covered topics that were not surveyed in the census, such as wages, agricultural colonies, entrepreneurship and industrial labor. Unfortunately, the publications did not include detailed tabulations of the data, and thus it cannot be used in statistical and econometric analysis.

The reports and the data of the census and the JCA survey were soon used in a number of publications that took advantage of the breadth and depth of the newly available information on Russian Jews. At the very least they amounted to a summary version of the Jewish data, but some of them went beyond that and provided knowledgeable discussions and synthesis that, on the whole, have yet to be surpassed. Among them were Brutskus (1908, 1909) (in Russian), as well as extensive citation throughout the articles of the Russian Jewish Encyclopedia (Katsenelson 1906); Lestschinsky (1906) and Ruppin (1906a,b,c) (in German);[19] Lestschinsky (1922) in Yiddish; and in English Rubinow (1907) and an article in the American Jewish Encyclopedia by Lipman and Rosenthal (1907). During the interwar period, the 1897 census data, soon augmented by the 1926 Soviet census and by the Polish censuses of 1921 and 1931, were deployed in a short-lived but

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indeed an absolute decline, nor even that there was merely relative decline compared to non-Jews. The most advanced attempt to address these questions is Kopczyński (2011), who used height measures of conscripts in Warsaw. According to the stature data, Jews in Warsaw 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 Warsaw Jews was declining. I am not familiar with attempts to estimate real wages.

[17] Chief among them was Andrei Pavlovich Subbotin, a non-Jewish researcher who authored some of the publications initiated by Bloch.

[18] The French version of the JCA report was published in two volumes as Jewish Colonization Association (1906).

[19] These were published by the Bureau for Jewish Statistics (Bureau für Statistik der Juden), founded in 1904 by Alfred Nossig in Berlin and headed by Arthur Ruppin.

thriving scholarly and policy debate on Jewish demographics, often not-so-subtly guided by Soviet or Zionist ideologies.[20]

Since WWII, the primary contribution to the understanding of the economics of the Jewish communities in the modern world was a synthesis put forward in a long draft by Simon Kuznets from 1956, published in a short form in Finkelstein (1960), and in full only half a century later (Kuznets 2011). Kuznets relied heavily on prior compilations of the 1897 census data and on similar sources from other countries, largely the fruits of decades of research by Jacob Lestschinsky. His overarching claim was that the economics of 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" (ibid., Section II.3).[21] 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. In his later study of the Jewish migration from Russia (Kuznets 1975), he reiterated this point based on data on the four main regions of the Pale, and also suggested that there were visible substitution effects between Jews and non-Jews, in the sense that Jews may crowd out non-Jews from typical Jewish occupations.[22]

In a way, the current paper is an attempt to pick 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 have regarded a qualitative differences between the old-country patterns in the Pale and the new patterns in the New World and in western Europe. In this paper I emphasize instead that in some respects there were radical differences. In the Pale of Settlement, alongside

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[20]   For studies on the interwar demography of Jews and its ideological dimensions see Hart (2000), Alroey (2006), and Yalen (2007).

[21]   The notion that greater Jewish density was associated with lower rates of commerce employment among Jews 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 [...]" (ibid., p. 502).

[22]   See in particular Kuznets (1975, pp. 72–77).

the tendency to cluster in towns within the districts, there were in fact dominant centrifugal forces that created a pattern of dispersed settlement across districts. In the West, on the other hand, centripetal forces dominated, such that the Jews, who were previously a rural service minority, abandoned the countryside upon migration to their new countries and became a metropolitan minority.

Since Kuznets had written this draft, the Cliometric revolution that occurred soon after was all but absent in the study of the economics of the Pale. At the same time, social historians seemed to have been reluctant to use quantitative methods in this field, and in particular to explore more thoroughly the data of the 1897 census. The notable exceptions were few; namely, a number of studies by social historians Arcadius Kahan (collected in Kahan (1986a)), Shaul Stampfer, and Joel Perlmann,[23] as well as a paper on the settlement distribution by Rowland (1986a).

Two recent hypotheses are also closely related to this paper. Historical anthropologist Yuri Slezkine (2004) identified Jews, particularly Russian Jews, as a primary example of a wider phenomenon of service minorities. They were mobile, literate, trading, and better prepared for urban life, standing in social and economic contrast to the land-toiling majorities. 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 and sought access to commercial urban environments, but were unable to develop a viable and long-lasting presence in non-commercial rural economies. According to this hypothesis, the costly educational requirements meant that over the long run, Jewish communities could only survive when Jews were able to exploit the occupational advantage provided by literacy,[24] and that this could not occur in a mainly agrarian economy. Hence, Jews opted out of agriculture and away from the countryside and into the cities and urban pursuits. This paper follows both these hypothesis in seeing Jews as a minority with a particular occupational comparative advantage that could be regarded as exogenously given.[25] On the other hand, I argue that the predictions of the Botticini and Eckstein (ibid.) model regarding the settlement distribution of Jews ought to be modified 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.

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[23] See references throughout this paper.

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

[25] This view somewhat differs from Kuznets (2011), who highlighted the condition of Jews as a minority that may suffer discrimination and that had only recently arrived to the host economy, as factors explaining their occupational choice. The latter may have applied to the West and to the New World, but in the case of the Pale, it is hard to argue that Jews were in any sense 'recent'. In many cases they were among the first settlers of the eastern frontier, and their occupational choices followed centuries of economic engagement with the non-Jewish population.

3 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. After presenting the model, its implications and its relation to the reality in the Pale are discussed.

3.1 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:

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

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:[26]

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

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

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[26]   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).

varies across individuals within each ethnicity. In particular, the labor efficiencies of worker i in the two occupations a and c are:

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

and

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

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

3.2 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

$$w_{is} = e_{is}\text{MPL}_s \tag{5}$$
$$= e_{is}\frac{\partial Y}{\partial L}\frac{\partial L}{\partial L_s}. \tag{6}$$

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: $x_i > \text{MRTS}_{a,c}^L = \frac{\partial Y/\partial L_a}{\partial Y/\partial L_c} = \frac{\partial L/\partial L_a}{\partial L/\partial L_c}$. 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

$$\tilde{x}(l_c) \equiv \text{MRTS}_{a,c}^L(l_c), \tag{7}$$

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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:

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

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 $\tilde{x}$.

3.3 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 $L_c = \int_{\tilde{x}}^{\infty} (pI\delta x f_J(x) + (1 - p)Ix f_N(x)) \, dx$, 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:

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

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 7 and 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.[27]

Intuitively, in equilibrium two mechanisms that relate the reservation degree of comparative advantage to the share of commerce-to-agriculture labor are balanced. Equation 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 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.

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[27] 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 $\tilde{x}$.

3.4 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.[28] In particular, I make the following assumption:

Assumption 3.1 (Comparative advantage of Jews in commerce). *The distribution F_J first-order stochastically dominates F_N. That is,*

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

Under this assumption, the following claim holds:

Claim 3.1 (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 B.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.[29] 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.

3.5 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

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

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[28]   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.

[29]   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 3.1 then implies the following:

Claim 3.2 (Within-ethnicity congestion). *The within-ethnicity wage elasticity is lower than the cross-ethnicity wage elasticity. That is, given A and K, for all $p \in [0, 1]$*

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

Proof. See Appendix B.2.   □

In words, the claim implies that 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.

3.6   Discussion

The diagrams in Figure 1, based on a simulation, illustrate the comparative statics predicted by this model. In diagram 1a, 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.[30] 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 1b. 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 1c exemplifies the congestion effects predicted in Claim 3.2. 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.[31] However, to the extent that the example

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[30]   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 $\delta = 0.6$.

[31]   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 3.2 it will always be the case that the Jewish curve will be tilted downwards relative to the non-Jewish curve.

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.

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 6, 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 6 I show that this was not the case in the Pale of Settlement. However, as I show in Section 7, 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.[32] 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.

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

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4 Data

The main source of data is the 1897 census of the Russian Empire. I also make use of the 1920 US census (Ruggles et al. 2010), but as the 1897 census is an under-utilized and less familiar source, I dedicate to it the entire discussion in this section. It was the first and only attempt to perform a universal Empire-wide census enumerating the entire population.[33] Previously, there had been limited censuses in Russia that counted tax-paying households and later adult males. Throughout the nineteenth century several revisions were conducted, as well as a number of city censuses.[34] The previous attempt to enumerate the entire Jewish population of this region was the Polish Jewish census of 1764 (Stampfer 1989). As discussed above, the main patterns of the demography of the Pale of Settlement were repeatedly cited in a number of studies, but neither the data on the Jewish population, nor the data on the population as a whole, have yet been subjected to more rigorous statistical or economic analysis based on the full depth and breadth of the census tabulations.

4.1 Coverage and Administrative Structure

The primary source within the 1897 census are the provincial volumes, a series of 89 books, each dedicated to a single province (*guberniia*, in Russian) and containing an almost uniform set of tables. To understand the structure of the data, it is useful to follow the diagrams in Figure 2. Diagram 2a describes the main relevant geographic partitions. Congress Poland and European Russia formed the core of the empire, a region stretching from the Urals in the east to the borders of the German and the Habsburg Empires in the west. I coded data from all sixty provinces of this area.[35] The Pale of settlement 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 as a part of the Pale. Courland, formerly a semi-independent duchy, 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. 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 European Russia, named here *Inner Russia*.

The Pale was administratively divided into four regions: Poland, Lithuania (including much of current day Belarus, and augmented by Courland), the southwest, and New Russia. The latter comprised the four provinces bordering the Black Sea. It was a frontier land, taken from the

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[33] For general reviews of the 1897 Russian census see Clem (1986) and Bauer, Kappeler, and Roth (1991).

[34] For history of censuses in the Russian Empire see Schwartz (1986).

[35] Other parts of the Empire, on which I did not collect data, were central Asia and Siberia in the east, the Caucasus, and Finland. Central Asia and the Caucasus had a few thousand Bukharian, Georgian and Mountain Jews, that were culturally very different from the Ashkenazy Jews in the Pale. Jewish communities in other regions were numerically insignificant.

Ottoman Empire at the end of the eighteenth century. Although not part of the former Polish-Lithuanian Commonwealth, it was exempted from the restrictions on Jewish settlement and formed part of the Pale. Jewish settlement in New Russia was recent yet substantial, numbering more than 700 thousand Jews by 1897. Additionally, Left Bank Ukraine, the two eastern provinces of the southwest (Chernigov and Poltava), was historically a Polish-Russian borderland and prior to the partitions of Poland it had been a semi-autonomous Hetmanate under Russia. Similar to New Russia it was included within the Pale, with recent and rather sparse Jewish settlement. Thus, in some of the analysis I distinguish two areas within the Pale that had no administrative parallel: 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 somewhat less numerous, either because the settlement was recent or because it was restricted.

Diagram 2b shows the administrative hierarchy of the data. All of the tabulations go down at least to the level of the district (*uezd*, in Russian), a subdivision of the province. There were 246 districts within the Pale, and 343 more in Inner Russia. Within each district there was at least one administrative town, *Gorod*, and often two or more. The Gorod status was partly arbitrary. It would typically be assigned to the largest town or towns in the district, but at times Gorods were hardly larger than a village. On the other hand, many small or even medium towns were not Gorods, including 27 Pale localities with more than 10 thousand inhabitants. Some of the tabulations report data separately for each of the Gorods, and for the rest of the district outside of the Gorods, a category denoted here as *countryside*. It is important to highlight two issues regarding the countryside category: First, the countryside included not only villages, but also small and sometimes medium towns. The weight of these urban localities that were not Gorods within the countryside may vary arbitrarily across districts. Second, countryside effectively meant different things for Jews and for non-Jews. Outside the Gorods, as we shall see, Jews typically clustered in the small towns whereas non-Jews populated the villages.

4.2 Demographic Information in the 1897 Census

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 religion based-Jews.[36] The small fraction of Jews native in another language reflected the early processes of Polonization and Russification experienced in the the largest urban centers,[37] as well as in regions of new settlement and in inner Russia. Some of the cross-tabulations with ethnicities in the census

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[36] Every subject was assigned to some religion, and there is no reason to suspect that non-observant Jews would not be captured by this category, unless converted to another religion.

[37] 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 (Yekaterinovslav, Lodz, Kiev, Kishinev, and Vilna) the shares were above 0.9. In Courland, one-quarter of the Jews were native German speakers.

publications were based on mother tongue, while others were based on religion. The differences between the two must be kept in mind, but overall they are immaterial for the results in the current paper.

The data collected from the provincial volumes of the census include cross-tabulations by gender, age groups, ethnicity, and literacy at the district level, as well as separate tabulations for the Gorods and the countrysides, aggregated at the level of the province.[38] Furthermore, I coded tabulations of occupational distribution of Jews and of the total population that enumerate the number of workers and the number of their dependents in each of 65 occupations, for each Gorod and for each district. I adopted the classification of occupations to occupational sectors used by Rubinow (1907), who tried to make them comparable to contemporary American categorizations. In all of the above, the identification of Jews is by mother tongue.

An additional volume among the census publications listed all of the empire's localities that had more than 500 inhabitants (Tsentral'nyi Statisticheskii Komitet 1905). The entries include the total population counts, as well as counts for each religious group that comprised more than 10 percent of the total population of the locality. Thus, any significant Jewish community within any locality that had more than 500 inhabitants was listed in the volume. I coded all entries within the 60 provinces of Congress Poland and European Russia that included a count of the Jewish population, as well as the district affiliation of these localities.[39] I also collected population counts for a number of Jewish communities that were available from other sources at JewishGen's Communities Database.[40] The localities data has 1,982 Jewish communities, including the vast majority of the Gorods within the Pale, as well as many other towns and townlets.[41] In effect, it 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.[42]

5   General Patterns

This section examines the general demographic patterns of the Jewish population of the Pale of Settlement, and provides empirical justifications for the assumptions of the model. It shows the commonly cited facts, that typically led to the conception of Jews as an urban minority:

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[38]   Unfortunately, this means that there are no Gorod-level or districts countryside-level counts.

[39]   The Jewish Statistical Society in Petrograd published a compilation of the towns that had data on Jewish population from the localities volume ([Jewish Statistical Society] 1917). This compilation did not include the provinces of Poland, but it does include additional data on the larger localities from around 1910 based on newer sources.

[40]   See www.jewishgen.org/Communities/Search.asp.

[41]   Among them, 1,918 localities indeed had at least 500 inhabitants and more than 10 percent Jews. There were 42 towns that had Jewish communities under 10 percent listed, almost all of them very near the 10 percent threshold. Similarly, 26 towns were under 500 inhabitants, mostly shortly under the threshold.

[42]   Rowland (1986b, 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.

Jews were literate, lived in towns, shunned agricultural labor, and were equally likely to work in commerce as in manufacturing. A closer look, however, guided by comparison to the non-Jews and by observations of the more disaggregated patterns, reveals that there was an overwhelming preference for commerce, particularly rural commerce. Moreover, above a very low threshold of locality size there is no evidence of preference for larger localities.

5.1 Basic Statistics on Urbanization, Literacy, and Occupations

A casual glance at the data from the 1897 census supports the view that Jews were a quintessentially urban minority (see Table 1). 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 (including females) 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. This figure is dwarfed by the rate of agricultural workers among non-Jews, who with over 60 percent, typical for a pre-industrial economy, 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 percent of all 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, adequate for the similar shares within the Jewish labor force.[43] However, the comparison to non-Jews tilts the balance, shedding an image rotated by ninety degrees. The role of manufacturing and of commerce in the economics of the Jews was altogether different. While it seems that manufacturing was paramount, this 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. 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, more than 22 times

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[43] For a recent representative example see the article Economic Life in The YIVO Encyclopedia of Jews in Eastern Europe (Teller 2008).

over-represented relative to their share in the working population. In short, judging by their revealed comparative advantage, Jews had a strong inclination toward commerce, paralleled by an overwhelming aversion to agriculture. Manufacturing was a field in which they shared ground and competed with their non-Jewish neighbors.[44]

5.2 Disaggregated Occupational Distribution

Going beyond the aggregated occupational sectors, what were the most typically-Jewish occupations? As far as the share of Jewish workers employed in a given occupation out of the total Jewish labor force, Jews were indeed a nation of tailors and shoemakers. Out of the list of 65 occupations tabulated in the provincial publications of the census, the single most common occupation among Jews was manufacturing of clothes, with almost 16.6 percent of all workers. Adding to that 2.9 percent that were employed in a separate category titled "textile industry", possibly workers in industrial plants rather than workshops, almost one of five Jewish workers was employed in this branch of manufacturing (for the complete list of occupations and their statistics, see Table A2). Textiles was a major manufacturing sector, and quite a few non-Jews were also employed in it,[45] rendering Jews just barely the majority of clothes manufacturers, but no more than that.

However, these figures are not fully informative on the particular occupational preferences of Jews. One reason why textiles took a large share of Jewish employment was that it was a large sector overall. To understand better in which occupations Jews had the greatest comparative advantage, a better metric would be the degree to which Jews were over-represented at any given occupation, a measure that controls for the size of the sector in the labor market.[46] The top-12 occupations according to this ranking appear in Table 2. First, the occupation in which Jews were by far best represented was trade in grains. The likelihood of a Jew in the Pale to be employed in it was 62.5 times greater than that of a non-Jew. Nine out of ten grain traders were Jews. A distant second was employment as a non-Christian clergyman (39.9 times over-represented). With no more than a slight exaggeration, the comparative advantage of Jews in trading in grains was greater than in being a rabbi.

With the exception of a single light manufacturing industry (tobacco), all remaining ten occupations among 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 trade categories that are entirely or mostly rural: cattle; furs and leather; and structural material and

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[44] 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).

[45] Among non-Jewish workers there were 2.11 and 1.14 percent in the two categories of manufacturing of clothes and in textile industry.

[46] Over-representation of Jews is measured as the ratio of the likelihoods of Jews and non-Jews to be employed at each occupation. 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 occupation j, and N_j and N_{j^-} are the total numbers of Jewish and non-Jewish workers..

fuel, which covers the timber trade. Interestingly, within the textiles industry Jews were far more over-represented in trade (27.59) than in production (7.86), despite the fact that the latter was the numerically most frequent occupation.[47]

The other end of the distribution, the occupations with proportionately least Jewish relative representation, features the opposite pattern. Second from the bottom was farming (the statistics of the complete list of occupations are on Table A2). Although a non-negligible share of the Jewish labor force was working on the land (2.2 percent), this share was 26 times smaller than among non-Jews. 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.[48] 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,[49] where Jews were under-represented not least due to official or implicit discrimination.

These patterns all point out that behind the seeming balance between commerce and manufacturing, the place in which Jews truly had a comparative advantage was commerce, particularly rural commerce. The cases of the grains and cattle sectors are particularly telling: there was a virtually complete vertical disintegration in the countryside—non-Jews produced, and Jews traded.[50] The most typically Jewish occupation involved daily contact with the workers of the least Jewish occupation. The vertical division of labor along ethnic lines existed despite this proximity. Jews and non-Jews were therefore complements, rather than substitutes, in the countryside. In manufacturing, on the other hand, competition prevailed.

A fundamental problem in the economic lives of Jews during the late Imperial period was that only a fraction of the total population of any given district could have been gainfully employed in commerce, before hitting diminishing returns to scale. This problem was exacerbated by the relatively faster population growth of Jews, who grew five-fold through the course of the nineteenth century (Stampfer 1989), whereas the modern growth sectors of heavy industry, civil service, and professional service did not provide an alternative outlet. Much of the empirical analyses performed in this paper are dedicated to studying this problem and its implications.

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[47] 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 (1986b), and Kuznets (2011, Section III.1).

[48] It is unclear how many of the 179 Jews that were recorded in the census as Orthodox clergymen were actual converts who became priests, yet still reported Yiddish as their mother tongue, and how many of them were erroneously recorded. Likely mistakes could have been rabbis whose coding was mistakenly put as Christian Orthodox instead of non-Christian, or priests who were mistakenly recorded as Yiddish speakers. Similarly, additional 83 Jews recorded as non-Orthodox Christian clergymen, which in the context of the Pale of Settlement mainly meant Catholic and Lutheran.

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

[50] Potential advantages of vertical ethnic integration were discussed by Kahan (1986b, pp. 10–16). The discussion refers to fields in which Jews were employed in both production and distribution, such as textiles.

5.3 Urbanization

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,[51] 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.[52]

In Figure 3, towns within the Pale were grouped by ranges of total population. The black bars represent the share of Jews among the population of each group of towns. It is clear that Jews were increasingly represented within these groups up to the group of 2,500–5,000 inhabitants. Within this group, 48.7 percent of the total population of the localities were Jews. This, however, was the group with the densest concentration, and in all groups of towns larger than 5 thousand the share of Jews was 43 percent or less. It is hard to see a clear trend, but if there was one it certainly was not increasing: towns that are larger within the localities data did not have more Jews in them, quite possibly they had fewer.[53]

One of the traditional explanations for the concentration of Jews in smaller cities is that Jews 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.[54] Another large city, Kiev, was situated within the Pale, but was exempted from it for various historical reasons.[55] 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. But there were 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.

These statistics are based on the localities data, and this implies that the sample is not representative of the entire population in each of the bins. All (in practice, almost all) localities with Jewish communities under 10 percent of the total population are excluded from this data set. 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

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[51] 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.

[52] The discussion in this sections follows up on Rowland (1986b), the first, and to my knowledge the only study to analyze the Jewish localities data from the 1897 census. In what follows, I highlight cases in which my methods or conclusions deviate from Rowland's.

[53] 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.

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

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

density with respect to town size.[56]

To cross-verify this pattern, the grey bars in Figure 3 represent only the Gorods, on which data on the size of the Jewish community exists whether or not the Jewish community was greater than 10 percent. Conditional on the size of the towns, there is no particular reason to suspect that towns with more Jews were more likely to be designated as administrative towns, or that if there was such difference that it was was differential across town size (thus creating a spurious trend). However, the sample of Gorods is smaller, and provides a poorer representation within the groups of smaller towns.[57] As the figure clearly shows, within the Gorods the pattern is almost identical. The group with the greatest Jewish density is still 2.5-5 thousand, with an almost monotonously decreasing share of Jews in groups of larger towns.

In short, among the population of town dwellers within the Pale, Jews were not more urban than non-Jews, 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 7, in the US after migration this pattern completely broke down. Jews became the quintessentially metropolitan American minority.

6   Results

I now turn to examine the correspondence between the predictions of the model and the patterns in the data. In what follows, I emphasize distributions and correlations between variables. The historical setting does not enable a clear experimental design that would credibly identify the magnitudes of parameters. Instead, I show that the distributional patterns and correlations predicted by the model indeed exist in the data, and that they are strong enough to remove suspicions that they could be spurious, or generated by other mechanisms and not by those suggested by the model.

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[56]   The statistics of Jewish density by town size produced by Rowland (1986b) 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. Rowland found that the group with the highest Jewish density was the towns of 25-50 thousand (37.1 percent Jews), still higher than the figure for towns above 50 thousand (35 percent) but also higher than in towns of 5-10 thousand (25.3 percent).

[57]   Another difference in the measures of Jewish density between the localities and the Gorods data is caused by the different definition of Jews—religion-based in the former, mother tongue-based in the latter. This is the cause of the difference between the two measure among the top two groups, all members thereof are included in both samples.

6.1 Spatial Distribution

Plot 4a describes the distribution of districts in the Pale of Settlement by Jewish density. As can be seen from the right tail, not a single district out of the Pale's 246 had a Jewish majority, or even a Jewish density of over 30 percent.[58] Ninety-five percent of the districts had under 20 percent Jews. This is despite the fact that Jews amounted to more than a ninth of the total population, which would have enabled them to become majority in at least a handful of districts. The fact that Jews avoided district-level clustering can be easily explained by their occupational distribution. In a pre-industrial economy, where agricultural workers make up the vast majority within each given area that is not an urban center, an ethnic group that is absent in agriculture will not become a majority at any single land cell without picking up the plow.

The mean of the distribution is 10.5 percent, with standard deviation of 5.3 percent. Curiously it has two distinct peaks, and it appears to be bimodal. The two different shades show that in reality, this distribution indeed merged two separate and very different distributions: districts in the former Polish-Lithuanian Commonwealth, and districts in regions of new settlement—New Russia, Left Bank Ukraine, and Courland province. Former Commonwealth districts are on average much more Jewish-dense (12.5 versus 5.8 percent), with a rather restricted range, the standard deviation is 4.3 percent. Furthermore, the left tail of the former Commonwealth districts is bounded below at a rate of 3.7 percent. 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.

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 non-increasing, most likely decreasing, returns to Jewish labor. 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 have expected that at least in some districts Jews would be absent and replaced by other ethnic 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 the model, the 1897 snapshot shows a state of partial equilibrium in which the frontier still posed a relative attraction.

Did the pattern of distribution of Jewish population at the district level replicate itself also at the town level? This does not appear to be the case. Plot 4b shows the distribution of the share of Jewish population across all towns in the localities data (recall that the sample is partly left-

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[58] 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).

truncated, as towns with less than 10 percent Jews are not supposed to be included in it). The average locality in this sample had 44 percent Jews, but the distribution is very much dispersed. On the right tail, there is a small proportion of towns where nearly all of the population is Jewish. As can be seen by the lighter parts of the bars that report separately towns above 2,500 and 5,000 inhabitants, the right end of the tail is mainly composed of very small localities. But even for towns over 5,000, the average was 42 percent Jewish, and 10 percent of them had a Jewish population of above two-thirds. There seems to have been little crowding effect 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, it was 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 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 concentrated bell shape with a peak around 10-15 percent (for towns of the former PLCW), one would be hard pressed to find a similar peak representing an optimal Jewish density at the town level. If there were meaningful congestion effects under a rate of 70 percent or, conversely, shortage of Jewish labor at the lower end of the distribution, this histogram is mute about them. This is consistent with the assumption that the relevant unit of production is the district-level and not the town-level. Jews dwelling in towns provided services to the surrounding environment, and therefore the proportion of Jews in the town itself was not a good indicator to the degree of congestion of Jews in the labor market. What mattered was the Jewish density in the environment as a whole, and this is better captured by Jewish density at the district-level.

6.2   A Jewless and a Jewful Economy

Since non-Jews are imperfect substitute to Jews, 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. It is useful, first, to consider the differences between the Pale and Inner Russia. If any of the predictions of the model apply within a region in which Jews were free to settle and move around, one would expect them to be clearly visible when comparing this region as a whole with the region from which they 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 process of interaction between Jews and other ethnicities, and that in regions that did not have a history of Jewish presence other ethnicities would have established themselves instead in this niche.

In the two histogram on Figure 5, the bars represent the distribution of the share of commerce workers out of all labor force participants in the districts of the Pale (A) and the districts of European

Russian beyond the Pale (B). The difference between the two regions is large and unmistakable. In an average Pale district, the proportion of commerce workers was almost twice as in an average district outside the Pale (4.27 and 2.25 percent). The difference is almost one and a half times the standard deviation of this proportion beyond the Pale. Moreover, the distribution within the pale is bounded from below. Out of 246 Pale districts, only in four did the proportion of commerce workers fall below 2 percent, and the minimum was 1.87 percent. In contrast, in 52 percent of the districts beyond the Pale this proportion was less than 2 percent, and quite a few districts had under 1 percent. In a nutshell, where Jews were banned, there was far lower commercial employment. Where Jews were allowed, the rates were higher, and there was nowhere a commercial employment vacuum.

To assess the extent to which the difference in the prevalence of commerce labor across the two regions was attributed to the presence or absence of Jews, Figure 6 reports similar distributions within and beyond the Pale, this time for the share of commerce workers among the non-Jewish labor force only. The ordering of the two distributions is virtually reversed. Non-Jews were almost completely crowded out by the Jewish commerce workers. Whereas beyond the Pale the average district had 2.21 percent of non-Jewish workers employed in commerce, the average within the Pale was not even half as much. The bottom percentile of commerce employment beyond the Pale was roughly equal to the median within the Pale (0.6 percent). Notwithstanding possible 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 that the presence of Jews crowded out some potential non-Jewish would-be commerce workers.[59]

6.3 District-Level Correlations

The model makes predictions on the correlations between Jewish density and three variables: all else being equal, the share of Jews in the district would be positively correlated with the share of commerce workers out of all workers in the district; negatively correlated with the share of commerce workers among Jews, and negatively correlated with the share of commerce workers among non-Jews. The broad patterns are presented in Table 3. The Pale districts are divided to quartiles ordered by their degree of Jewish density, going from 3.8 percent in the bottom to 17.2 in the top quartile. The correlated variables are indeed ordered as expected. Among all workers in the district, the share of workers increases by two thirds, from 3.2 percent to 5.4 percent, from the bottom to the top quartiles. Among Jews, there is a monotonous decline from 39.1 percent to 27.6 percent, Similarly, among non-Jews the rates decline by almost three-fifths from the first to the third quartile, and they remain so at the top quartile.

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[59]   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 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).

Formal tests of the correlations are represented in Table 4.[60] Panel A reports district-level OLS regressions in which the dependent variable is the total employment in commerce. As can be seen in column 1, in which employment in commerce is regressed on the share of Jews in the district, larger Jewish population is indeed strongly and significantly associated with commercial activity (see also a graphic representation in the scatter plot and the non-parametric regression in Figure A1). A 1 percentage point increase in the share of Jewish population increases total commercial employment by 0.168 percentage points, which is 4 percent of the average. A coefficient of correlation of 0.576 implies that a one-standard deviation increase in the share of Jews is correlated with a 0.576-standard deviation increase in commercial employment. According to the R-squared, a full third in the variation in commerce is explained just by variation in Jewish density. Clearly, the prevalence of Jewish population is a first-order determinant of the rate of commercial employment.

Adding the rate of literacy to the regression in column 2, another variable that might be expected to be strongly correlated with commercial activity, does not change the coefficient on Jews. In fact, the literacy coefficient is slightly negative. Neither can the correlation between Jews and commerce be attributed to a tendency of Jews to concentrate in particular areas that may have a higher potential for commercial activity. This can be seen in columns 3 and 4, where regional and provincial fixed-effects are added. The within-region correlation was in fact stronger, and the within-province correlation was even stronger yet—within provinces, a district with 1 percentage point more Jews would have 0.261 percentage points more workers in commerce. However, even this coefficient is somewhat smaller than the average share of employment in commerce among Jews (0.32). This hints at a certain degree of decreasing returns to scale—when more Jews live in the district, they add a less-than-proportional number of commerce workers.

To see these decreasing returns to scale more clearly, Panel B. reports similar regressions where the dependent variable is the share of employment in commerce among Jews alone. The univariate regression in column 1 shows a remarkably strong and statistically significant correlation. (see also a graphic representation in the scatter plot and the non-parametric regression in Figure A2). When the share of Jews in the district is 1 percentage point greater, the share of employment of Jews in commerce decreases by 0.82 percentage points. The coefficient of correlation is -0.555, and the R-squared suggests that Jewish density alone explains 30.8 percent of the variation in Jewish commercial employment. The coefficient is somewhat attenuated as geographic fixed-effects are added, but even with provincial fixed effects, it is still -0.61.

The correlation between Jewish density and non-Jewish employment in commerce, reported in Panel C, shows a more nuanced pattern. Before controlling for geographic fixed-effects, there is negative and statistically significant correlation between Jewish density and non-Jewish commerce employment (-0.053 in both specifications). The coefficient of correlation is about half the magnitude seen in the regressions above (-0.241), and the R-squared is down by more than 80 percent to

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[60] See Kuznets (2011, Section II.3, Table 3) for a test of cross-country correlation between the share of Jews among the non-agricultural labor force and the proportion of Jews employed in various sectors.

0.058. The raw correlations thus reflect some degree of substitutability between Jews and non-Jews in commerce, but not overwhelmingly so. To the extent that such substitution existed, there is no evidence that it occurred at the regional level. Within region, this correlation is practically reduced to zero, and it is positive (0.038) and statistically significant at 5 percent when controlling for province fixed-effects. However, in all of the specifications in columns 2–4 the F-test is not significant, meaning that it is impossible to rule out that all coefficients are jointly different from zero. The third prediction of the model is thus not strongly affirmed: the predicted correlation existed across districts in the Pale as a whole, but there is no evidence that they existed within regions or provinces.

6.4   Town-Level Correlations

Did the negative correlation between Jewish commerce and Jewish density exist also across towns, or was it only a cross-district pattern? If there was such town-level negative correlation, that is, if within restricted regions similar towns with greater Jewish density had smaller shares of Jews employed in commerce, that would be consistent with a model in which the size of the commerce labor market is the locality.[61]   On the other hand, if within districts there was no systematic correlation between Jewish density and Jewish commerce, that would imply that the size of the labor market for occupations in trade was greater than the locality itself. Jews would crowd each other out only to the extent to which they were numerous at the district-level. Beyond that, the Jewish density at any given town, conditional on the district-level density, would not be predictive of the share of Jews in commerce.

Table 5 reports a series of OLS regressions, using the data on the occupational distribution in the sample of the 346 Gorods, that test the town-level correlation between Jewish density and Jewish commerce. In the univariate regression (column 1), the correlation is indeed negative and significant, but compared to the district-level regressions (Panel B in Table 4) it is rather weak, and the R-squared is much smaller (0.074). The regression reported in column 2 adds the size of the town and the degree of Jewish density at the level of the district. The coefficient on town-level Jewish density is now reduced by two-thirds, and it is no longer significant. On the other hand, the coefficient on the district-level Jewish density is an order of magnitude greater (-0.505), and significant at 1 percent. This turns out to be an econometric single-horse race—the Jewish density at the level of the town hardly adds predictive power on top of the district-level density.

In columns 3–4, region and province fixed effects are added. With each progressive addition, the coefficient on the district-level density is weakened (similar to Panel B in Table 4). This reflects that the intraregional allocation of labor was more efficient than interregional allocation. Since

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[61]   A similar idea was implied by Kuznets (1975, pp. 76–77). He believed that the correct variable indicating Jewish congestion was not the share of Jews among the total population, but among the urban population. He was not specific as to whether this meant that this congestion should be measured at the level of the locality or by wider geographic units.

it is reasonable to assume that migration within regions and provinces was easier than migration outside them, it could be that greater degree of efficient sorting of labor prevailed across districts within these units. For example, if two districts had different degrees of Jewish density, some Jews in the more crowded district would migrate to the sparser one, unless there was some difference in the fundamental economics of the two districts. Over time, the variations in occupational composition within provinces would reflect more of the underlying economic differences, and less of the differences in Jewish density, compared to the variation across provinces.

Finally, column 5 attempts to test the within-district correlation by adding district-fixed effects. The identification in this regression is based only on districts that had more than a single Gorod. The coefficient is practically zero. Given the large number of district fixed effects relative to the sample size, it is no surprise that the F-test turns out statistically insignificant.

6.5 Town Size and Commerce

The model does not make a prediction regarding the correlation between the size of the town and its occupational composition. Judging by the coefficient on log-town population in Table 4, there were in fact fewer Jewish commerce workers in larger towns (the specification with province fixed effects is significant at 1 percent). Table 6 sheds more light on the matter. Column 4 reports the share of Jewish workers employed in commerce out of the total Jewish labor force by towns size-based groups. The shares do not show a clear trend. The rate of Jewish commerce at the largest three cities is identical to the rate within the groups of 2.5-5 thousand and 5-10 thousand. The top row reports commerce employment in the countryside, and this is the group in which Jews had the highest rate of commerce employment. Among non-Jews, however ,the largest cities clearly had more commerce workers, while their share plummeted to 0.6 percent in the countryside.[62] Column 6 shows the relative share of Jews among all commerce workers in each group, and there is a clear difference between the smaller towns, where Jews were over 80 percent of the labor force in commerce, and the largest cities, where the rate was around 60 percent. The conclusion is that within commerce, non-Jews had comparative advantage in metropolitan commerce, whereas Jews leaned toward small town commerce.

Going back to the comparison between the Pale and Inner Russia, Figure 7 shows differences in commerce employment within population-based groups of towns. In the big cities beyond the Pale, non-Jews substituted more easily for the absence of Jews. In the groups of smaller towns, namely in the countryside and in towns under 5 thousand, the gap between the two regions was larger. In short, small town commerce in rural environment was the sector in which Jews specialized, and in which they had fewer close substitutes among the non-Jews. To the extent that the occupational choices of Jews reflected a comparative advantage in terms of labor efficiency, rather than

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[62] As discussed above, the countryside included the districts excluding the Gorods, which for Jews mainly meant very small towns and some villages, while for non-Jews it mainly meant villages.

productivity-neutral preferences and tastes, the laws restricting Jewish residency beyond the Pale caused a Russian-wide labor mismatch problem, that mainly left the Inner-Russian countryside understaffed with commerce workers.

6.6 Literacy

Another related piece of evidence comes from the distribution of Jewish literacy rates. As argued by Botticini and Eckstein (2012), from Late Antiquity to the Late Middle Ages the exogenously high rate of literacy among Jews generated among them a nexus between literacy, cities, and employment in commerce. On the other hand, as we saw above, beyond the inclination to avoid the villages, in the Pale there seems to have been no association of commercial activity and Jewish density with more urban centers. Furthermore, the regressions in Panel B of Table 4 do not show that there was positive correlation between Jewish literacy and Jewish commerce.[63] It turns out that there is some evidence that Jews in larger cities were somewhat more literate. But this large-city literacy premium was not very large, and it was of second order compared to the larger regional variation in Jewish literacy.

A brief comment on the reliability of the sources is warranted here. In the data of the 1897 Russian census, Jewish literacy was far from universal, even among adult males. Several generations of demographers, starting from the first scholars that analyzed the Jewish data soon after the census publications were issued, tended to discard the Jewish literacy data and deem them unreliable.[64] The suspicions of the reliability of the rates of literacy was based on comparison to a range of sources, both qualitative and quantitative, indicating that if complete illiteracy among adult Jewish males was not unheard-of, it was nevertheless rather rare. It is clear that basic Jewish literacy, a condition in which Jews were able to read the standard book of prayers (the *siddur*), 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. This means that Jewish literacy was measured using a higher threshold, and since the criterion that was effectively used was vague there must have been some noise caused by inconsistencies. However, this does not mean that the literacy data are uninformative, particularly when comparing across larger units.[65]

Unfortunately, the census does not provide locality- or Gorod-level data on literacy, but it does have aggregated 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 8. Each bullet represents a

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[63] Controlling for region fixed effects (column 3), the correlation is negative and significant. Within provinces (column 4), the coefficient is practically zero.

[64] See Lestschinsky (1906), Brutskus (1909), and Shabad (1908). For more recent studies see Stampfer (1987), that surveyed a large number of contemporaneous local sources, and Corrsin (1999).

[65] 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. He concluded that the 1897 rates of literacy reflected a reality and should not be dismissed.

single province in the Pale, and the diamond-shaped marker stands for all Inner Russia put together. The vertical axis stands for literacy of Jewish males of all ages in the Gorods, and the horizontal axis represents the same measure for each province's countryside.[66] On average, literacy in Gorods was 4.5 percent higher than literacy in the countryside. This was much less than the equivalent non-Jewish Gorods premium of 24 percent (see the non-Jewish literacy plot on Figure A3).

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. The coefficient of correlation between Gorod literacy and countryside literacy was 0.936 (compared with 0.701 for non-Jews). 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. 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, the likes of Aharon Ya'akov Dukhan.

7   Jews in the United States

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.[67] The 1920 Census recorded mother tongues (own's, mother's and father's), which enables a fairly reliable identification of the east-European Jewish population.[68] The question is, did Jews continue to follow the rural service minority model in their new country?

7.1   An Ignorant Prediction

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 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

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

[67]   For recent surveys and histories of the Jewish migration to the US see Alroey (2008) and **lederhendler2009**. On the economics of these migration see Kuznets (1975), Boustan (2007), **Spitzer2014-2**, and Spitzer and Zimran (2014).

[68]   The full sample of the 1920 became available short time ago. The current version still makes use of the one-percent sample, but future versions of this paper will use the full data.

textile workers, and New York was a textile manufacturing center, so Jews chose the place where they could use their existing human capital.[69] Jewish immigrants arrived to the US through the large port cities of the East Coast, therefore by default they clustered there.[70] Furthermore, Jews preferred to cluster in cohesive large communities,[71] partly because of their precarious condition as a minority, and partly because keeping up the institutions of a Jewish community had substantial fixed costs, which should have made larger communities more desirable and efficient to maintain. Finally, Jews were not the only minority of recent immigrants from the European periphery that revealed a newly-found overwhelming preference for the cities. They behaved similar to Poles, Italians, and Irish, many of whom had a rural background, yet they largely opted for the cities—settling the metropolises was an immigrant thing to do.

A comprehensive critical debate of all these explanations is beyond the scope here, but the following discussion will highlight some major weaknesses in each of them. The purpose is to point out how strikingly different was the way by which Jews settled America relative to prior patterns of settlement. On the basis of their experience in Eastern Europe, as reflected in the Russian census and the model above alone, one would make the following predictions: After migrating across the Atlantic, Jews would continue to do what they did since the late Middle Ages. Using their comparative advantage, they would tend to distribute evenly across space. Many would go to the large metropolises, but not disproportionally so. If the ports of entry happened to belong to the group of American metropolitan centers, then at first one might expect some clustering in those cities, but not in other very large cities. From the ports of arrival Jews would move in equal measures to the large, medium, and small towns, with no special preference for industrial regions. They would be equally likely to be found in Chicago as in a small town in Kansas, or in any of the myriad American railroad towns—Bozhedarovka's twins.

Indeed, there would be some qualitative differences. The US was an industrialized economy, yet the countryside was still vast—30.4 percent of Americans still lived on farms. Being a far smaller minority in the new country,[72] unlike in Russia it would have been virtually impossible to keep up a Jewish community in nearly every single small town. But that need not pose a problem—most small towns will not have a Jewish community, but there would be many Jewish clusters in some small towns. 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.[73] Since local congestion should not have occurred, there would be no problem of Jews crowding each other

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[69] 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 specializaiton in manufacturing see Perlmann (2000).

[70] For example, see Kahan (1978, p. 241). The main Atlantic ports of entry were New York, Boston, Philadelphia, and Baltimore. Exceptions to this rule were migration through the Canadian border, and a small movement of Jewish migrants that arrived through Galveston (Marinbach 1983).

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

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

[73] 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.

out of commerce. The occupational distribution would shift towards more trade workers relative to the Pale of Settlement.

In reality, none of this happened.

7.2 Jews Reinvented as a Metropolitan Minority

In Figure 9, the cumulative distribution of various American ethnic groups, based on the one-percent IPUMS sample of the 1920 US census, are plotted across the range of locality sizes (note the logarithmic scale on the horizontal axis). The ethnic groups are of first generation only, defined either according to mother tongue or to country of birth.[74] The metropolitan nature of the American Jews 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, and 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 ethnic groups of immigrants. 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.[75]

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 10, the over-representation of Jews is separately indicated for each town size-based group of localities (note the logarithmic scale on the vertical axis). For comparison, the over-representation of Italians is plotted alongside. 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 steadily and almost monotonously all the way down to the lowest groups: roughly equal representation in towns of 100-250 thousands, roughly half in 10-25 thousand, and finally 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

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[74]   Jews and Poles can only be properly identified by mother tongue. Henceforth, the term *Jews* will refer to subjects whose mother tongue was Yiddish. Using Yiddish as an identifier bundles former-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.

[75]   For recent studies on the Norwegian immigration see Abramitzky, Boustan, and Eriksson (2012a,b).

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, in how the preference for counties varied across the rural-urban scale. As against the rather uniform dispersion of Jews across Russian districts, Jews were virtually absent in many American counties.[76] 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 given the overall lower share of Jews out of the total population; however the Jewish representation across counties was much more clustered than that of other immigrant groups of comparable sizes.[77] That this was a reflection of a tendency to avoid rural environments can bee seen in Figure 11. The bars report the over-representation of Jews (and of Italians, for comparison), in groups of US counties ordered 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 in such counties, 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.[78] The disengagement of Jews from the countryside and from the rural economy could not have been more complete.

7.3 Remnants of the Rural Service Minority

Finally, it remains to see how the occupational choices of Jews were distributed. In the US, 50.4 percent of the Jewish labor force was employed in manufacturing occupations, and 30.8 percent was employed in commerce. To the extent that the two categories are comparable between the Russian and the American censuses, this implies a massive shift in the balance 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. Naturally, the two economies were so different that these figures are insufficient to tell whether American commerce was under-staffed, but no doubt, over-represented "only" 3 times, Jews were no longer kings of the trade castle.

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

[77] The figures for other immigrant groups were: Italians (b.p.), 572; Irish (b.p.), 762; Poles (m.t.), 440; Norwegians (b.p.), 524; Swedes (b.p.), 741.

[78] 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.

Unfortunately, the scope for making a perfectly analogous analysis over the US counties as was performed above for Pale districts is limited, as the one-percent sample does not enable to meaningfully measure the share of Jews and the occupational shares among Jews in most counties.[79] Furthermore, almost all Jews lived in urban counties, and the share of Jews in the county was thus very strongly correlated with the size of the city (as seen in Figure 10), such that it would be impossible to disentangle the effects of Jewish density from the effects of the size of the city. Nevertheless, Figure 12 is sufficient to suggest that vestiges of the rural service minority model did survive the migration, even if the general patterns that it had produced did not. The bars in the histogram indicate the over-representation of ethnic groups of immigrants within trade occupations, relative to their share in the population.[80] This pattern resonates with the old one from the Pale: the very few Jews who opted for the smaller localities were almost seven times over-represented in trade. They did specialize in the niche of small town trade, possibly peddling and agricultural commerce, but the numbers were negligible compared to the figures prior to migration. 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 rate of their representation with respect to the size of localities.

8   Conclusion

In this paper I proposed a model 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 clearly placed in rural services, the model explains the main patterns of the economic ecology of the Jews—some of which were well known, but others were not previously observed, or were observed yet misinterpreted. The fundamental state variable in this model is Jewish density at the level of the district, and several predictions on its distribution and on its correlation with other variables are confirmed in the data.

The Jewish population tended to approach a relatively uniform distribution across districts, such that there were neither Jewish vacuums nor Jewish majorities at the district level. Regions from which the Jewish population was banned had much less commercial employment due to the absence of Jews. In Regions of new 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 clearly identified at the intra-regional level. The overall effect was that fewer Jews implied less commerce. Furthermore, the level of the locality does not appear to be the unit in which Jewish density should have been measured—conditional on Jewish density at the district, the degree to which Jews crowded within any given town did not matter with regard

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[79]   The full sample may enable to do so.

[80]   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.

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to their occupational composition. This is a key observation showing that Jews did not belong to an independent urban economy, but were part and parcel of the countryside, living in small towns that were integrated within it.

In this light, I argue that the patterns of occupation and settlement in the US were, in fact, much 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 I show that 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 tend to settle large cities—Jews were metropolitan above and beyond their fellow urban immigrants of other nations. Given the sheer size of the switch in patterns, I suggest that traditional explanations are insufficient in accounting for this transition. Although I believe that the puzzle would still remain, I propose to assign greater weight to the precariousness of the niche of rural service. Jews would have wanted to provide rural services in the US, but the niche was relatively smaller, and no longer empty in their absence. Unlike in Russia, in the commercialized American economy Jews did have close substitutes, their historical occupational niche was all but filled by others.

Finally, returning to Lestschinsky's evaluation cited in the introduction, that east European Jews were urban people, the claim Lestschinsky was making was in fact that 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 from the current study is that even at the turn of the twentieth century it should not be taken for granted that Pale Jews were indeed urban people rather than rural. The rural-urban distinction was blurred at best, and in as far as their economic ecology, Jews were still a thoroughly rural service minority.

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Table 1: Occupational and residential specialization of Jews

| Category | In category among | | Share Jews within | Over-rep. of Jews |
	Jews (1)	Non-Jews (2)	(3)	(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	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.

Table 2: Occupational specialization of Jews—disaggregated descriptive statistics

			Percent in category among			
Rank	Occupation	Category	Jews (1)	Non-Jews (2)	Share Jews within (3)	Over-rep. of Jews (4)
1	Trading in Grain	Commerce	3.32	0.05	0.899	62.489
2	Clergymen, non-Christian	Prof. Services	0.39	0.01	0.851	39.889
3	Trading in Furs, Leather, etc.	Commerce	0.83	0.03	0.820	32.025
4	Trading in Structural Material and in Fuel	Commerce	1.84	0.06	0.809	29.713
5	Trading in Textile and Clothing	Commerce	2.78	0.10	0.797	27.590
6	Commercial Middlemen	Commerce	1.06	0.04	0.775	24.154
7	Trading in Metal Goods, Machinery, and Arms	Commerce	0.45	0.02	0.773	23.802
8	General Commerce	Commerce	6.36	0.27	0.772	23.716
9	Peddlers and Hucksters	Commerce	1.27	0.06	0.762	22.440
10	Cattle Trading	Commerce	1.09	0.05	0.750	20.998
11	Trading in all other Agricultural Products	Commerce	9.74	0.49	0.739	19.809
12	Tobacco, and Tobacco Manufactures	Manufacturing	0.53	0.03	0.733	19.205

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 occupation 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).

Table 3: Commerce and Jews—means by Jewish density

| Jewish density quartlile | N (1) | Jews (2) | Employed in commerce | | |
			All (3)	Jews (4)	Non-Jews (5)
Q1	61	0.038	0.032	0.391	0.016
Q2	62	0.090	0.040	0.322	0.010
Q3	61	0.121	0.044	0.293	0.007
Q4	62	0.172	0.054	0.276	0.007
Total	246	0.105	0.043	0.320	0.010

Notes: Each observation is a district within the Pale, including Courland Province. Jewish density is the share of (mother tongue) Jews within the distrct; the quartiles are ordered by Jewish density. 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. The averages are weighted by districts, not by population. Source: 1897 Russian Census, provincial volumes, Tables XXI and XXII.

Table 4: Commerce and Jews—district-level correlations

	Employed in commerce			
	(1)	(2)	(3)	(4)
A. All workers				
Jews	0.168^a	0.169^a	0.230^a	0.261^a
	(0.018)	(0.018)	(0.016)	(0.018)
Literacy		-0.014^b	0.009	0.022^b
		(0.006)	(0.006)	(0.009)
Constant	0.025	0.029		
	(0.002)	(0.002)		
R-squared	0.332	0.346	0.634	0.793
P-val. (F)	0.000	0.000	0.000	0.000
B. Jewish workers				
Jews	-0.818^a	-0.937^a	-0.761^a	-0.610^a
	(0.080)	(0.090)	(0.084)	(0.073)
Literacy		-0.114^a	-0.144^a	0.016
		(0.042)	(0.048)	(0.053)
Constant	0.406	0.463		
	(0.010)	(0.022)		
R-squared	0.308	0.328	0.509	0.714
P-val. (F)	0.000	0.000	0.000	0.000
C. Non-Jewish workers				
Jews	-0.053^a	-0.053^a	-0.006	0.038^b
	(0.018)	(0.016)	(0.013)	(0.016)
Literacy		0.022^a	0.036^a	0.052^a
		(0.006)	(0.006)	(0.012)
Constant	0.016	0.010		
	(0.002)	(0.002)		
R-squared	0.058	0.132	0.483	0.696
P-val. (F)	0.003	0.000	0.000	0.000
Fixed-Effects			Reg.	Prov.
Observations	246	246	246	246

Notes: Each observation is a district within the Pale, including Courland Province. Each panel reports regressions with different dependent variable, the share of commerce workers within the ethnic group. *Jews* is the share of (mother tongue) Jews within the distrct. *Literacy* is the rate of total literacy (Russian, non-Russian, and above-elementray), for all ages and genders, within each ethnic group. The share of commerce workers for each ethnicity is the total number of workers in commercial occupations, divided by the total number of workers in all occupations in the district. Robust standard errors are in parentheses.
Significance: [a] : $p < 0.01$; [b] : $p < 0.05$; [c] : $p < 0.1$.
Source: 1897 Russian Census, provincial volumes, Tables XV, XXI and XXII.

Table 5: Commerce and Jews—town-level correlations

	Jewish workers in commerce				
	(1)	(2)	(3)	(4)	(5)
Jews (town)	-0.113^a	-0.038	0.031	0.004	-0.005
	(0.035)	(0.048)	(0.032)	(0.031)	(0.088)
Jews (dist.)		-0.505^a	-0.305^b	-0.162^c	
		(0.153)	(0.122)	(0.092)	
Town population (logs)		0.002	-0.010^c	-0.016^a	0.053
		(0.006)	(0.005)	(0.004)	(0.036)
Constant	0.341	0.344			
	(0.017)	(0.059)			
Admin. unit FE			Reg.	Prov.	Dist.
Town size FE					Yes
R-squared	0.074	0.162	0.366	0.597	0.897
P-val. (F)	0.001	0.000	0.000	0.000	0.486
Observations	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 all Jewish workers. *Jews* are the share of (mother tongue) Jews within the town and within the district. Town size fixed-effects are indicators for town size-based groups, Standard errors are clustered at the level of the district.
Significance: $^a : p < 0.01$; $^b : p < 0.05$; $^c : p < 0.1$.
Source: 1897 Russian Census, provincial volumes, Tables XXI and XXII.

Table 6: Commerce and Jews by town size-based groups

			Shares			
				Commerce		
Group (1,000s)	Units	Population (1,000s)	Jews	Among Jews	Among Non-Jews	Jews in commerce
	(1)	(2)	(3)	(4)	(5)	(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.

(a) Distributions of comparative advantage

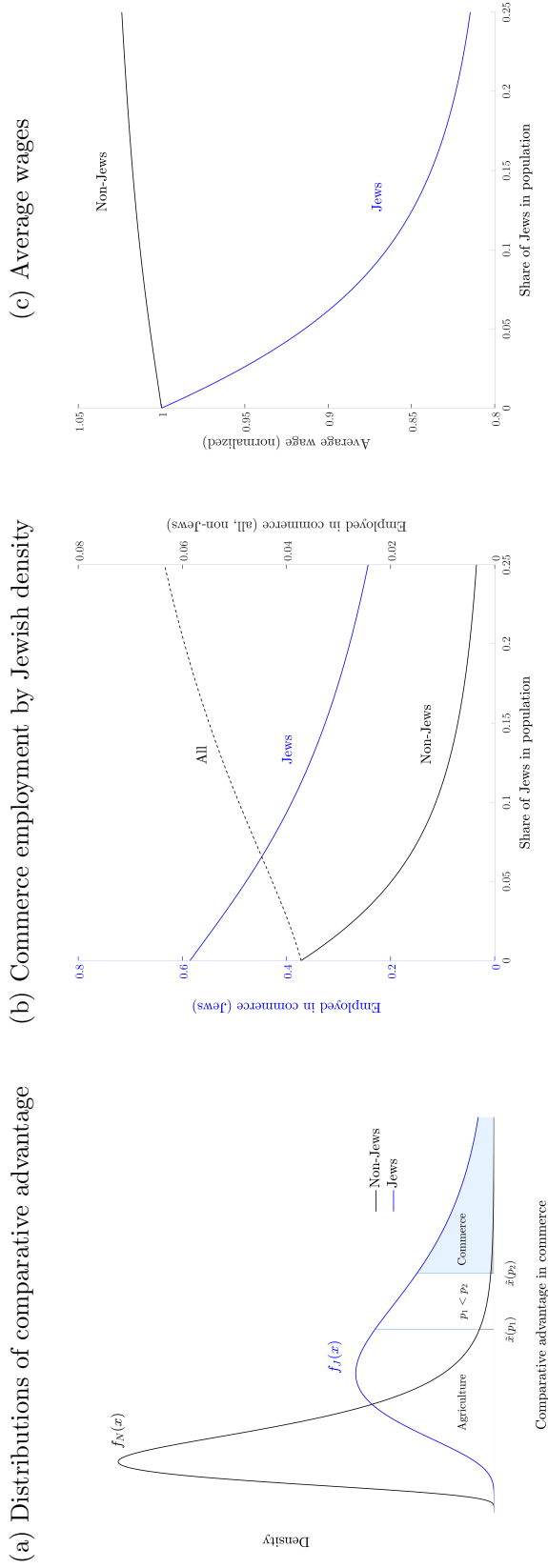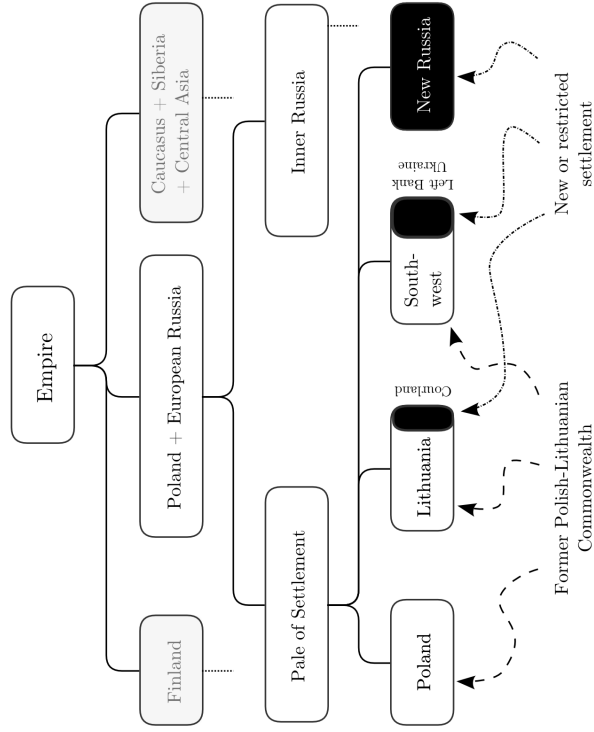(b) Commerce employment by Jewish density

(c) Average wages

Figure 1: Model illustration

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 3: $L = (\gamma L_a^\rho + (1-\gamma)L_c^\rho)^{1/\rho}$, $\gamma = 0.9$, $\rho = 0.5$, $\delta = 0.6$, $F_N(x) = \Phi((\log(x) - \mu_N)/\sigma)$, $F_J(x) = \Phi((\log(x) - \mu_J)/\sigma)$, where Φ is the cumulative normal distribution function, with $\mu_N = 0, \mu_J = 1$, and $\sigma = 0.5$.

(a) Geographic coverage
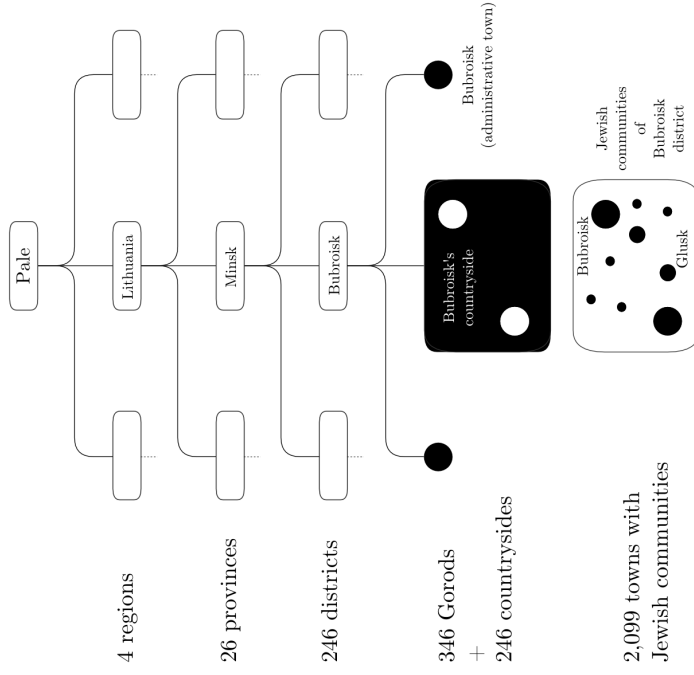
(b) Administrative hierarchy

Figure 2: 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 is used as an example.
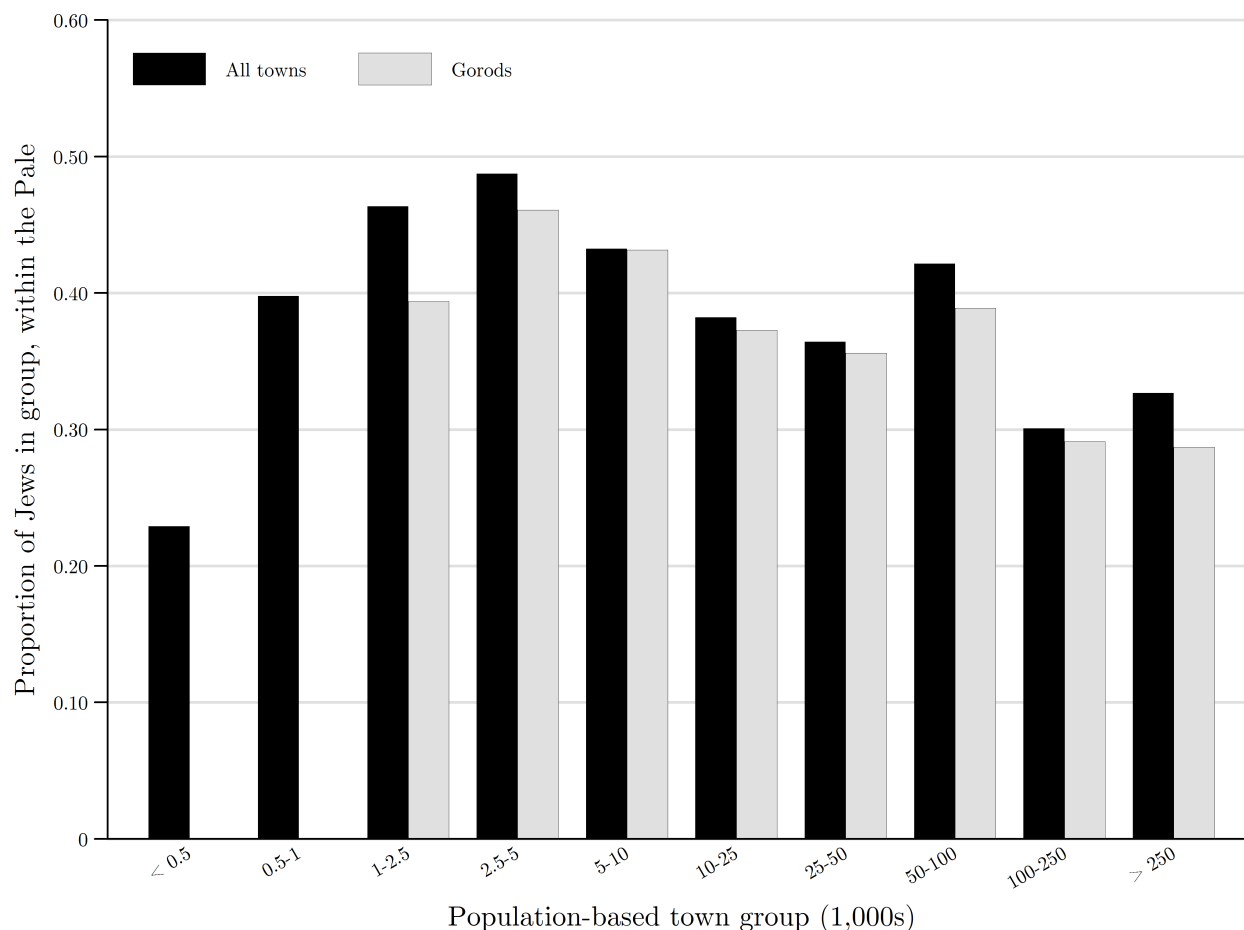
Figure 3: Jewish density by town size-based groups

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 2,099 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. One Gorod had under 1,000 inhabitants, but is represented within the group of 1,000-2,500 inhabitants. The towns with more than 250 thousand inhabitants were Warsaw, Odessa and Lodz.
Sources: 1897 Russian census, localities volume and Provincial volumes, Table XXI.
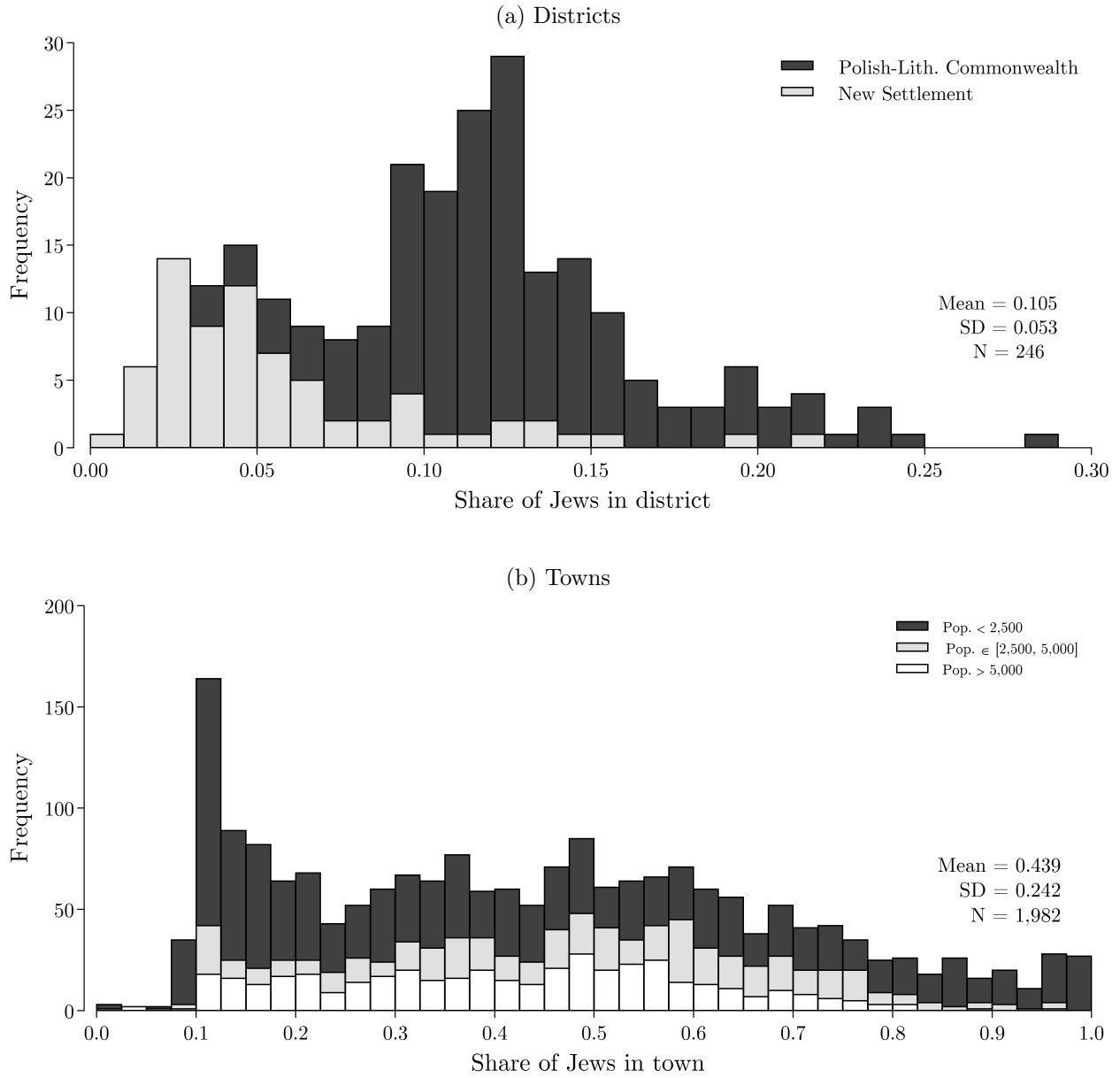
(a) Districts

(b) Towns

Figure 4: Distribution of Jewish densities

Notes: Panel 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.

Panel 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.
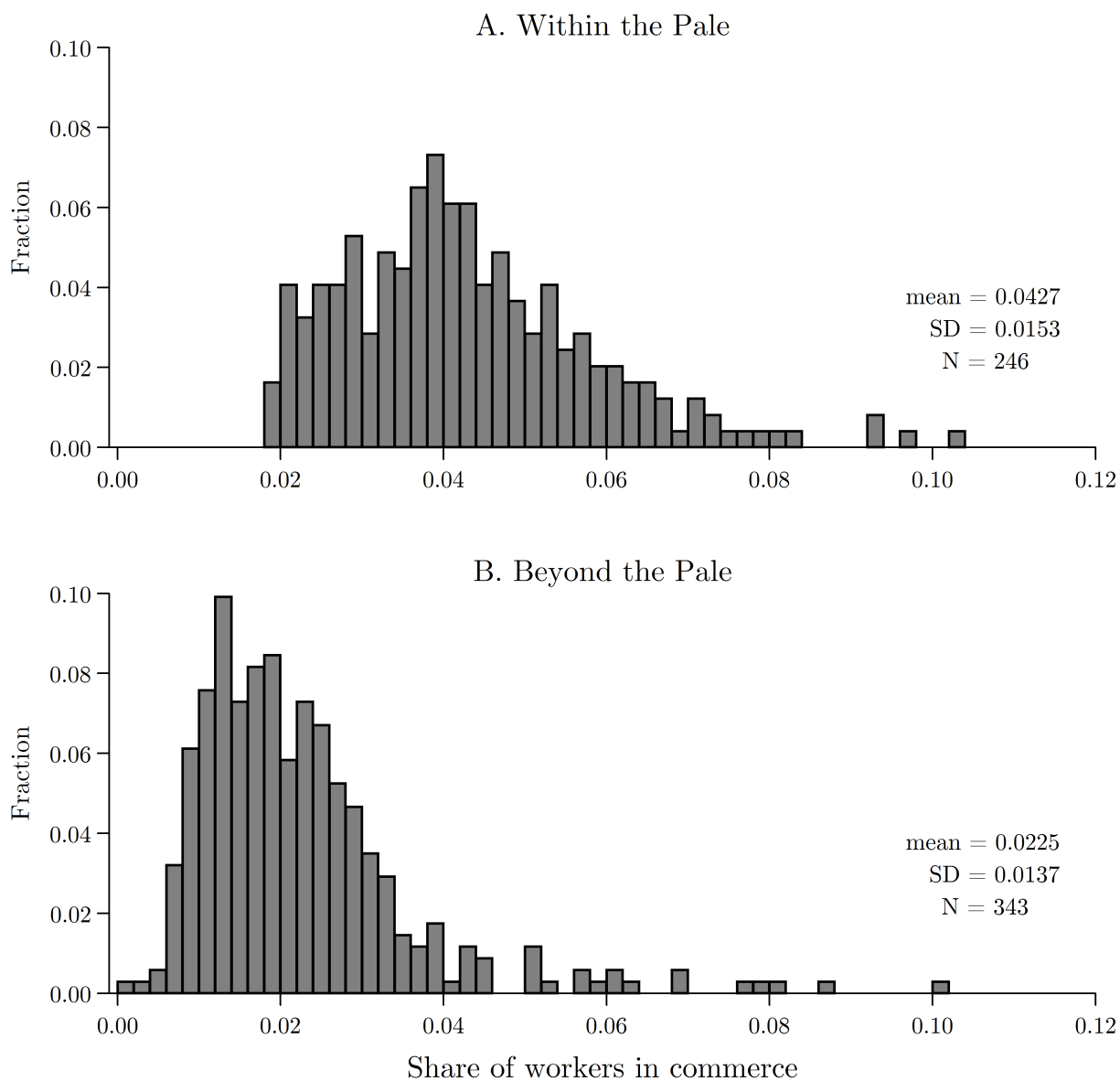
Figure 5: A Jewless economy—commerce within and beyond the Pale

Notes: The plots represent the distribution of districts within the Pale (a) and in European Russia beyond the Pale (b), with respect to the share of commerce workers out of all workers. Courland province is included within the Pale. Each observation is a district. The horizontal axis represents the share of commerce workers in the district. The vertical axis represents the share of the districts within each equally ranged bin. Sources: 1897 Russian census, Provincial volumes, Tables XXI and XXII.

A. Within the Pale

mean = 0.0100
SD = 0.0115
N = 246

B. Beyond the Pale

mean = 0.0221
SD = 0.0133
N = 343

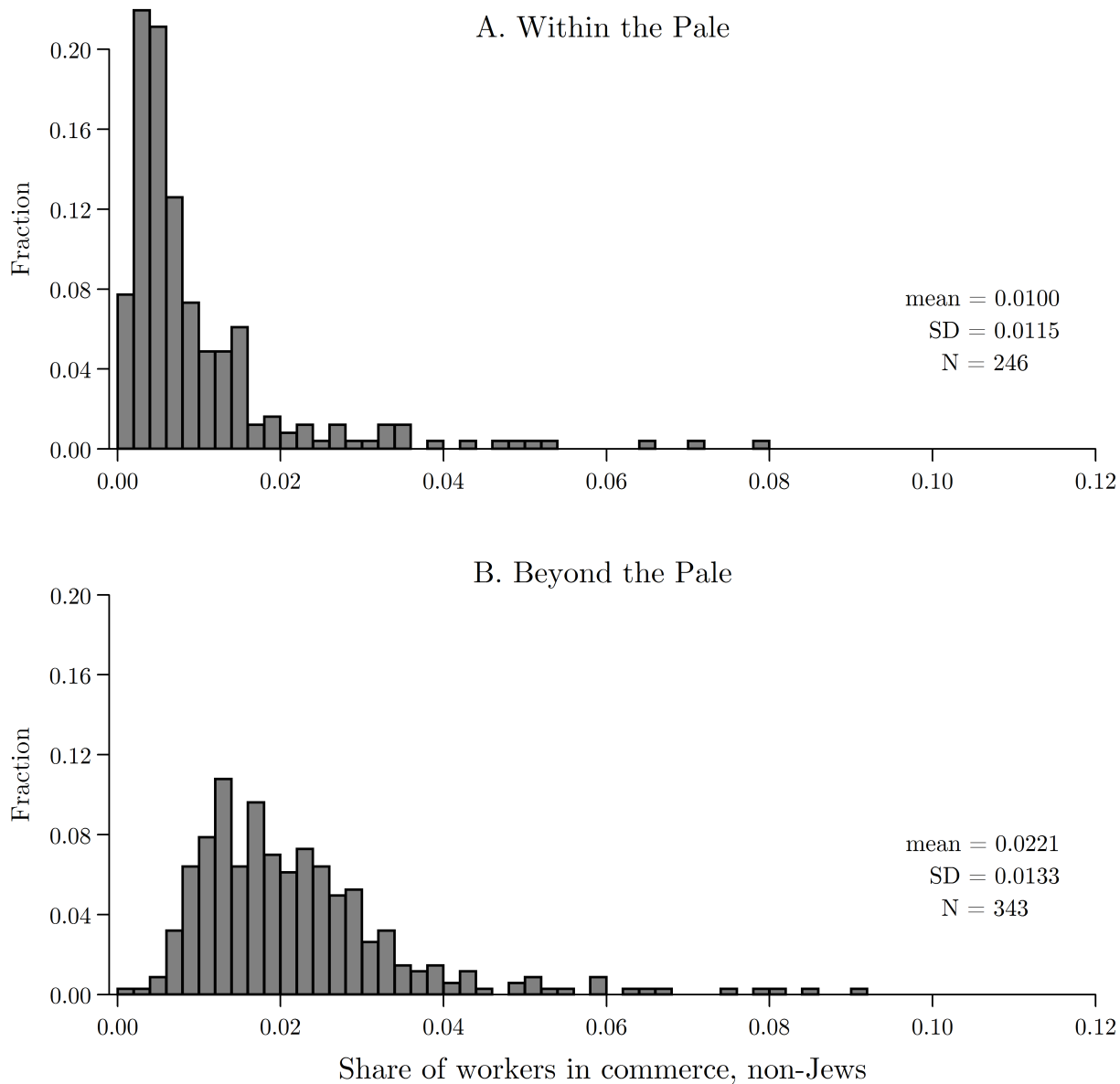Share of workers in commerce, non-Jews

Figure 6: A Jewless economy—non-Jewish commerce within and beyond the Pale

Notes: The plots represent the distribution of districts within the Pale (a) and in European Russia beyond the Pale (b), with respect to the share of commerce workers out of all non-Jewish workers. Courland province is included within the Pale. Each observation is a district. The horizontal axis represents the share of commerce workers in the district. The vertical axis represents the share of the districts within each equally ranged bin. Sources: 1897 Russian census, Provincial volumes, Tables XXI and XXII.
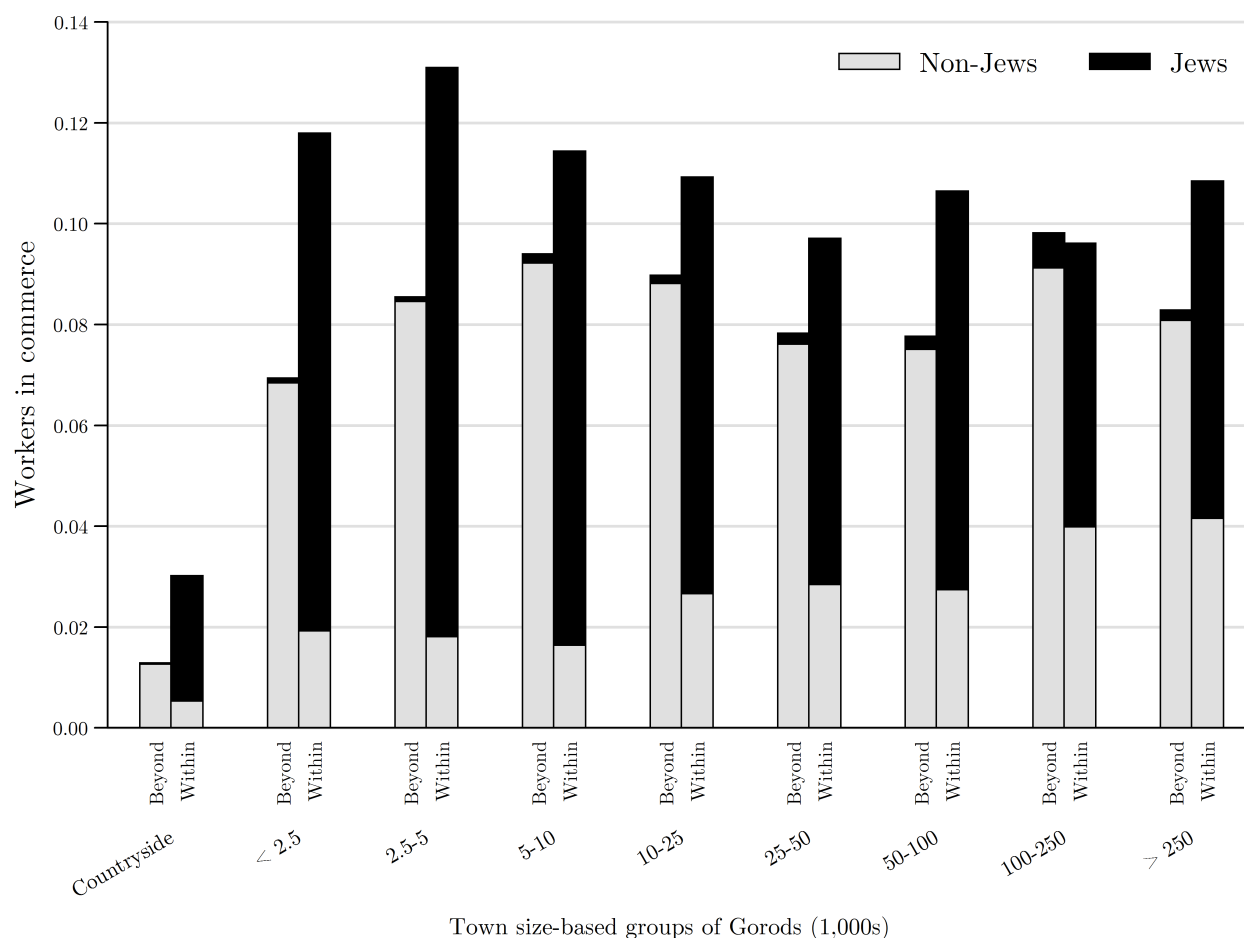
Figure 7: Ethnic composition of commerce workers by town size, within and beyond the Pale

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.
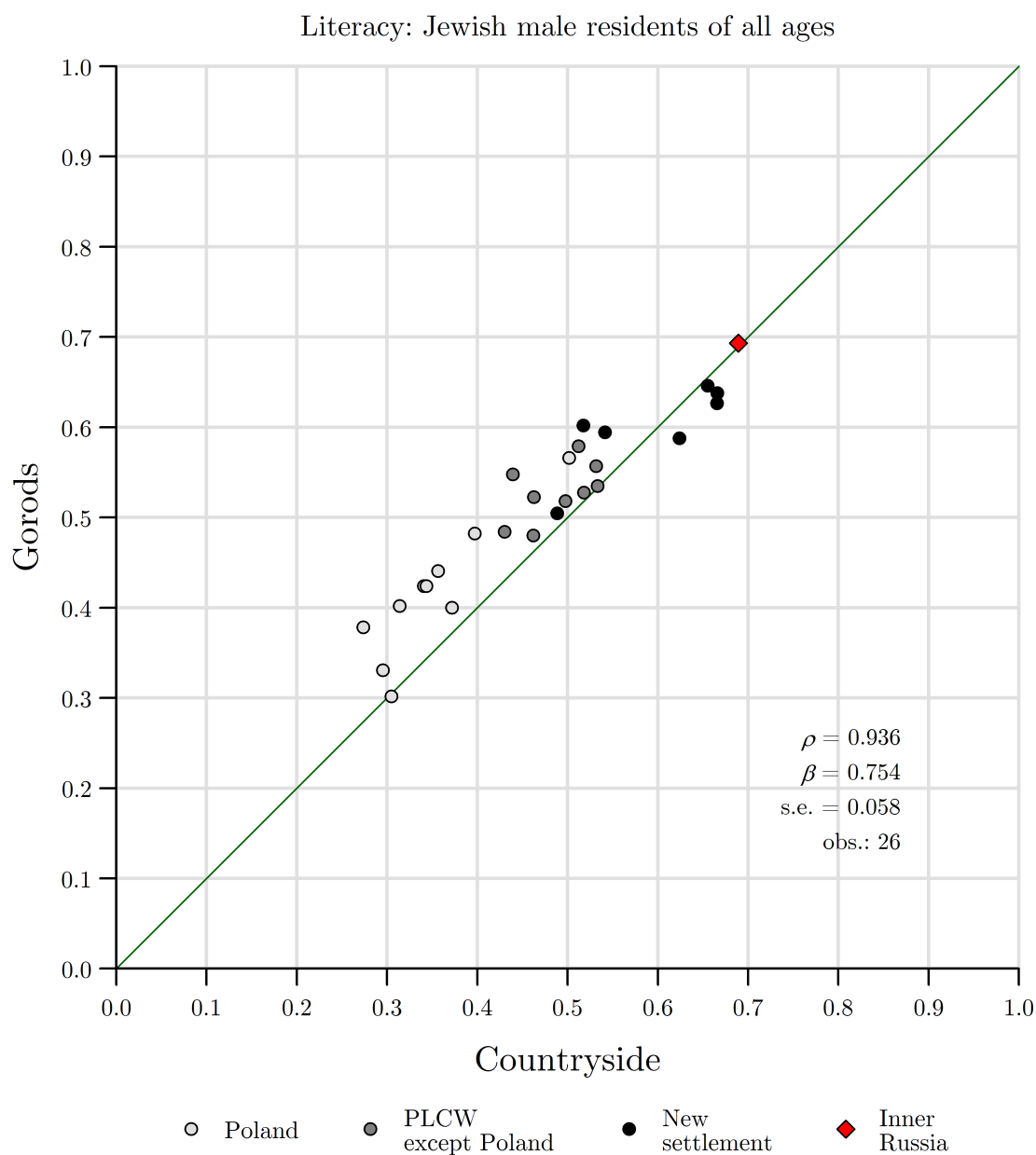
Figure 8: Literacy of Jews, administrative towns vs. countryside

Notes: Each bullet represents a province within the Pale (including Courland). The red marker representing all remaining provinces of European Russia. The measures on both axes are rates of literacy among all Jewish males (i.e., all age groups, counting together literacy in Russian, literacy in another language, and higher education). The vertical axis represents the rate of literacy in all administrative towns (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.
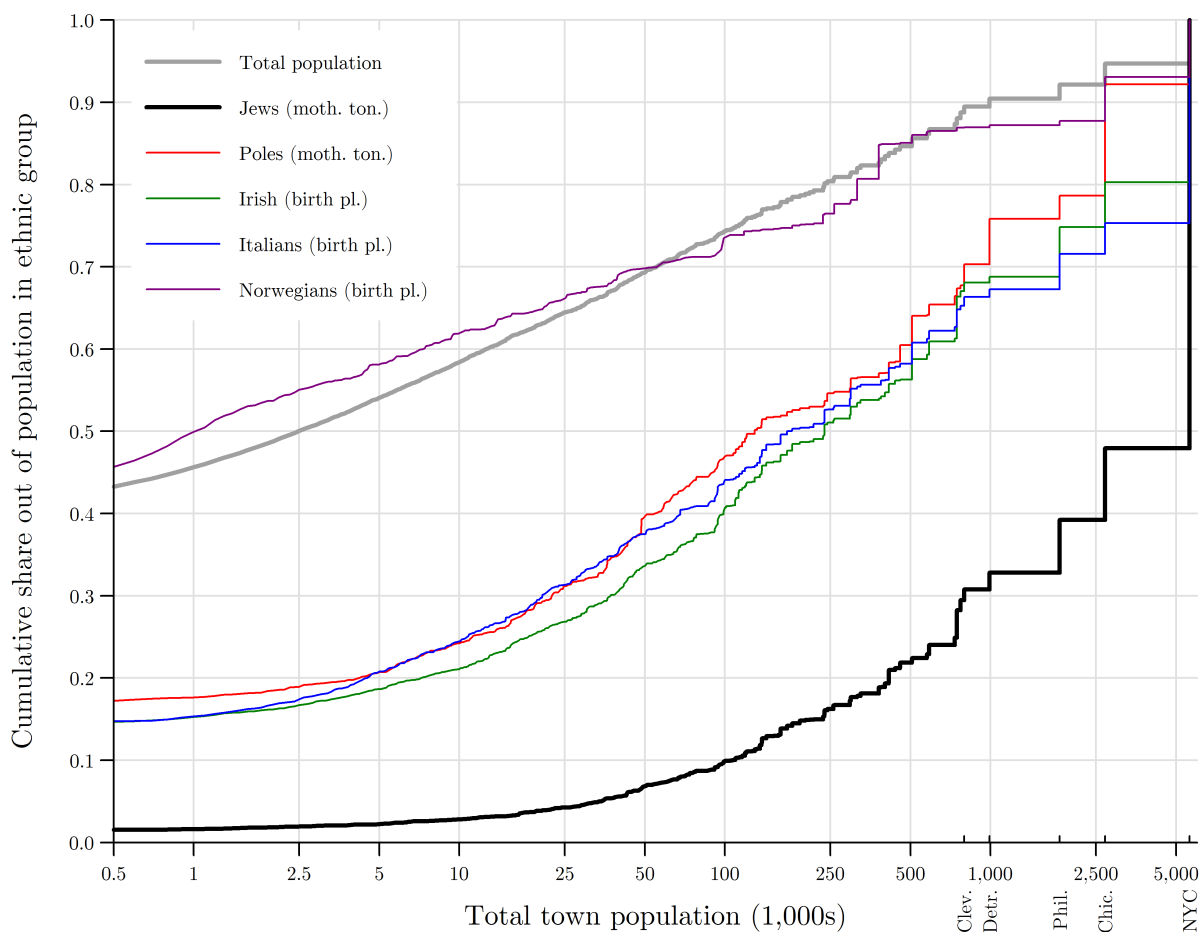
Figure 9: Cumulative distribution of ethnic populations by town size, US 1920

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 lograithmic). 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.
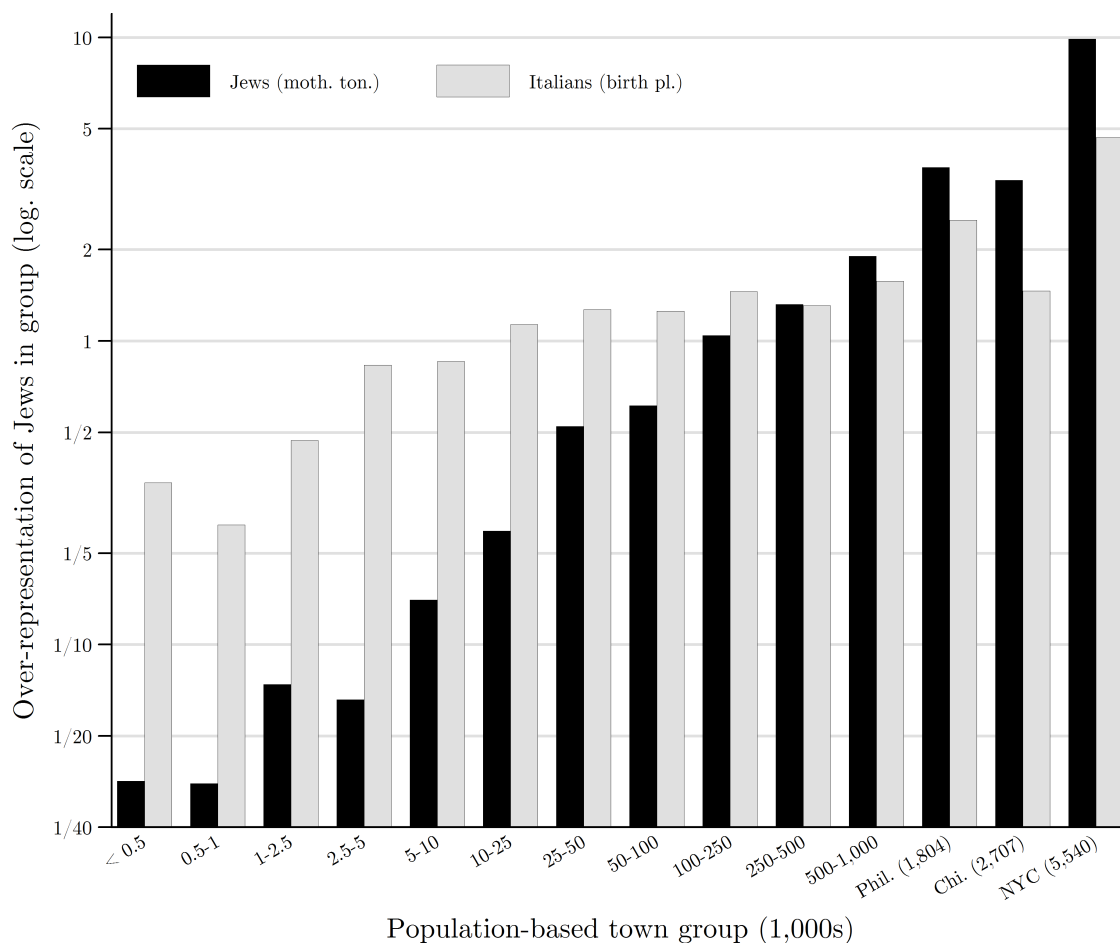
Figure 10: Over-representation of Jews and Italians by town size-based groups

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.
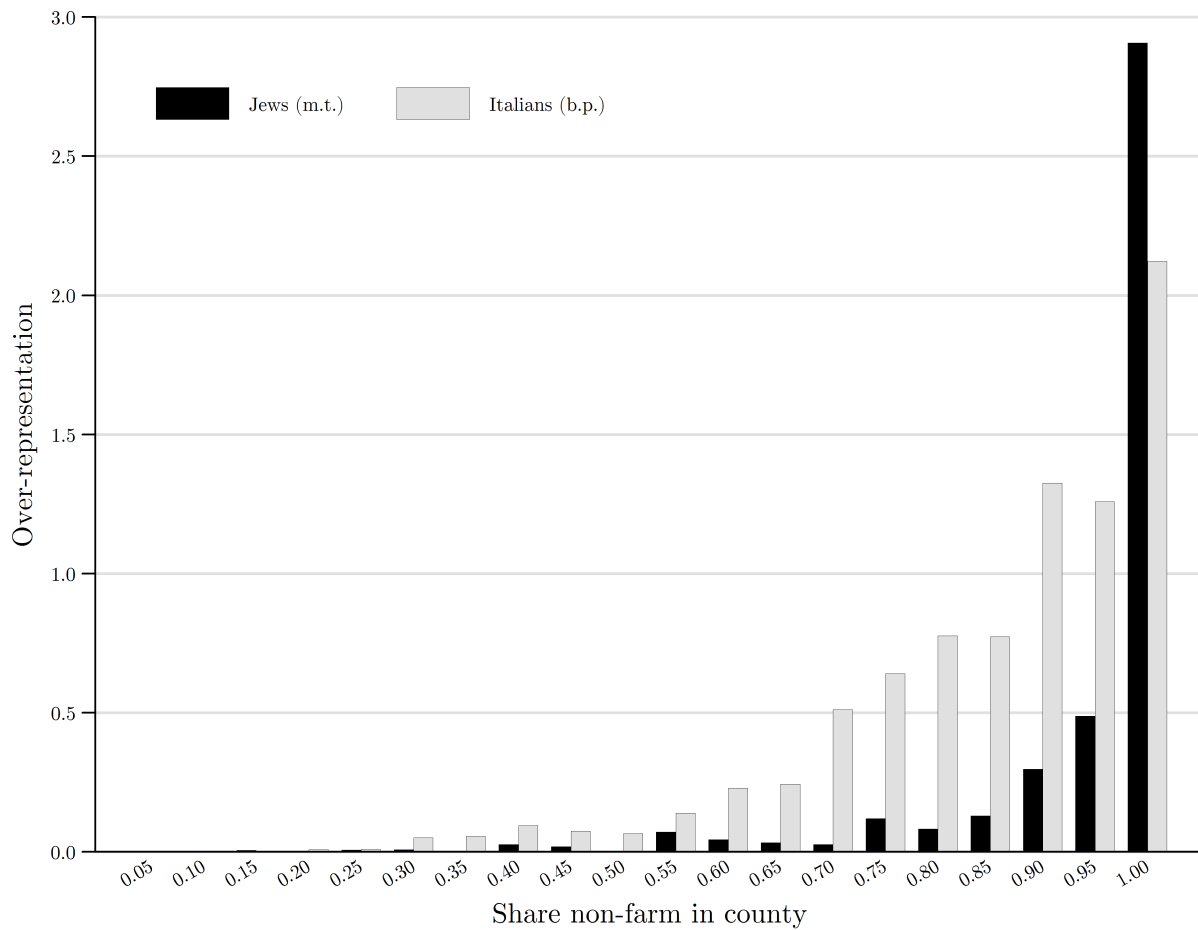
Figure 11: Over-representation of Jews and Italians by share non-farm in county

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.
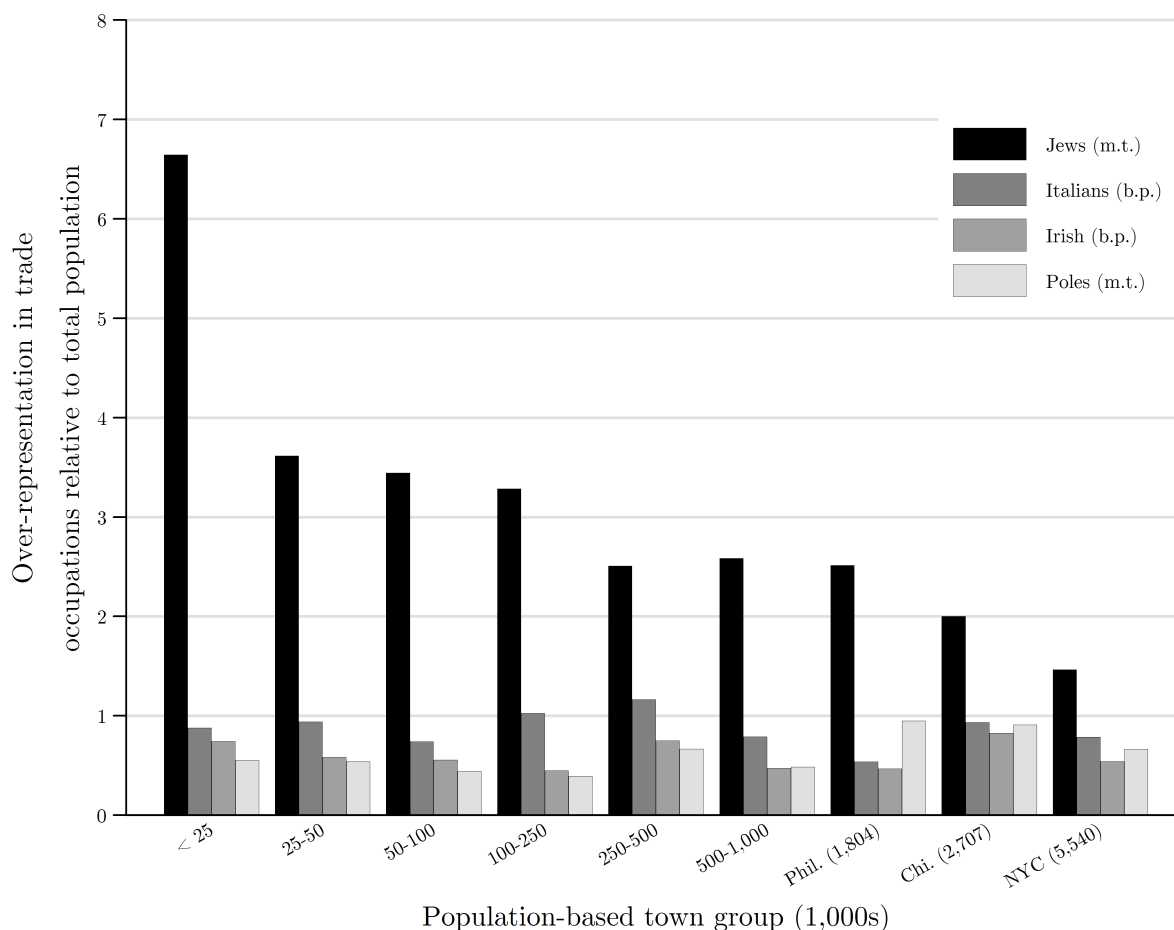
Figure 12: Over-representation in trade by ethnicity and town size, US 1920

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).

A 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),[81] 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.[82] 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.[83]

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 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 A1 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

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

[82] 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 4.

[83] 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.

Table A1: Bobruisk and Verkhne-Dnieprovsk
Aharon Ya'akov Dukhan's migration

| District | Province | Jews (1) | Employed in commerce | | |
			All (2)	Jews (3)	Non-Jews (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.

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,[84] 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.

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.

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[84]   Henceforth, the term *Jewish density* will be used to denote the share of Jews among the total population.

B Proofs

B.1 Proof of Claim 3.1

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 9 as

$$l_c(\tilde{x}, q) = \frac{\int_{\tilde{x}}^{\infty} (qx f_J(x) + (1-q)x f_N(x))\, dx}{q F_J(\tilde{x}) + (1-q) F_N(\tilde{x})}, \tag{A1}$$

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 3.1. The derivative of the numerator in equation A1 with respect to q is

$$\frac{\partial}{\partial q} \int_{\tilde{x}}^{\infty} (qx f_J(x) + (1-q)x f_N(x))\, dx = \int_{\tilde{x}}^{\infty} x f_J(x) dx - \int_{\tilde{x}}^{\infty} x f_N(x) dx \geq 0, \tag{A2}$$

where the inequality follows from first-order stochastic dominance (assumption 3.1). 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 $\mathbf{E}_{F_J^{\tilde{x}}}(x) = \int_{\tilde{x}}^{\infty} x f_J(x) dx$, and similarly for N, the inequality in equation A2 holds.

Since the numerator in equation A1 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 $\partial \tilde{x}^*(p)/\partial p > 0$. ∎

B.2 Proof of Claim 3.2

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 11, the average wage of ethnicity g is

$$\begin{aligned} w_g(p) &= w \left(\hat{w}_a \int_0^{\tilde{x}} e_{ia} f_g(x) dx + \hat{w}_c \int_{\tilde{x}}^{\infty} e_{ic} f_g(x) dx \right) \\ &= e_g w \left(\hat{w}_a F_g(\tilde{x}) + \hat{w}_c \int_{\tilde{x}}^{\infty} x f_g(x) dx \right) \\ &= e_g w_c \left(\tilde{x} F_g(\tilde{x}) + \int_{\tilde{x}}^{\infty} x f_g(x) dx \right) \end{aligned} \tag{A3}$$

where $e_g = 1$ for non-Jews and $e_g = \delta$ for Jews, and the last equality follows from equation 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 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[85]

$$\begin{aligned}
\eta_g(p) &= \eta_{w_c} + p\frac{\partial \tilde{x}}{\partial p} \cdot \frac{F_g(\tilde{x}) + \tilde{x}f_g(\tilde{x}) - \tilde{x}f_g(\tilde{x})}{\tilde{x}F_g(\tilde{x}) + \int_{\tilde{x}}^{\infty} xf_g(x)dx} \\
&= \eta_{w_c} + \eta_{\tilde{x}} \cdot \frac{\tilde{x}F_g(\tilde{x})}{\tilde{x}F_g(\tilde{x}) + \int_{\tilde{x}}^{\infty} xf_g(x)dx}.
\end{aligned} \tag{A4}$$

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

$$0 \leq \frac{\tilde{x}F_J(\tilde{x})}{\tilde{x}F_J(\tilde{x}) + \int_{\tilde{x}}^{\infty} xf_J(x)dx} \leq \frac{\tilde{x}F_N(\tilde{x})}{\tilde{x}F_N(\tilde{x}) + \int_{\tilde{x}}^{\infty} xf_N(x)dx}, \tag{A5}$$

since $\int_{\tilde{x}}^{\infty} xf_J(x)dx \geq \int_{\tilde{x}}^{\infty} xf_N(x)dx$ (see proof within Appendix B.1), and $\tilde{x}F_J(\tilde{x}) < \tilde{x}F_N(\tilde{x})$ (by Assumption 3.1). Since $\eta_{\tilde{x}} > 0$ (following Claim 3.1), we have that for all $p \in [0, 1]$

$$\eta_J(p) \leq \eta_N(p). \tag{A6}$$

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

C   Tables and Figures

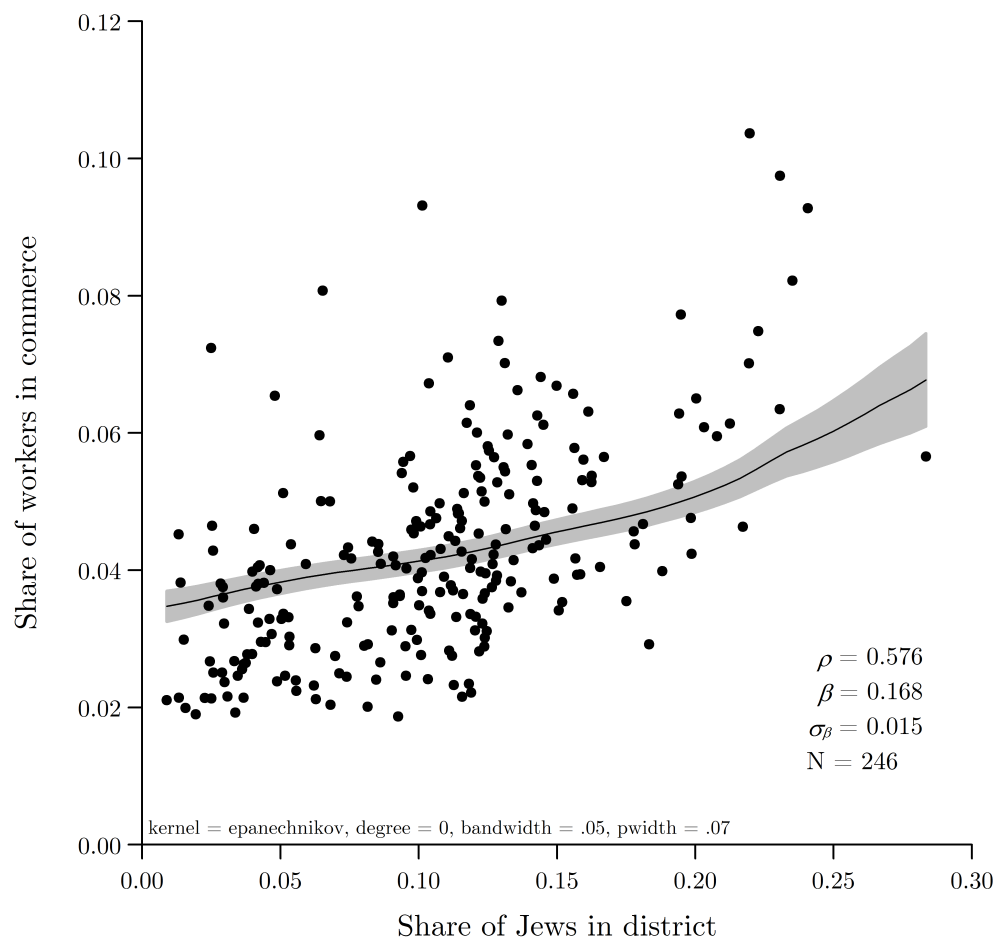Figure A1: Jewish density and workers in commerce

Notes: Each pair of bars represents a population size-based group of towns within the Pale (population is in thousands). The horizontal axis represents the share of (mother tongue) Jews in the district. The vertical axis represents the share of commerce workers out of all workers in the district. Sources: 1897 Russian census, Provincial volumes, Tables XXI and XXII.

$\rho = -0.555$
$\beta = -0.818$
$\sigma_\beta = 0.078$
N = 246

kernel = epanechnikov, degree = 0, bandwidth = .06, pwidth = .1

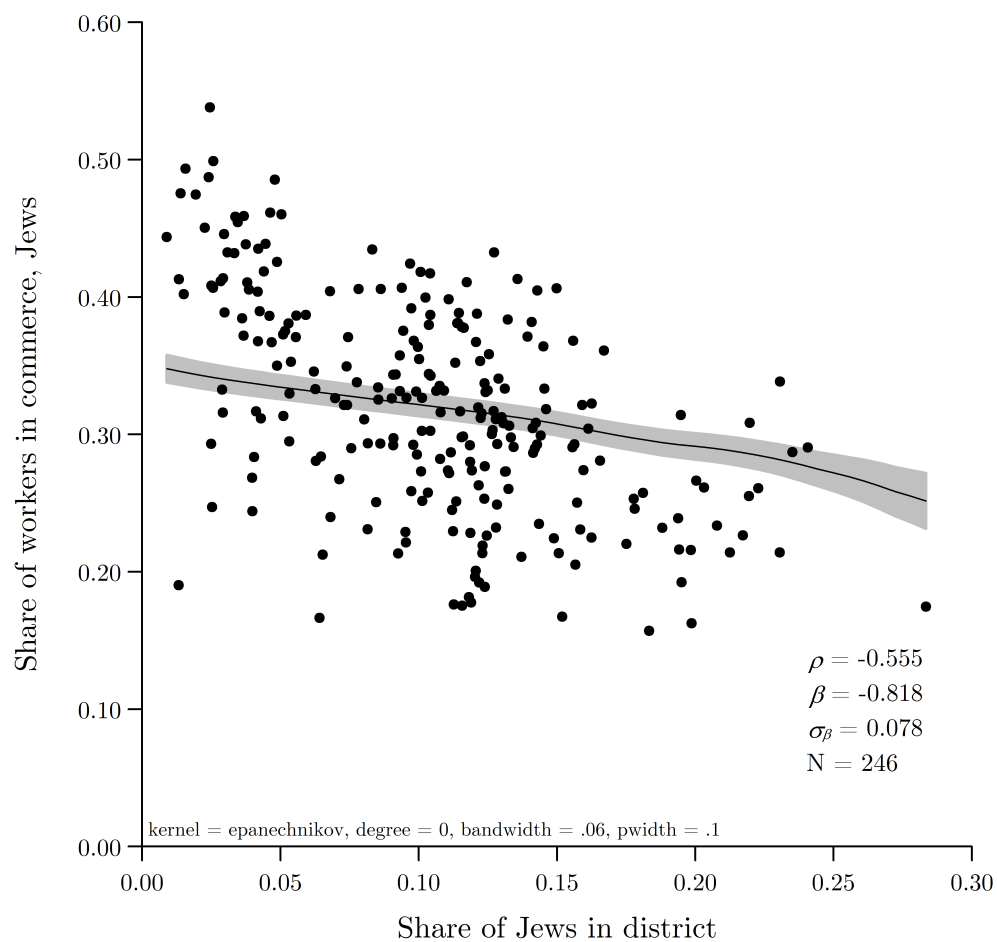Figure A2: Jewish density and Jewish workers in commerce

Notes: Each observation is a district within the Pale (including Courland province). The horizontal axis represents the share of (mother tongue) Jews in the district. The vertical axis represents the share of Jewish commerce workers out of all Jewish workers in the district. Sources: 1897 Russian census, Provincial volumes, Tables XXI and XXII.
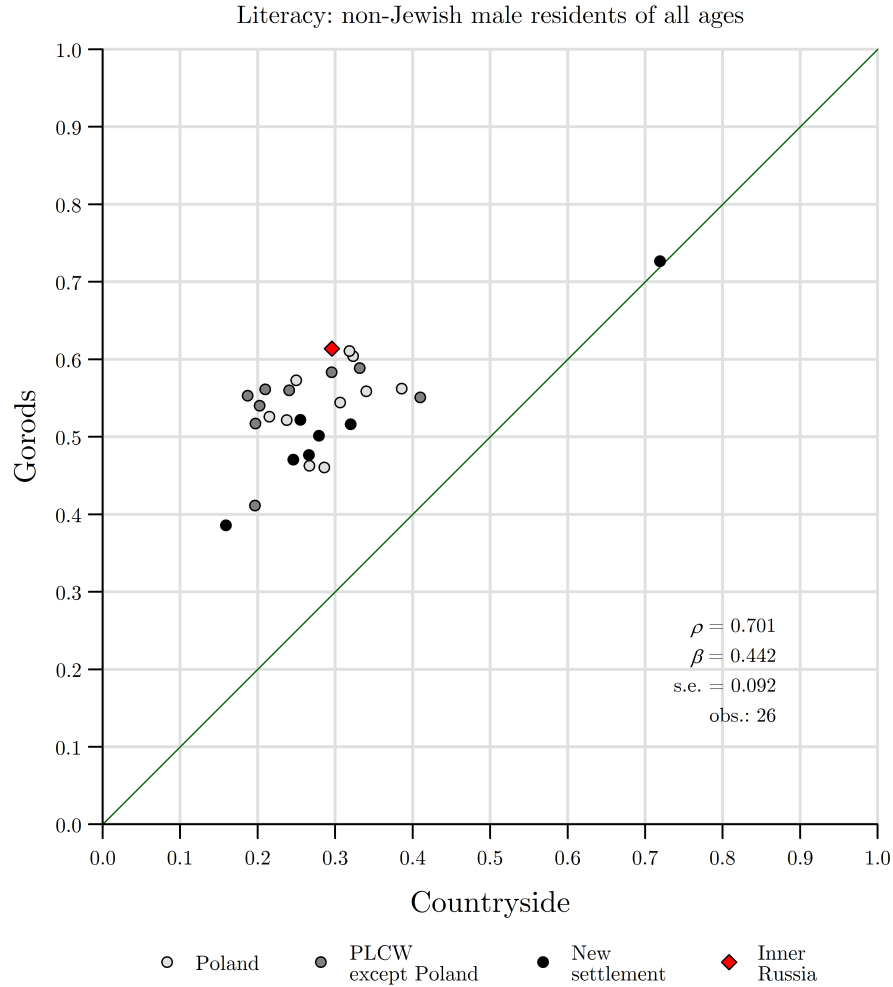
Figure A3: Literacy of non-Jews, administrative towns vs. countryside

Notes: Each bullet represents a province within the Pale (including Courland). The red marker representing all remaining provinces of European Russia. The measures on both axes are rates of literacy among all non-Jewish males (i.e., all age groups, counting together literacy in Russian, literacy in another language, and higher education). The vertical axis represents the rate of literacy in all administrative towns (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.

Table A2: Occupational specialization of Jews—disaggregated descriptive statistics

	Percent in category among		Share Jews within	Over-rep. of Jews
Category	Jews (1)	Non-Jews (2)	(3)	(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).