

From Farmers to Merchants: A Human Capital Interpretation of Jewish Economic History*

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Abstract

Since the Middle Ages the Jews have been engaged primarily in urban, skilled occupations, such as crafts, trade, finance, and medicine. This distinctive occupational selection occurred between the seventh and the ninth centuries in the Muslim Empire and then it spread to other locations. We argue that this transition was the outcome of the widespread literacy among Jews prompted by an educational reform in the first century CE. Based on the growing nexus between education and Judaism in the first half of the millennium, we build a model in which Jewish men choose education, occupation, religion, and location. The model predicts that when urbanization expands (as it did in the Muslim Empire), Jews move to new cities due to their comparative advantage in urban, skilled occupations. Furthermore, *before* urbanization a proportion of Jewish farmers are predicted to convert to other religions. The predictions of the model regarding conversions, migrations, and reduction in the size of the Jewish population are consistent with the historical evidence about the first millennium provided by the historians. Hence, our study presents evidence for the long-term economic implications of changes in social norms.

1 Introduction

Why since the Middle Ages have the Jews been engaged primarily in urban, skilled occupations, such as crafts, trade, finance, and the medical profession? Why were the Jewish people a

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minority in many urban centers and towns? When and why did this occupational selection and demographic characteristics become the distinctive mark of the Jews? Is there an economic theory that can explain these facts and pass the test of its other implications? In this paper we provide an answer to these questions based on a human capital theory that is consistent with facts collected, described, and interpreted by historians.¹

The distinctive occupational and residential structure of the Jews has attracted the attention of scholars of Jewish history. Abrahams (1896) and Roth (1938) promoted the well-accepted view that the Jews were not engaged in farming like the rest of the population because of the restrictions and prohibitions imposed by the local rulers. Since the late Middle Ages, in many countries Jews were prohibited from owning land, and in certain areas they were forbidden from living in rural areas. Moreover guilds excluded them from working in certain crafts within urban areas.

Kuznets (1960) also addressed these questions. Like Reich (1960), he established the fact that at the end of the nineteenth century and the beginning of the twentieth century, the Jews in Europe and North America were not engaged in agriculture independently of the size of the agricultural sector in a given country (Table 4 in Appendix B). Furthermore, although engaged in almost all urban occupations, the Jews specialized in trade and finance. Kuznets explained this fact as the outcome of an endogenous decision within an economic theory of small minorities. Taking the minority status as exogenous, he argued that the minority's noneconomic goal of maintaining its identity made the Jewish minority specialize in certain occupations.

In stating their arguments, both Roth and Kuznets were influenced by the observed economic structure of the Jews in the nineteenth and early twentieth centuries. However, the transition of the Jews away from agriculture into crafts, trade, and finance occurred in the eighth century mainly in Mesopotamia and the entire Muslim empire, and later in western Europe where the Jews migrated. At the time when the occupational transition was occurring, none of the restrictions and prohibitions discussed by Abrahams and Roth existed. Jews owned land but were not engaged at all in agricultural work. Narrative evidence also indicates that at this time, the Jews were aware that their new urban occupations enabled them to improve their standard of living. Hence, the restriction theory cannot account for the occupational transition. As for Kuznets' theory, notice that before the occupational transition, in the first half of the millennium the Jews were farmers *and* were also a minority in the lands of the Roman and Persian empires.² Given that they were a minority even when they were farmers, Kuznets' theory would predict that they should stay in this occupation to preserve their group identity that had been built at that time for a farming society.³ Yet, Jews did not remain farmers despite their minority status.

The historians Baron (1937; 1952), Ben-Sasson (1976), and Gil (1992; 1997), who described and analyzed the transition from farming to crafts, trade, and finance in urban centers in Mesopotamia, Palestine, and the rest of the world during the eighth and ninth centuries, maintained that deteriorating agriculture and urbanization in the Muslim empire made almost all

¹Our model follows Becker and Lewis (1973)'s and Becker (1975)'s theory of children's quality. The utility and cost specifications are similar to those of Iannaccone (1992), the specification of the intergenerational transmission of religious traits is similar to the one in Bisin and Verdier (2000), and the occupational choice is the same as Roy's (1951). At the same time, we use the historical evidence provided in the academic works of historians.

²In Palestine the Jews became a minority from the fourth century on. The province of Judaea was renamed Syria Palaestina by the Romans after the Bar Kokhba Revolt in 135 CE.

³The geographic dispersion and minority status of the Jews just *before* the transition to urban occupations were similar to those of the Jews in the nineteenth and twentieth centuries. For example, in Babylon from the fifth to the eighth century the Jews were a minority like in Poland in the early twentieth century.

the Jews move into urban occupations. The question is: Why did the Jews move into these occupations whereas almost all other inhabitants remained engaged in agriculture?

Our thesis is that the distinctive characteristic of the Jews at that time was that almost all Jewish men were literate. The Jews had a comparative advantage in the skilled, high-paid occupations demanded in the new urban centers developed by the Muslim rulers.

Why were Jewish farmers (and Jews in general) literate whereas the rest of the rural population was illiterate at the beginning of the seventh century? The Jewish religion made primary education mandatory for boys in the first century when the high priest Joshua ben Gamala (64 CE) issued an ordinance that “teachers had to be appointed in each district and every city and that boys of the age of six or seven should be sent.”⁴ In the first century CE, the Jewish warrior and writer Josephus underlined that children’s education was the principal care among the Jews.⁵ After the destruction of the Temple in 70 CE, Judaism changed from a religion that was mainly concerned with sacrifices and ceremonies performed by priests in the Temple to a religion whose core was centered around learning the Torah. The synagogue became the center of this activity. From the second to the sixth century, Jewish leaders promoted further the learning and reading of the Torah and the recently redacted Mishna and Talmud by degrading the status of those who remained illiterate (“*am ha-aretz*”). The compulsory education for boys and the reading of the Torah, Mishna, and Talmud became the essence of Judaism.⁶ The monumental work of Goitein (1967–1988) from the documents of the Cairo Geniza provides extensive evidence of the full implementation of mandatory primary schooling for boys in the Jewish communities in the Mediterranean at the turn of the millennium.⁷

Based on this historically documented nexus between education and Judaism, we build a model whose main assumption is that Jews derive higher utility from their children’s literacy (education) than non-Jews. An adult Jewish man chooses the level of education for his children, his occupation (trade or farming), religion (Jewish or non-Jewish), and location (migration). We further postulate that Jewish education (literacy) has a positive effect on a merchant’s income but not on a farmer’s income. Obviously the model predicts that Jews invest more in their children’s education, and given that, that they always prefer to be merchants. Yet, the demand for merchants restricts the proportion of Jews employed in urban occupations. When urbanization expands (as it did in the early Muslim empire), the Jews move to the cities where the returns to their human capital are high. Hence, our answer to the main question raised in this paper is that the occupational selection of Jews into urban, skilled occupations was mainly

⁴It is a popular view (see the debate in Brenner and Kiefer (1981) and Ayal and Chiswick (1983)), that Jews (and other diasporas) invested in human capital because, unlike physical capital, it is portable and cannot be expropriated. However, the decision by Jews to invest in human capital came *before* the migrations and was motivated mainly by religious reasons.

⁵Josephus Flavius, *Against Apion*, Book I, sec. 12, and Book II, sec. 19.

⁶The Mishna consists of six volumes of rules. It was written in Hebrew during several hundred years and was redacted in Eretz Yisrael in about the year 200 CE by Rabbi Judah the Prince. The six volumes of the Mishna are: *Zeraim* deals with the rules for land cultivation, *Moed* with feasts, *Nashim* with wedding, divorce and intimate relations, *Nezikin* with financial issues, *Kedeshim* and *Teharot* with sacrifices and other Temple related issues. The Gemara consists of interpretations of the Mishna, debates and allegories told and written by Jewish scholars and rabbis in Palestine and Babylon from the third to about the end of the sixth century. Mishna and Gemara together form the Talmud. There are a Jerusalem Talmud and a Babylonian Talmud.

⁷The Cairo Geniza documents refer to the thousands of contracts (sales, marriage deeds, loans, business partnerships), last wills, letters, and courts records that were found in a synagogue in Old Cairo in Egypt. The documents marvelously depict the economic, demographic, and social life of many Jewish communities in the Mediterranean from about the ninth throughout the thirteenth century.

the outcome of (i) the Jews' investment in literacy, and (ii) urbanization.

The model's other important implication is that the cost of children's education for farmers makes a certain proportion of Jewish farmers convert to non-Jewish religions in each generation. The question is whether historically these conversions were significant. According to historians (Baron 1952, 210; 1971) and demographers (DellaPergola 2001), the key demographic fact in the first millennium was the sharp decrease in the world Jewry from about 4.5 million in the first century to about 1-1.5 million in the sixth century.⁸ This is the period when Jews worldwide were still farmers and, yet, education became the center of the Jewish religion. At the same time, Christianity emerged as a segment of Judaism that did not assign the same importance to literacy and education. Historical sources indicate that about one million Jews lost their lives during the revolts against the Romans in Judaea (70 and 135 CE) and in Egypt (115 CE). There is also evidence of some forced conversions to Christianity, but the description of these episodes of conversions from the fourth to the sixth century cannot account for the remaining reduction (2 million) of the Jewish population. The model's prediction of a slow process of decrease in the Jewish low-educated population due to conversions is supported by the historical evidence.

The model's prediction regarding migrations is that Jewish farmers with high preference for Judaism would migrate to centers of Jewish life if in their own country economic conditions deteriorate. The large migrations from Egypt and Palestine to Babylon in the second and third centuries provide evidence in favor of this prediction. Another prediction related to migration is that once Jews become merchants (as they did in Mesopotamia where about 70 percent of the world Jewry lived in the second half of the millennium), they would have an incentive to migrate to new urban cities where crafts, trade, and finance provide high returns to their high human capital. The fast migration of Jews during the ninth and the tenth centuries to western Europe and the high standard of living acquired by them in these locations is consistent with this prediction. The evidence also supports the model's prediction that these Jewish traders were among the most educated Jews, who learned the logical thinking provided by the enormous amount of debates and daily life analysis in the Mishna and Talmud.

Our paper contributes to two strands of literature. First, we suggest a different interpretation of the economic history of the Jews in the past two millennia. We aim to show how economic models can help analyze these issues and provide a different perspective on historical facts. Second, the economic history of the Jews offers a perfect laboratory for studying the impact of changes in social norms on economic performance over the long run. Some economic patterns that we observe nowadays (e.g., the selection of Jews into urban, skilled jobs) have been heavily influenced by social norms, religious attitudes, and cultural values that emerged centuries ago.⁹ From this point of view, our project is related to recent work that endogenizes the formation of social norms and studies their impact on economic outcomes (e.g., Mailath and Postlewaite 2002; Fang 2001).

The paper is organized as follows. Section 2 presents the theories set forth to explain the occupational selection of the Jews into crafts and trade. Section 3 discusses these arguments in light of the historical evidence. Section 4 highlights the nexus between Judaism and education. Section 5 outlines the model and section 6 compares the predictions of the model with the

⁸Baron gave a figure of 8 million Jews at the beginning of the first century CE. After talking with Sergio DellaPergola and other scholars, and after reading and evaluating various sources, we decided to choose the lower bound (4.5 million) of the estimates on the size of world Jewry in the first century.

⁹See Berman (2000) for a study of the economic and social characteristics of Ultra-Orthodox Jews in contemporary Israel.

historical evidence. Section 7 concludes.

2 Main Explanations

A common view among scholars, prominently advanced by Roth, maintains that the occupational choice of the Jews as they observed it historically was mainly the outcome of restrictions and prohibitions. Quoting from Roth (1938, 228),

The Jew was driven by the unfortunate circumstances of his history to be predominantly a townsman. He had to seek an outlet, despairingly, in every branch of urban economy. Yet even here he found himself hampered at every turn by repressive legislation—whether in buying, selling, or manufacturing.

Abrahams (1896, 249), quoting the scholar Loeb, asserted that

When the medieval Jews devoted themselves largely to commerce and moneylending, there were not obeying a natural taste nor a special instinct, but were led to these pursuits by the force of the circumstances, by exclusive laws, and by the express desire of kings and people. The Jews were constrained to adopt these modes of obtaining a livelihood by the irresistible material and moral forces opposed to them.

According to the “restrictions theory,” from the Middle Ages until modern times Jews did not engage in agricultural occupations since they were prohibited from owning land. Moreover guilds’ regulations excluded nonmembers, such as Jews, from the occupations regulated by the guilds. Moneylending, the medical profession, and the diamond industry were the few occupations in which Jews were allowed to engage.

Unlike the argument based on restrictions, Kuznets (1960) proposed a theory in which the economic structure of the Jews is the result of an endogenous choice. Kuznets noted that in those countries with the largest Jewish communities in the nineteenth and twentieth centuries (the United States, the Soviet Union, eastern Europe, and Eretz Yisrael), independently of the proportion of Jews to the local population, a negligible percentage of Jews was employed in agriculture (see Table 4 in Appendix B); most Jews were engaged in trade and finance and next in industry and handicrafts. For example, in Poland in 1931, 96 percent of the Jews was engaged in nonagricultural occupations, whereas the percentage dropped to 47 for non-Jews. Notice that at that time, in both the United States and Europe the Jews were not prohibited from being farmers.

The explanation presented by Kuznets for this occupational selection is based on endogenous choice—what he called “the economics of small minorities.” In his theory, the minority status of the Jews is exogenous, but the occupational choice is endogenous. For noneconomic reasons a minority group has distinctive cultural characteristics within a larger population. Thus, the *noneconomic* goal of maintaining cohesion and group identity can lead minority members to prefer to be concentrated in selected industries and selected occupations, with the consequence of ending up living in cities where these occupations are available. Therefore, while the occupational distribution within the total population is “normal,” by definition the economic structure of a small permanent minority must be “abnormal,” otherwise the minority cannot survive as a distinctive group.

Before Kuznets, Weber (1917, 363–64) argued that the Jews voluntarily chose to segregate and to become an urban population in order to maintain their ritualistic correctness, dietary prescriptions, and Sabbath rules, which would have been impossible to follow in rural areas. Kuznets, though, pointed out that his argument was general and applied to any minority like the Italians in Brazil, the Indians in Africa, or the Chinese in Southeast Asia. In his view, “the economics of Jews is thus one case of many with similar characteristics” (p. 1604).

3 Facts and Explanations

Both the restrictions theory and Kuznets’ explanation must hold true for the period in which the occupational selection of the Jews into urban, skilled jobs occurred. But when and where did this occupational transition occur?

Table 1 summarizes the occupational distribution of the Jews in the first millennium. Before and when the Mishna was redacted (ca. 200 CE), the occupation of almost all Jews in both Palestine (where they were a majority) and elsewhere (where they were a minority) was farming. Yet, in Jerusalem, Alexandria, Babylon, and Rome some Jews held nonagricultural occupations^{10,11}

The transition of Jews from agriculture to crafts, trade, and moneylending started in the Talmudic period (Baron 1937, vol. 2, 244). Agriculture remained the main occupation of Jews living in numerous countries. Yet in Palestine and Babylonia agriculture became less and less important as a source of income and wealth for Jews after 200 CE. According to Baron, in the fifth and sixth centuries most Jews abandoning agriculture moved into the towns, and became small shopkeepers and artisans in the tanning, linen, silk, and dyeing industries, and glassware making. Some Jews became wealthy traders, merchants, and moneylenders. For example, in Alexandria Jewish traders were organized in a powerful guild that obtained privileges from the Christian emperors (Baron 1952, 249). It is clear from many discussions in the Talmud that although the Jews deemed important to own land, they were aware that trade was more profitable than agriculture (Beer 1974, 38).

The key period of urbanization occurred in Islam during the Abassides rulers from the eighth century to the tenth century. Many cities developed, and Baghdad became the main center (Lewis 1976). Urbanization in the Muslim Empire led Jews to migrate from country to country and from small villages to cities. At the end of the eighth century the Jewish population in the Muslim regions was almost entirely urban (Ben-Sasson 1976, 393; and Gil 1997, 593–96). The movement of the Jews to the cities brought to a full-fledged stage their transition away from agriculture into urban and skilled occupations. Jews were attracted to many occupations within the cities, including handicrafts, tanning, dying, shipbuilding, corn and cattle dealing, bookselling, and tax farming. They were also engaged in long-distance trade. In the ninth century a Muslim writer mentioned Jewish traders who, from southern France, traveled to Islamic lands and then went to India and China. Jews were also involved in moneylending and became bankers to the rulers.

¹⁰The history of the Jews in the classical period is closely intertwined with the history of two empires: the Roman Empire (with Palestine, Egypt, and Italy being the main centers of Jewish settlement), and in the east the Parthian Empire, with Babylon hosting a very large Jewish population.

¹¹Browne (1936), Malamet (1976), Tadmor (1976), Safrai (1976a), and Fuchs and Sevensen (1995).

TABLE 1—OCCUPATIONAL DISTRIBUTION OF THE JEWS IN THE FIRST MILLENNIUM

Time	Location	Farmers	Craftsmen Artisans	Merchants Moneylenders Doctors
0–200 CE	Palestine	80–90%	few	few
	Mesopotamia	80–90%	few	few
	Egypt ^a	60-70%	some	some
	Roman Empire ^b	70-80%	few	few
200–638	Palestine	60-70%	some	some
	Mesopotamia	50-60%	many	some
	Egypt ^c	??	??	??
	Roman/Byzantine Empire ^b	??	??	??
638–1170	Palestine	20-30%	many	many
	Muslim Empire ^d	10-15%	many	many
	Western Europe	5-10%	many	many

Sources: Benjamin of Tudela (1170), Abrahams (1896, chapters XI and XII, and Appendix at pp. 245–49), Juster (1912; 1914), Newman (1932), Browne (1936), Baron (1937; 1952, 244), Roth (1938), Tcherikover (1945; 1961), Agus (1965), Neusner (1965-1970; 1990a), Goitein (1967), Mann (1970), Beer (1974), Stern (1974; 1976), Gross (1975), Applebaum (1976a; 1976b), Ben Sasson (1976), Malamat (1976), Safrai (1976a), Tadmor (1976), Avi-Yonah (1984, p. 20-23), Dan (1990), Hamel (1990), Jacobs (1990), Gil (1992; 1997), and Safrai (1994).

Notes: The percentages in this table should be considered ranges of values instead of exact figures. In some instances, the available primary sources do not provide quantitative evidence at all. In other cases, some scholars of Jewish history have not been interested in gathering and presenting data as economists do. With this caveat in mind, the percentages still offer a reasonably good picture of the patterns and trends in the occupational distribution of the Jews throughout the first millennium.

^a At this time, the Jewish community in Egypt was mainly concentrated in Alexandria, where according to the first-century philosopher Philo about two-fifths of the inhabitants were Jews. This might explain the larger percentage of non-urban occupations held by the Jews in Egypt.

^b It does not include Palestine and Egypt.

^c After the revolts in 115 and 135, the Jewish community in Egypt almost disappeared due to massacres and migrations. Therefore, it is difficult to establish the economic characteristics of the Jews living in Egypt at this time. See Tcherikover (1945; 1961).

^d It includes all lands under Muslim rule, including Mesopotamia and North Africa, but not Palestine.

When in 1170 Benjamin of Tudela wrote his travel itinerary describing the Jewish communities around the world, the transition of Jews away from agriculture into urban occupations was almost complete.¹² Almost all Jews were farmers in the first century CE. Ten centuries

¹² Benjamin of Tudela found scholars devoted to the study of the Talmud and learned people among Jews in most of the places he visited. He also mentions Jews as officials of Pope Alexander in Rome, a physician of a prince in Amalfi, dyers in Brindisi, artisans in silk in Thebes and Salonika, merchants, tanners and the king's physician in Constantinople. Jews were glassmakers in Antioch and in Tyre, where they also owned maritime

later almost all Jews were urban dwellers with skilled occupations, whereas the rest of the population remained engaged mainly in agriculture. These urban, skilled occupations remained the distinctive mark of the Jews throughout history.

Do the assumptions of the restrictions theory and the theory of the economics of small minorities hold true during the Arab and Muslim expansion in the second half of the first millennium, when the Jews moved away from agriculture into trade?

The restrictions theory does not hold during the Muslim period for at least three reasons. First, none of the economic restrictions highlighted by Roth were imposed on the Jews at that time. There were no restrictions on occupations, on land ownership, and, in general, no restrictions on any other factors affecting the choice of being farmers (for example, slave ownership). The non-Muslim population (Jews included) living in Palestine kept the right to own land from 638 CE until the eleventh century at the time of the Crusades (Gil 1992). Also, the documents from the Cairo Geniza illustrate the great variety of occupations (including farming) that Jews appear to have held in all the lands of the Muslim empire, and therefore, demonstrate that no restrictions existed at the time Jews moved away from agriculture into urban occupations (Goitein 1967; and Gil 1997).

Second, the restrictions theory maintains that Jews did not engage in agriculture since they were prohibited from owning land in many places where they lived. Even when there were no legal prohibitions, material insecurity would have made the Jews prefer to invest in portable assets instead of land. However, it should be noted that a large percentage of the non-Jewish population were landless peasants working as sharecroppers, fixed-rent tenants, or wage workers throughout history. Even if the Jews could not own land or found it disadvantageous to cultivate their own land, they could have worked as tenants for non-Jewish landowners. In fact, this is what happened just after the revolts against the Roman Empire in the first and second centuries. When in Palestine a portion of the land holdings belonging to Jewish farmers were confiscated, some of the Jews who were previously owner-farmers, became tenant-farmers (Heinemann 1990, 269). They could have kept working as tenant-farmers in later centuries, yet they did not. Also, in the late Roman and early Byzantine empires other groups were discriminated against land ownership and, yet, they did not become merchants. For example, the Samaritans, who were disqualified from bequeathing property, did not move into urban, skilled occupations but they remained engaged in agriculture (Osman 1976, 138).

Third, people engaged in handicrafts, trade, and finance earned, on average, more than farmers throughout history (Kuznets 1960, 1621). This held true even more during the first millennium. Hence, restrictions paradoxically pushed Jews into more profitable occupations. If the purpose of these restrictions was to somehow discriminate against the minority, one wonders why these prohibitions made Jews end up in occupations that provided them with higher incomes and wealth. It seems reasonable to conclude that other economic motives and not restrictions by local rulers determined the transition of Jews into urban, skilled jobs in the seventh-ninth centuries.

Still the question remains: what economic motives can explain why almost none of the Jews remained engaged in farming and almost all moved into urban jobs, and why did most non-Jews remain farmers? Kuznets' explanation recognized that the occupational selection of Jews was the outcome of choice, but he claimed that the minority status and the desire to maintain cohesion

vessels, and were handicraftsmen and dyers in Sidon, Jerusalem, Bethlehem, and Jaffa. Benjamin of Tudela also mentions Jewish farmers in Mesopotamia.

and group distinctiveness were the main reasons for the observed occupational distribution. His argument faces two objections. First, the Jews were a minority in all locations (Roman Empire, Babylon, and Egypt) except in Palestine in the first and second century, and yet almost all of them were farmers (see Tables 1 and 2).¹³

TABLE 2—DISTRIBUTION OF THE JEWISH POPULATION (IN MILLION)

	Time Period							
	0-70 CE	70-135	2-3rd	6th	12th	Late 15th	Early 18th	Early 19th
Palestine	2	1.5	0.7	0.2	0.002	few		
Mesopotamia	1	1.2	1.2	many	0.768	many		
North Africa	1	0.1	few	few	0.07	many	0.187	0.26
Syria	0.1	0.1	0.1		0.024			
Asia Minor	0.1	0.2	0.1		0.024	many	0.187	0.26
Roman Empire	0.3	0.3	0.3					
Western Europe				few	0.108	0.507	0.147	0.444
Eastern Europe					0.048	0.089	0.574	2.215
Rest of the world					0.156		0.003	
Total Jews	4.5	3.3	2.5	1-1.5	1.2	1.3	1.1	3.2
Total Population	82 ^a	82 ^a	67 ^a	50 ^a	90 ^a	135 ^a	285 ^b	380 ^b
Jewish Population World Population (%)	5.5	4.0	3.73	2.0	1.3	0.96	0.38	0.84

Sources: Benjamin of Tudela (ca. 1170), Margolis and Marx (1927), Browne (1936), Baron (1937; 1952; 1971), Roth (1938; 1946; 1960a; 1960b; 1975; 1978), Ruppin (1946), Lestschinsky (1946), Lewis (1952), Ben-Zvi (1960), Goldin (1960), Engleman (1960), Halpern (1960), Kuznets (1960), World History of the Jewish People (1966), Encyclopedia Judaica (1971), Stern (1974; 1976), Gross (1975), Tadmor (1976), Epstein (1980), Avi-Yonah (1984, p. 19), Raphael (1985), Herr and Oppenheimer (1990), Gil (1992), Safrai (1994), Fuchs and Sevensen (1995), and DellaPergola (2001). On world population: Clark (1968), Durand (1977), McEvedy and Jones (1978), Biraben (1979), and Kremer (1993).

^a The numbers include: Europe, North Africa, the Near East, and the Middle East.

^b The numbers include all world regions except China and India where the Jews rarely settled.

When the Jews became a minority also in Palestine in the fourth century (Table 3), most of them remained farmers (Herr and Oppenheimer 1990, 109). Later, in the Byzantine Empire, there were urban areas but Jews were mainly living in Galilee as farmers. Therefore, the historical evidence clearly indicates that the Jews were a minority well before becoming merchants in the eighth century. Their minority status could not have been the main economic motive behind their occupational transition.

¹³We thank Sergio DellaPergola for a very helpful discussion on Jewish demographic history and for sharing his work. We built this table after a careful reading of the references listed in the table's footnote. In some cases, as the references provide conflicting data, we had to make a decision about what evidence to accept and reject. The numbers in Table 2 should be considered as ranges of values, instead of exact figures. Also, since there is no direct evidence on population in this period, one might be skeptical regarding these numbers. However, all the studies published on Jewish and world population (see the footnote of Table 2) agree with the *pattern* that emerges from Table 2.

TABLE 3—JEWISH AND TOTAL POPULATION IN PALESTINE (IN MILLION)

Period	Total Population	Jewish Population
60 CE	3	2.25
100	2.25	1.5
150	1.75	1.0
235	—	Large migration to Babylon
300	1.1	0.5
395	0.8	0.25
5 th –6 th centuries	1.5 ^a	0.2

Source: Herr, Mosheh David (ed.). The History of Eretz Yisrael. The Roman-Byzantine Period, The Mishna and Talmud Period, and the Byzantine Rule (70–640). Jerusalem: Keter Publishing, 1990 (in Hebrew).

^a Mostly were Christians.

Second, during the first millennium in the places where the Jews lived there were many other minorities who kept their distinctive characteristics yet living in villages or towns as farmers (Cohen and Frerichs 1993).¹⁴ For example, in the Byzantine period, there were in Palestine 1.5 million people (Jews, Christians, Hellenistic pagans, Samaritans, and some Arabic tribes).¹⁵ The pagans themselves were a minority in Palestine and yet they were farmers. All these minorities were not segregated in any occupation. It is not clear why the Jews could not keep their distinctive minority status and cohesion by being farmers and living in villages as they did in Galilee and Babylon before the eighth century. The Samaritans and Christians did. Why not the Jews?

The related claim advanced by Weber that the Jews voluntarily chose to segregate and to become an urban population in order to maintain their ritualistic correctness, dietary prescriptions, and Sabbath rules, which would have been impossible to follow in rural areas, is contradicted by groups, such as the Amish in the United States, who remained engaged in agriculture and yet maintained their cohesiveness (Kuznets 1960, 1605).

Before we turn to our explanation, it is important to mention that Baron (1952, 245), Ben-Sasson (1976, 393), and Gil (1997, 595–96) maintained that declining profitability in agriculture in the late Roman and early Muslim empires, and increasing urbanization during the Arab expansion determined the occupational transition of the Jews. This argument raises the puzzle of why declining profitability in agriculture and urbanization did not make everybody prefer to live in cities, not just the Jews. In early Islam, most pagans and Christians who converted to Islam remained in farming whereas the Jews in Eretz Yisrael and Babylon moved to the urban centers controlled by the Islamic rulers. Thus, the question remains: why did the Jews become merchants and the non-Jews did not despite similar changes in economic conditions?

We argue that the distinctive characteristic of the Jews with respect to other minorities is that by the sixth century, their religion was centered around education. Our claim is that this distinctive feature, and *not* their minority status, is the main reason for why from the seventh-eighth centuries they chose to be merchants when they *could* choose to be farmers.

¹⁴Even in the nineteenth and twentieth centuries in Iraq, Syria, and Eretz Yisrael there were many minorities such as Druses and Christians, who lived for centuries as farmers in separate villages and town communities.

¹⁵Later, most of the pagans and Arabic tribes became Christians (Dan 1990, 239).

4 Education in Judaism

If a satellite sent back to the distant past could spy the populated world in the first millennium, what picture would it bring? Jews dressed, looked like, and spoke the same language as the rest of the population. The key difference between Jews and non-Jews was that after the second century a significant percentage of male Jews was already able to read (and some to write). At the end of the millennium, virtually all male Jews were literate (and only few were farmers). At the same time, almost the entire population in the places where the Jews lived was illiterate (and most of them were engaged in agriculture).

Why were most of the Jews literate whereas most of the population was illiterate in the first millennium? We argue and show that Judaism made primary education universal and mandatory for boys almost two millennia before a similar development occurred in the rest of the world. Only in modern times in Europe, the first laws making primary education universal and mandatory can be found.

Early and Classical Times (up to about 150 CE). The development of Jewish educational institutions was a slow and long process. During the *Soferim* (scribes) period (about 515–200 BCE), academies for higher learning in Jerusalem were founded. Their main purpose was to prepare the priests for the Temple, and for this reason the access was restricted to a very small group of people (Swift 1919, 86–98; Ginzberg 1943, 8–11).¹⁶ Schools for higher education (*Bet Hillel* and *Bet Shammai*) were founded in Babylon and Jerusalem and later in other towns. The admission fees, the living and transportation costs, and the tough entry requirements, however, turned out to be serious obstacles, and these secondary schools were not attended by many students as the reformers had hoped (Drazin 1940; and Morris 1977).

To overcome this problem, after the Maccabean victory, under the influence of the president of the Sanhedrin, Simeon ben Shetah (about 65 BCE), free secondary schools were established throughout Palestine and were to be attended by young adults (16 or 17 years old). Thus, a two-level school system came into existence. In Jerusalem a college for advanced students had to prepare students to higher academies, whereas across Palestine were founded preparatory schools, which provided free and compulsory education for all male adolescents (Greenberg 1960).

This secondary schooling system, though impressive for the period, suffered of a fundamental problem: orphans and children whose fathers did not have the time or the knowledge to provide them with some basic education, did not receive the necessary primary education required to meet the standards of admission to the secondary schools. To address this problem, in about 64 CE the high priest Joshua ben Gamla issued an ordinance that made primary education universal and compulsory for boys over six or seven.¹⁷

¹⁶The Second Temple in Jerusalem was built in about the years 538–516 BCE.

¹⁷A quote from the Talmud indicates the stages toward the establishment of universal primary education among Jews: “However, that man is to be remembered for good, and his name is Joshua ben Gemala; for were it not for him Torah would have been forgotten in Israel. For at first he who had a father was taught Torah by him, and he who had no father did not study Torah. It was then decreed that teachers of children should be appointed in Jerusalem. However, he who had a father, the father would bring him to Jerusalem and have him taught, while he who had no father, would not come to Jerusalem to study. It was then decreed that teachers of the young should be appointed in every district throughout the land. But the boys would be entered in the school at the age of sixteen and seventeen and if the teacher would rebuke one of them, he would resent it and leave. Thus it was until Joshua ben Gemala decreed that teachers of children should be appointed in every district and every city

Notice that the educational reform (from the schools of higher education to the elementary schools) occurred in Palestine from about the third century BCE to the first century CE when most Jews were farmers. In other words, it occurred *before* the destruction of the Temple and the ensuing migrations. Moreover, this educational structure was adopted by Babylonian Jews who were also mainly farmers at that time. The destruction of the Temple and the revolts enhanced this decision to invest in human capital but other religions were “persecuted,” and yet, they did not place such an emphasis on literacy and education.

The destruction of the Second Temple in 70 CE brought a deep change in the Jewish religion. The core of Judaism consisted no longer of the rituals and ceremonies performed by the priests in the Temple. The reading and teaching of the Torah became the essence of the Jewish religion (Safrai 1968; and Telushkin 1991). The synagogue became the center of praying and learning, and the main purpose of the Sabbath day meetings in the synagogue was not public worship in the usual sense, but religious instruction.¹⁸ Also, the rabbis and scholars emerged as the prominent leaders in the communities (Greenberg 1960, 1277). The rabbis stated even more strongly that worship of God was achieved not only by prayer but also by study (Sombart 1913, 158). To observe all the laws of his faith, a Jew had to be educated. A good Jew had to read sections of the Pentateuch four times a week at services, twice on the Sabbath and once every Monday and Thursday mornings (Drazin 1940, 25). Today’s Jewish religious education is almost the same as the one established around the first century CE.¹⁹

Christianity grew within Judaism, but in the first century the two religions did not differ significantly as they did later (Cohen 1987; and Neusner 1990c).

One may speculate why the educational reform occurred in Judaism at that time. The rabbis might have favored the educational reform because it increased their revenues as teachers.

Alternatively, Aberbach (1982, p. 19) maintained that the good economic conditions during the third century BCE made it possible to expand the learning of the Torah and the educational system. In this favorable economic situation, Simeon ben Shetah ruled to make secondary schools compulsory in about the first century BCE. This view is consistent with the fact that many pagans converted to Judaism at that time as they saw that the Jews were doing well from an economic point of view.

Other scholars have attributed the emphasis on schooling and education to a development within the religion (Baron 1952). In the second and first centuries BCE and until the destruction of the Second Temple in 70 CE, there were two main groups within Judaism—the Sadducees and the Pharisees. To the Sadducees belonged the high priests who ruled the Temple in Jerusalem, the aristocratic landowners, and the wealthy merchants. They seconded the Hellenistic trend within Judaism while at the same time being the stronghold of conservative views (i.e., they only accepted the Written Torah consisting of the first five books of the Bible). In contrast, the study and interpretation of both the Written and the Oral Law was considered of the utmost

and that boys of the age of six and seven should be entered.” [Baba Batra 21a, cited in Greenberg (1960, 1261).]

A post-Talmudic treatise, listed as an appendix to the Talmudic treatise Aboth (Aboth v. 21) outlines the typical Jewish educational pattern: “At five years old (he comes) to the reading of Scripture, at ten to the Mishna, at thirteen to the practice of the commands, at fifteen to the Talmud, at eighteen to marriage” (Schürer 1891, 52, fn. 39).

¹⁸A law enacted during the first century allowed a community to transform a synagogue structure into a Bet Ha-Midrash (institution of higher learning for studying and interpreting the Torah), but prohibited the sale of a Bet Ha-Midrash for exclusive synagogue use; the Bet Ha-Midrash was considered to have a higher state of sanctity than the synagogue itself (Greenberg 1960, 1277; and Goldin 1960, 158).

¹⁹Here we refer to the religious education as it is studied in Orthodox Jewish schools and Yeshivas today.

importance for the Pharisees, who also aimed to expand learning and study of the Torah to all Jews (Feldman 2002). When in 70 CE the Temple was destroyed, the Sadducees lost their main source of their religious, economic, and political power, and shortly after they disappeared as a group within Judaism. Meanwhile, the Pharisees who did not actively participated in the rebellion against Rome in 66–70 CE, gained the permission to establish an academy at Jabneh, where they replaced the cult of the Temple with study and prayer.

Regardless of the motivation, the outcome of the educational reform remains the same: more and more male Jews were becoming literate well before any economic gains could accrue. The economic returns occurred centuries later.

The Mishna and Talmudic Period (150–638 CE). The emphasis on learning and education grew in the next centuries. Within the academies the sages known as *Tannaim* organized in a systematic way the vast body of Jewish Oral Law accumulated through the centuries. Their work was brought to completion by Rabbi Judah the Prince who redacted the Mishna in about the year 200 CE (Ebner 1956). At the same time, he also pushed membership in the Jewish community to become more and more identified with the knowledge of the Torah. In earlier times, *am ha-aretz* (literally “people of the land”) referred to a Jew who disregarded tithing and the norms of ritual purity (*am ha-aretz lemitzvot*). In contrast, under Rabbi Judah’s influence, from the third century the word acquired the new meaning of “one who is illiterate,” someone who did not know and did not teach his sons the Torah (Oppenheimer 1977; and Haas 1989, 149). To be an “*am ha-aretz letorah*” in a Jewish community meant to be considered an outcast. There is evidence that the decision of Rabbi Judah the Prince to make literacy the main feature of being a “good Jew” generated a lot of tension at that time between the illiterate (*ammei ha-aretz*) and the rabbis and *tannaim*.²⁰

The *Tannaim* were succeeded by the *Amoraim*, who were commentators on the set tradition. Their opinions were collected in the Gemara until the end of the sixth century. Together, the Mishna and the Gemara formed the Talmud (Jerusalem Talmud and Babylonian Talmud). Literacy became more widespread among male Jews in the centuries when the Talmud was being compiled (Aberbach 1982, p. 32). Goitein (1962) maintains that there are many references in the Talmud that fathers had to pay for their sons’ education and to teach them a craft. The requirements on Jewish education became more demanding with the compilation of the Talmud, when the written texts Jews were supposed to learn and the number of commands and prohibitions a Jew had to observe grew in number and complexity (Perlow 1931; and Safrai 1976b).

Up to the time of the Bar Kokhba Revolt in 135, the Romans themselves did not distinguish between Jews and early Christians. However, from the second century onward, Judaism and Christianity started significantly departing from each other. Under the influence of Paul’s doctrine, faith replaced obedience to the Law as the core of Christianity whereas Judaism moved in the direction of becoming a club based on literacy (Neusner 1987; 1990c). One of the main goals set forth by Paul one century earlier was to make Christianity a Gentile religion (Alon 1980, 296). For this purpose, he declared that obedience to the Torah and circumcision were no longer required to Gentiles who converted to Christianity whereas they were still binding for Jewish Christians. Later, with the support of Roman emperors, Christianity became a mass

²⁰For example, in the book *Pesahim* in the Babylonian Talmud, there is the following quote: “Greater is the hatred wherewith the ammei ha-aretz hate the scholar than the hatred wherewith the heathens hate Israel.”

religion in the lands belonging to the Roman Empire. In 315 the emperor Constantine decreed that Christianity was the official religion in the empire (Neusner 1987).

From the Arab Expansion to the Middle Ages. The wealth of documents from the Cairo Geniza indicates that by the tenth century, among Jews virtually all male children had primary education. Each community was required to provide one teacher if there were twenty-five pupils or less, one teacher and one assistant if there were between 25 and 50 pupils, and two teachers if there were 50 pupils (Swift 1919, 95). One schoolteacher usually taught to a variety of children of different ages attending the same class. Rich households also hired private tutors.

The requirement to send boys to primary schools was observed by most Jews independent of wealth or social status. A wife who wanted to prove that the husband did not act as a proper father for their children claimed in court that he did not pay for the school fees.²¹ School fees were regularly entered into the budgets of wealthy, as well as humble, households. For example, in a partnership contract, the two parties agreed that expenses for food were to be covered with money from the business venture, whereas each partner had to personally pay for rent and school fees (Goitein 1971, 174; 1978).

Further evidence corroborates the claim that education was deemed extremely important among Jews at that time. In a letter sent from Cairo in the twelfth century, a Jew writes “Your boy Faraj now reads the *Targūm* accompanying the lections—as I guaranteed you he would” (Goitein 1971, 175). In a letter, a man in Alexandria writes to a relative away traveling that “your children are well and go to school every day” (Goitein 1971, 173–74).

Goitein (1962) also mentions schools for girls and female teachers. For women, however, it is less clear the degree of universality of primary education.

Costs, Content, and Returns to Jewish Education. How costly was for a Jewish family to send a child to school? What did the children learn in schools and synagogues? And what were the economic returns to Jewish education?

Data for the first millennium are scanty. Yet, for the Muslim period the documents from the Cairo Geniza edited and studied by Goitein (1962; 1971; and 1983) turn out to supply a lot of information. One learns that parents had to pay $\frac{1}{2}$ silver *dirhem* per child per week for the teacher’s salary in public schools. Thus, a child costed 2 *dirhems* per month to his family (Goitein 1962, 87). This should be compared to the poll-tax of 3.4 *dirhems* per month that non-Muslims paid, and to the average monthly salary for a teacher, which amounted to 2 gold dinars (= 80 silver *dirhems*). These data suggest that children’s education was costly, especially for farmers who earned less than teachers or other skilled crafts, as documented by Goitein (1967). In addition to the cost of providing his own children with a Jewish education, each household head who had resided for twelve months or longer in a given location, had to pay an education tax to finance the education expenses for orphan and/or poor children.²²

As for the structure and content of Jewish education, Carlton and Weiss (2001) remark that in contrast to other areas in which Jewish law imposed many restrictions and prohibitions, Jewish religion favored competition in the teaching of the Torah. Teachers taught basic literacy but also the Torah. While the main goal was to prepare the male child to pray at the synagogue, the schools also taught Arabic. We have evidence of this from a letter from the Cairo Geniza

²¹See Goitein (1971, 173–74).

²²Greenberg (1960, 1270), and Zeitlin (1978, 303).

documents, in which a boy wrote to an uncle: “I am writing you this letter with my own hand. My brother Nabāt still attends school; he is now thirteen. You mentioned in your letter that your boys studied the Sacred Law and Arabic and Hebrew calligraphy. We thank God for this” (Goitein 1971, 173–74). In addition to Hebrew and Arabic, children learned basic mathematics. According to Goitein (1962), numeracy was deemed even more important than writing. Even non-Jews sometimes attended synagogues to learn not religious subjects but basic mathematics.

It is then clear what were the economic returns to Jewish education. First of all, the ability to read and write in one language (Hebrew) helped Jews to read and speak in other languages as well. The development of the Hebrew-Arabic, the Yiddish, and the Ladino documents the ability of Jews to write in Hebrew alphabet the local languages spoken in the places where they lived.

The ability to read and write religious texts also enabled the Jews to read and write any other documents written in Hebrew, such as business letters, contracts, loans, and sales. Therefore, the religious requirement to learn the Torah in Hebrew turned out to be profitable in the economic sphere as well: the Jews learned the Torah in Hebrew, and then they used this knowledge to write business contracts and transactions in Hebrew/Arabic. This enabled and enhanced the network externality among Jewish merchants described by Greif (1989). Literacy was a pre-condition for the use of community sanctions among Jewish merchants. Only a Jew who could read a fellow merchant’s letter or report could enforce sanctions on members who cheated and displayed opportunistic behavior towards other Jewish merchants. In addition to the Cairo Geniza documents analyzed by Goitein and Greif, the vast rabbinic Responsa literature indicates that the investment of Jews in literacy and education enabled them to exploit the network externality at a great extent.

Literacy and education was valuable not only for merchants and moneylenders. Unlike today, the production of many goods was custom-tailored in the first millennium. Therefore, even for artisans and craftsmen such as goldsmiths, blacksmiths, shoemakers, or tailors, there was an advantage from being able to write contracts between the artisan and the customer, which specified the size and type of goods in case disputes occurred later on. Also, craftsmen and artisans bought raw materials from, and sold their finished products to, local and distant merchants. Again, the ability of drafting or reading a contract was beneficial.

The economic returns to education are also clearly indicated by the wages across various occupations. Educated and literate people earned more than farmers. In addition to the quote of a fourth-century rabbi who claimed that “a merchant with a capital of 100 *zuzim* could afford meat and wine daily, whereas a farmer owning land of the same value had to be satisfied with salt and roots” (Baron, 1937, vol. 2, 250), we also have some suggestive data about the wages in various occupations. Around the early first century CE in Palestine, the daily wage of a vineyard worker was 1 denarius, a doctor’s fee 2 denarii, and the wage of a scribe was 2 denarii per day (Sperber 1965, 250–51). In Egypt in the first century CE, men on farm work earned a daily wage varying from $\frac{1}{8}$ to $\frac{1}{6}$ denarius, a plasterer’s assistant $\frac{1}{5}$, a bricklayer $\frac{1}{4}$, a pruner $\frac{1}{6}$, a ploughman $\frac{1}{5}$, a man who harvested $\frac{1}{12}$, a household servant $\frac{1}{10}$, a weaver $\frac{1}{7}$, and a teacher $\frac{1}{4}$.²³ Later, in Babylon the *Amoraim*, the learned scholars in the academies, were also the wealthiest merchants.

In addition to basic literacy, those Jews who engaged in learning the Mishna and especially the Talmud, also acquired the argumental thinking that is the essential feature of many Talmudic

²³Sperber (1966, p. 187; 1968; 1970); Frank (1938, 86); and Duncan-Jones (1974, 1976).

debates. The sophisticated logical and argumental structure of the Talmud that is related to daily life and economic pursuits was certainly an important input in the ability of the Jews to engage in handicrafts and trade (Sombart 1913, 149).

Lastly, there is a feature of literacy and education that might have influenced the large migrations of Jews: literacy made mobility less costly since it enabled educated people to stay in touch with each other.

Looking at the existing literature, it appears that the nexus between education and Judaism has been neglected when explaining the main trends in Jewish economic and demographic history. Meanwhile, it is our claim that the emphasis of Judaism on education was a powerful mechanism that affected the selection of the Jews into urban and skilled occupations, and the selection of Jews in and out the Jewish communities themselves. The nexus between education and Judaism, and the increasing importance of education among Jews in the first half of the first millennium, *prior* to the migrations to Europe and to other urban centers, is the central aspect of the specification of the model below. Our aim is not to explain why Judaism became a religion centered around education. We take this nexus as given (this is our main assumption) and we proceed in analyzing the impact of this nexus on the choice of occupation, investment in children’s human capital, conversion, and migration.

5 The Model

We intend to provide a coherent economic story for the implications of the educational reform in Judaism. The model analyzes the choices of both Jewish and non-Jewish adults regarding their occupation, religion, migration, and the level of their children’s education, taking the number of children in a household as given. The main assumption that distinguishes Jews is their higher utility from their children’s Hebrew literacy (education).²⁴ Without indicating at the outset the location, we consider individuals making these choices during the first millennium at one of the four locations where Jews mainly settled during this period—Palestine, North Africa, Near East, and western Europe.

The model specifies the supply of labor for two occupations: farmers and merchants, where farmers are located in villages and merchants in cities. The demand for merchants is assumed to be exogenously given by the development of cities and commerce in the world, as well as by regulations that are set by the rulers. Unless there are explicit restrictions set by the rulers, Jews are assumed to be free to choose being farmers or merchants in all times and locations.

5.1 Setup

An individual is assumed to live for two periods. In the first period, he is a child (son) living with (and maybe working for) his family; he may also receive religion-related education e from his family.²⁵ In the second period, an adult (father) born at date $t - 1$ makes decisions regarding the education level of his children, his own occupation, religion, and migration.

²⁴We follow Becker and Lewis (1973)’s and Becker (1975)’s theory of children’s quality; the utility and cost specification is similar to those of Iannaccone (1992) and the occupational choice is the same as Roy’s (1951).

²⁵Here we do not distinguish between general human capital and Jewish-specific human capital. Carmel Chiswick (1999) makes this important distinction to explain the survival of Judaism. In our setup, a Jew who learns through religious instruction acquires literacy in Hebrew, as well as some general human capital. See also Iannaccone (1990) for a human capital approach to religion.

Let x_t be an exogenous taste parameter that weights the value of being a Jew in the utility function of an adult at time period t , and let r_t indicate his religion, where $r_t = 1$ for the Jewish religion and $r_t = 0$ for a non-Jewish religion. Let e_{t-1} be the education level of an adult individual at time t , that is, the education that he received when he was a child at $t - 1$. Therefore, in period t each adult individual born at $t - 1$ is indexed by a state vector, $s_t = \{x_{t-1}, r_{t-1}, e_{t-1}, x_t\}$, which indicates his father's characteristics x_{t-1} and r_{t-1} , and the individual's own education level e_{t-1} (which he received as a child at $t - 1$) and his own taste parameter for Judaism x_t .

By assumption, the taste parameter x_t is given to an adult individual as a draw from a distribution that depends on his family (father)'s attitude toward Judaism. Specifically, the value of x_t is taken from a distribution $G(x_t | x_{t-1}, r_{t-1})$, where x_{t-1} and r_{t-1} are, respectively, the father's level of x and religion, and $g(x_t | x_{t-1}, r_{t-1})$ is the corresponding density function. The distribution of the Jewish attachment index x has the following intergenerational transmission properties:²⁶

$$\begin{aligned} G(x_t = 0 | x_{t-1} = 0 \text{ or } r_{t-1} = 0) &= 1, \text{ such that } g(x_t > 0 | x_{t-1} = 0 \text{ or } r_{t-1} = 0) = 0 \\ G(x_t > 0 | x_{t-1} > 0 \text{ or } r_{t-1} = 1) &> 0, \text{ such that } g(x_t \leq 0 | x_{t-1} > 0 \text{ or } r_{t-1} = 1) = 0 \end{aligned} \quad (1)$$

and the mean of G is increasing in x_{t-1} , for $x_{t-1} > 0$. The assumption on the distribution reflects the idea that the taste parameter for Judaism is transferred through the family (father)'s attitude to the religion.

The typical dynastic father is assumed to have the following linear utility function:

$$u(c_t, e_t, r_t; s_t) = c_t + x_t e_t r_t + x_t e_{t-1} r_t - \pi x_t (r_{t-1} - r_t) \quad (2)$$

where c_t is the family consumption and πx_t is the utility cost of conversion ($\pi \geq 0$) from the Jewish to a non-Jewish religion. From (1), if $r_{t-1} = 0$, then $x_t = 0$, and therefore, the conversion of a non-Jewish individual to Judaism has a zero cost.

Given the strong evidence of the importance of education in the Jewish religion presented in the previous section, we set the preferences of an adult individual to be such that, when he and his son have no education at all, the individual derives no utility from being a Jew. Notice that the preference parameter x is interacted with the level of education; that is, the utility from being a Jew is increasing with the sum of the individual's education and of his son's education. This is because the Jewish religion emphasizes the importance of learning and reading as part of the Jewish practice. An observant Jew *has* to teach his son to read at a very early age.²⁷ The interaction between x and $(e_t + e_{t-1})$ provides a simple specification for these observations on the Jewish religion.

A Jew who follows the rules established by his religion has to provide at least a minimum level $e_{\min} > 0$ of education to his son; otherwise, if $0 < e < e_{\min}$, the education level is equal to 0, and the Jewish individual is called *am ha-aretz*. Let $h_t = 1$ if the individual or his son are *am ha-aretz* (and 0 otherwise). Based on the development of Judaism (see Section 4) that made *ammei ha-aretz* (illiterate persons) outcast in the Jewish communities starting from the second-third century CE, we assume that there is a community penalty of $\epsilon > 0$ imposed on a

²⁶This specification of the intergenerational transmission of religious traits is similar to the one in Bisin and Verdier (2000).

²⁷See also Chiswick (1988) for a discussion of tastes, investment in children's education, and earnings across ethnic groups.

Jew ($r_t = 1$) if he is *am ha-aretz* ($h_t = 1$). Lastly, the cost of providing education to children is given by $p(e_t)$, such that for a minimal level of education $p(e_{\min}) = p_{\min} > 0$, and $p'(e_t) > 0$, $p''(e_t) > 0$, for $e_t > e_{\min}$.

As mentioned earlier, there are two occupations: farming (F) and trade (merchant = M). The choice of occupation ($o_t = [F \text{ or } M]$) is equivalent to the choice of location within the same geographical area. Let $w_t(o_t = F) = w^F > 0$ and $w_t(o_t = M, e_t | e_{t-1}, r_{t-1})$ be, respectively, the earnings in agriculture and trade, which are equal to the productivity in each occupation. These earnings represent the income that a family derives from the father's occupation and includes the son's input assuming that he works with his father. Education does not affect a farmer's productivity, and by assumption, the wage in agriculture is equal for each farmer independently of his characteristics.²⁸ A merchant with no education earns the same as a farmer. However, for merchants, the father's and his son's education (literacy) levels have a positive marginal product. Furthermore, following Lucas (1985)'s specification of the human capital externality in production, we assume that the earnings for merchants increase with the average level of literacy among merchants, E_t^M .^{29,30} Based on the assumptions we just spelled out, the earnings for merchants are

$$w_t(o_t = M) = w^F [1 + e_t^\alpha (e_{t-1} E_t^M)^{1-\alpha}]. \quad (3)$$

The farmers and merchants' budget constraints are, respectively,

$$c_t^F \leq w^F - p(e_t) - \epsilon h_t r_t - \tau_t^F \quad (4)$$

$$c_t^M \leq w^F [1 + e_t^\alpha (e_{t-1} E_t^M)^{1-\alpha}] - p(e_t) - \epsilon h_t r_t - \tau_t^M \quad (5)$$

where τ^{ro} is the tax paid by an individual of religion r in occupation o .

Formally, the father solves the following maximization problem:

$$\max_{c_t, e_t, o_t, r_t} \{u(c_t, e_t, r_t; s_t) : c_t(r_t, o_t) + p(e_t) + \epsilon h_t r_t + \tau_t^{ro} \leq w_t(o_t, e_t | e_{t-1}, E_t^M)\}. \quad (6)$$

The previous discussion dealt with the supply of labor for each occupation. As for the demand for rural and urban occupations, we make the following assumptions. First, the size of the population in each occupation and in each location is assumed to be exogenously determined. The world population is assumed to be of constant size N .³¹ Second, we set the beginning of the analysis in about the year 150 CE, after the Jewish revolts and when Judaism and Christianity started departing from each other. This is the time when the educational reform in Judaism started to be implemented. At this time, let the total number of Jews be a fraction $\theta_{t=0}^J$

²⁸This is an extreme assumption that can be replaced with the milder assumption that the marginal product of education is higher for merchants than for farmers.

²⁹In equilibrium, because of the heterogeneity among Jews with respect to x_t , the level of education has a cross section distribution that is endogenously determined. This distribution is changing over time, as we show later.

³⁰Greif (1989; 1993) documents the existence of the network externality generated by Jewish institutions, such as the Maghribi traders' coalition during the Muslim period. By writing and sending letters to fellow merchants, the Maghribi traders managed to impose community sanctions on members who displayed opportunistic behavior toward other members of the Jewish trading network. This network externality could not exist without high literacy levels among these merchants.

³¹Table 2 indicates that the world population decreased during the first half of the millenium and then it stabilized. This trend can be imposed but it will not affect the main results of the model.

(~ 0.045) of the relevant world population. In the first half of the millennium, the number of urban occupations is assumed to be a constant fraction θ^M (~ 0.05) of the N people in the world. The Jewish and non-Jewish proportional number of merchants at $t = 0$ is assumed to be the same ($\theta_{t=0}^M$ (~ 0.05)). Third, at the beginning of the Arab and Muslim period (seventh-eighth centuries), the demand for urban occupations θ^M increases.

The model makes various predictions, which we summarize as follows (see Appendix A for a detailed analysis of the model):

5.2 Results

*Result 1 (Children's religion-related education)*³²

- (i) Non-Jewish farmers will not invest in their children's education whereas a positive proportion of Jewish farmers will invest in their children's education.
- (ii) For all $t > 0$, the education level of all Jewish merchants is higher than that of non-Jewish merchants and Jewish farmers, if at the initial period ($t = 0$) the education level among Jewish and non-Jewish merchants is the same.

Result 2 (Occupation)

- (i) Jewish and non-Jewish merchants, non-Jewish farmers, and uneducated Jewish farmers do not want to change their occupations.
- (ii) In contrast, Jewish farmers with positive level of literacy (education) prefer to become merchants since their earnings, and, thus, utility, are higher as merchants. Over time, the proportion of literate Jewish farmers increases and all of them would prefer to become merchants. The limited number of urban occupations prevents them from changing occupation. As the demand for urban jobs increases, literate Jewish farmers become merchants before the potential transition of non-Jewish farmers into these jobs.

Result 3 (Conversion)

- (i) Jewish farmers with very low levels of attachment to Judaism ($x_t \in [0, \frac{\epsilon}{e_{t-1} + \pi}]$) convert to a non-Jewish religion and do not educate their children.
- (ii) Jewish farmers with low levels of attachment to Judaism ($x_t \in [\frac{\epsilon}{e_{t-1} + \pi}, \gamma]$) remain Jews but do not provide their children with education, and therefore, they are *ammei ha-aretz*.
- (iii) Jewish farmers with $x_t = \gamma$ do not convert and provide their children with the minimum education level $e_{\min} = 1$.
- (iv) Jewish farmers with high levels of attachment to Judaism ($x_t \geq \gamma > 2 - \alpha$) do not convert and provide their children with an education level greater than the minimum level e_{\min} .

³²Result 1 on children's education is built into the model whose assumptions are based on the discussion in Section 4 that motivates the structure of the model itself.

- (v) If at the initial condition ($t = 0$) the proportion of Jewish farmers with no education ($e_{t-1} = 0$) is high, then the conversion rate among Jews is high. Since Jewish farmers with very low levels of attachment to Judaism convert, and since the mean of the conditional distribution G increases with the attachment index x_t , the proportion of conversions among Jewish farmers decreases over time.
- (vi) Jewish merchants with any positive level of attachment to Judaism do not convert to a non-Jewish religion.

Result 4 (Migration)

- (i) Migration of farmers and merchants can be the outcome of deteriorating economic conditions in one location, improving economic conditions in other locations, or large differences in taxes.
- (ii) Since the supply of merchants is limited and exogenous, literate Jewish farmers migrate to places where the opportunities for urban jobs become available so that they can engage in urban occupations in which returns to education are higher than in farming. Once Jews become merchants, they move to new locations where the demand for urban occupations is increasing. The network component (E^{JM}) explains the external effect on the migration of Jews as merchants.

6 Historical Evidence on the Model's Implications

Children's Education. Early mandatory primary education was almost unique of Judaism in the first millennium (Feldman 1996, 501). The pagan celebrations of the Greeks and the Romans did not assign a high value to learning. In the Hellenistic regions, primary schools became widespread although they were not universal. In classical Rome, among the prominent families children went to primary school at the age of seven, to the *grammaticus* at eleven, and to the rhetor from fifteen to twenty years old. However, lower classes and rural districts were left out (Marrou 1982). Moreover, most of the population in the first millennium was rural; by definition, this means that their literacy was zero. Although we do not have a direct source on literacy rates in the world population at the end of the first millennium, we know that literacy rates even in modern times were very low.³³

In contrast, there is evidence of the implementation of the educational reform and the increasing literacy among Jews, including farmers.³⁴ For example, archeological findings indicate that synagogues had existed in Palestine in earlier times, but from the third century onward they started being built in great numbers in many villages in Galilee where most of the Jews were living after the revolts against the Romans (Chancey 2002, p. 61, 66). The information on synagogues is important since at that time, teaching was organized in the synagogue, in

³³For example, in Poland formal schooling for Jewish children was compulsory from the age of six to 13, whereas the rest of the population remained illiterate as late as 1790 (Maller 1960). The earliest examples of mandatory primary education are those of Prussia in 1763 and 1773 under Frederick the Great and Maria Teresa of Austria, France in 1860-80, and England in 1870 (West 1970). In the 1830s, the enrollment rate in primary schools in England was still a low 27.4 percent (Lindert 2001, 45).

³⁴See Hezser (2001) for a critical view of the extent of literacy among Jews in Roman Palestine.

the Talmud Torah, and in the teacher's house called *heder* (Aberbach 1982, p. 41). Indirect evidence of widespread primary schools come from an amoraic sermon (third-fourth century) according to which of every thousand beginners in primary school only one would be expected to continue as far as Talmud. In the fourth century, however, there were enough advanced students to warrant academies in Lydda, Caesarea, Sepphoris, and Tiberias (in Palestine), where leading scholars trained disciples for communal service as teachers and judges (Cohen 2002).

At the same time, the many quotes in the Mishna and Talmud referring to the *ammei ha-aretz* as those Jews who did not read and teach their sons the Torah indicate that some Jewish farmers did not provide their children with basic Jewish-specific education.

Hence, the historical evidence just mentioned supports Result 1 (i): some Jewish farmers invested in their children's education more than non-Jewish farmers, whereas other Jewish farmers did not invest in their children's education (like non-Jewish farmers).

The Jews who were engaged in long-distance trade had high human capital and some of them were also the religious leaders of the Jewish communities who devoted a lot of time to the study of the Talmud (Agus 1965, p. 7; Goitein 1967). This is consistent with Result 1 (ii) that predicts that Jewish merchants will invest more in their children's education than Jewish farmers.

Occupations. Regarding Result 2 (ii), the historical evidence shows that Jews invested in education and *then* moved to urban occupations. The educational reform in Judaism that made primary education compulsory for male children, started in the first century CE, was fueled by the negative attitude at the beginning of the second century in Palestine and then in Babylon against the *ammei ha-aretz*, and was reinforced by the development of the Mishna and Talmud (second-fifth centuries). When the educational reform was implemented, most Jews in Palestine and Babylon were still farmers. The transition from agriculture to crafts and trade occurred between the sixth and the ninth century. Hence, the occupational transition occurred *after* primary education was made compulsory for male children. An alternative model in which Jews first became merchants (for some exogenous reasons) and then decided to invest in their children's education is not consistent with the historical evidence.³⁵

Also, consistent with Result 2 (ii), when urbanization and the demand for urban occupations expanded as it did in the early Muslim Empire, all literate Jewish farmers moved to the newly available urban occupations.

³⁵Key to Result 2 (ii) is the assumption that merchants earn more than farmers. With the returns from education being higher in crafts and trade than in agriculture, the educated Jews found it more profitable to switch from agricultural to nonagricultural occupations. Data from Roman Palestine and other regions of the Roman Empire indicate that wages were higher for urban, skilled occupations (see page 15). Also, the Jews in Palestine from the first to the fourth century were poorer than the Jews living in Babylon (Jacobs 1990). Jews in Eretz Yisrael before the Arab conquest (638 CE) remained engaged in farming (Baron 1937; Grayzel 1965, 307; Dan 1990; Herr and Oppenheimer 1990; and Safrai 1994). In contrast, in the Persian Empire although agriculture remained the main occupation, the Jews, particularly the *Amoraim* (the scholars and the leaders of the communities) held a greater number of nonagricultural occupations (Newman 1932; Neusner 1966, p. 14, and 1990a, p. 169; Beer 1974; and Heinemann 1990, p. 289). The Mishna and the Talmud provide evidence of the divergence in the occupational structure of the Jews in Palestine and in Babylonia (Jacobs 1990, 333). In the Talmud Jews appear to have been engaged more in nonagricultural activities than those in Palestine described in the Mishna (Neusner 1998). Also, in the Babylonian Talmud there is more material dealing with civil law than in the Jerusalem Talmud.

Conversions. The results regarding Jewish conversions and migrations are not directly built into the model. Thus, finding evidence that supports these implications provides a test to our explanation for the observed transition of Jews to urban occupations.

First, notice that both the size and the geographical concentration of the Jewish population underwent significant changes throughout the first millennium (Table 2). At the beginning of the first century CE, there were about 4.5 million Jews spread all over the Roman Empire and the Persian Empire, with three large and wealthy centers (Palestine, Egypt, and Babylon). By the time most Jews became engaged in urban, skilled occupations around the seventh–eighth centuries, there was a large and wealthy Jewish community in Babylon and the Near East, a small community in Palestine, and even a smaller community in Egypt and in other places for which we do not have much information. Overall, in the early Muslim Empire (seventh century) the size of world Jewry was about 1-1.5 million.

The reduction in the total size can be the outcome of deaths and conversions.³⁶ For the Jews in the Roman Empire, the key events were the two rebellions against Rome.³⁷ The rebellions and subsequent repressions reduced the Jews in Egypt from about one million to few thousands and the Jewish population in Palestine by about one-third (Table 3). Based on the data suggested by historians, though, these massacres account for less than half of the reduction in the total size. The rest of the reduction was the outcome of conversions. A distinction has to be made between forced and voluntary conversions as our human capital argument is relevant only for the latter. There were certainly episodes of forced conversions during the first millennium.³⁸ However, none of these episodes was large enough to account for the 2 million Jews who converted.³⁹ Where then does the evidence of voluntary conversions come from?

First, at the very beginning of the first century, there were many groups within Judaism

³⁶The reduction in the size of the population might have also been the outcome of reduced fertility because of the high cost of providing Jewish children with an education. We acknowledge that this is a very good remark. However, since we do not have any data on fertility trends in the Jewish population in the first millennium, we have to leave this observation subject to speculation at this stage.

³⁷The former rebellion and the destruction of the Temple in 70 CE caused the death of thousands of Jews, the countryside was ravaged, and some towns and villages were razed. In 113–115, the emperor Trajan had to fight Jews revolting in various parts of the empire (Egypt, Cyrenaica, Cyprus, and Mesopotamia). The community living in Alexandria was almost completely destroyed (Safrai 1976a, 370–73). In 135, the Jews were able to wage the Bar Kokhba Revolt in Eretz Yisrael and then in Egypt (Stern 1976, 314). The outcome of this war was a reduction of the Jewish population in Palestine by half a million; some were killed and most of them migrated to Babylon and other locations away from the Roman Empire. The same occurred in Alexandria where the wealthy and numerous Jewish community almost disappeared (Tcherikover 1945; 1961).

³⁸In 583, the Merovingian king Chilperic I in France ordered the baptism of a large number of Jews in Paris. In 591, the bishops of Narbo and Arelate were reproved by Pope Gregory for forcibly baptizing the Jewish inhabitants of their cities. In Spain, the Visigothic king Sisebut (612-620) ordered all Jews in his domains to receive baptism (Juster 1912).

³⁹Both Christianity in the Roman Empire and Zoroastrianism in the Persian Empire had established the principle of nonconversion of Jews by force. However, both encouraged conversions, sometimes through economic incentives. For example, in Persia tax exemptions were granted for lip service to the Zoroastrian gods (Baron 1952, 180). After the crushing of the Bar Kokhba Revolt in 135, the emperor Hadrian made the teaching and practice of Judaism a capital crime (Goldin 1960, 154). The edicts of Hadrian were repealed by the next emperor, Antoninus Pius, although acceptance of proselytes was still forbidden. The same ban was reintroduced two centuries later when Constantius forbade Jews from making proselytes and conversion to Judaism was punished with death. To reduce even further the number of conversions to Judaism, the attitude of Jewish leaders also played a role. Unlike in previous times when Judaism sustained proselytism, after the destruction of the Second Temple the rabbis tried to discourage conversions, and leaders in Palestine showed contradictory attitudes toward proselytism (Goodman 1994; 1998).

such as Jews, Samaritans, Kutim, and many others. After the Bar Kokhba Revolt, there were also villages of Jewish farmers who became Kutim in Palestine. These groups became clearly distinguished one from the other at the end of the second century when Judaism under rabbinic influence made the reading of the Torah the main requirement for being a good Jew. The Samaritans, for example, were Jews who did not accept the Mishna and the Talmud (and the Oral Law in general). They slowly separated from Jews when Judaism emphasized learning, and spread from Samaria to other regions in Palestine (Herr and Oppenheimer 1990, 204). Some of the *Tannaim* in the first generation after 135 considered the Samaritans as true Jews. However, one generation later, Rabbi Judah the Prince equated them to Gentiles, and his grandson Gamaliel II ruled that the meat slaughtered by Samaritans was not kosher (Alon 1984, 745). Gil (1992) maintains that Jewish and Samaritan farmers in Palestine converted to Christianity during the Byzantine period; their offspring later converted to Islam before the Crusaders' conquest.

Second, early Christians were Jews. The departure of Christianity from Judaism was slow. In fact, Christian Jews, Jewish Christians, and Jews themselves were all viewed as Jews in the Roman Empire even after the Bar Kokhba Revolt. The divergent trajectory of Christianity and Judaism started in the second century, when Christianity under Pauline influence stopped circumcision and declared that reading the Bible was not the main requirement for being a good Christian (Neusner 1987; 1990c). As Nock (1969) emphasizes, "Christianity gave a way of life and made men at home in the universe; and did it for the ignorant as well as for the lettered." Baron (1937, 237; 1952, 163) states that most early Jewish converts to Christianity were uneducated, poor free Jews.

Among the various Jewish Christian sects, there were three main groups: the Ebionites, the Nazarenes, and the Jewish Christian gnostics. The Ebionites accepted the Pharisaic form of Judaism (Written and Oral Torah), practised circumcision, and kept the Sabbath. They rejected Paul's doctrine whereas, at the same time, they recognized Jesus as a Prophet and Messiah. They spoke Jewish Aramaic and they had both a Hebrew Bible and a Hebrew version of the Gospel. Some Ebionites had close relationship with Gentile Christians, others did not. The Nazarenes were observant Jews who accepted Paul's doctrine like the Gentiles Christians, and shared hostility feelings toward the Jewish scholars and the Pharisees. Lastly, other groups, collectively designated as Jewish Christian Gnostics, adhered to the laws of the Torah but rejected some part of the Bible (e.g., the one dealing with sacrifices), believed in Jesus as Messiah or prophet, and shared gnostic elements together with other non-Jewish sects.

Up to 70 CE, Jewish leaders and the Pharisees held ambivalent feelings toward these Jewish Christian sects, but overall the trend was one of tolerance. However, after the destruction of the Temple and then the Bar Kokhba Revolt in 135, the Jewish sages of the academies declared the various sects of Jewish Christians outside the Jewish fold. This is evident in the "*Birkat ha-Minim*," the prayer against the Jewish Christian sects contained in the "Eighteen" Benedictions that date from the Academy of Yabneh (c. 100 CE). The prayer reads as follows: "May the apostates have no hopes, unless they return to Thy Torah, and may the Nazarenes and the Minim disappear in a moment. May they be erased from the book of life, and not be inscribed with the righteous" (Alon 1980, 288–307). These apostates were not the Gentiles Christians, who were not the concern of the Jewish sages and scholars in the academies in Palestine; rather the apostates and the Minim were the Jewish Christians who could no longer be considered as members of the Jewish community.

Third, indirect evidence that Jews voluntarily converted to Christianity is provided by some imperial decrees. In 426 CE, a decree established the annulment of any Jewish will in which a baptized son, daughter or grandchild, were left less than their *ab intestato* share (Baron 1937, vol. 2, 253). Also, the Theodosian Code decreed the death penalty by fire for Jews who harmed Jewish converts to Christianity (Alon 1984, 753). There is also a translation of the Bible that was done in about 400 CE by Jews converted to Christianity in Palestine (Herr and Oppenheimer 1990, 182).

Fourth, the endless number of references in the Mishna and the Talmud against the *ammei ha-aretz* (illiterate) and their transformation into outcast under the influence of Rabbi Judah the Prince shows that some uneducated Jewish farmers did not convert to other religions but remained within Judaism. At the same time, there is little evidence that the early Christian Church was particularly successful in converting *ammei ha-aretz* to Christianity.

All this evidence supports Result 3 (i-iii) that uneducated Jewish farmers with very low levels of attachment to Judaism converted to Christianity (and later to Islam). Other uneducated Jewish farmers did not convert and remained within Judaism, but they became the *ammei ha-aretz*—outcast within the Jewish communities under the influence of rabbinic Judaism from the second century on. The Jewish leaders were not concerned about conversions of the *ammei ha-aretz* to other religions because they wanted them out of the Jewish fold.

Consistent with Result 3 (v-vi) the historical evidence indicates that conversion from Judaism into non-Jewish religions was a slow but significant process that mainly occurred when Jews were farmers, but almost stopped when they became merchants. In the Muslim period and after the transition from agriculture to crafts and trade, the size of the Jewish population did not change significantly, which means that massive conversions did not occur (Table 2).⁴⁰ As Greif (1989) has shown for the Maghribi merchants in the Mediterranean in the high Middle Ages, there were significant benefits from being a Jewish merchant because as members of an ethnic group specialized in commercial enterprises, Jewish merchants could impose community sanctions that reduced transactions costs and generated network externalities. This further reduced the benefits from converting to another religion.⁴¹

Interestingly, studies by biologists and genetics have shown that contemporary Jewish populations show a closer genetic link to Jews from far away locations than to their neighboring non-Jewish populations (Bonné-Tamir et al. 1978; Hammer et al. 2000). This is especially true for the Ashkenazi Jews of eastern Europe who are genetically closer to Jews from the Middle East and North Africa, as well as to other Middle Eastern non-Jewish populations, than to eastern European non-Jewish populations. This provides additional evidence that there were no significant conversions to and out of Judaism once the Jews became merchants and migrated to western and then eastern Europe, and it clearly shows that the Jews all migrated from the same original location.

⁴⁰One of the predictions of Rapoport and Weiss (2002)’s model is consistent with this historical fact.

⁴¹As for conversions of non-Jews to Judaism, we know that there were large conversions of pagans to Judaism *before* the revolts in the first century CE. The conversion by the king of Abiadene and its kingdom reported by Flavius Josephus himself is just one of the instances of conversion by choice to Judaism at this time. In contrast, we are not aware of cases of conversions by choice of non-Jews to Judaism *after* the third century. People converted to Judaism only by coercion, such as in the case of slaves owned by Jews. In fact, the rules issued by the late Roman and then Byzantine emperors prohibiting Jews from converting slaves are evidence of the forced conversion of slaves to Judaism. For example, in the early fourth century, the emperor Constantine prohibited Jews from owning non-Jewish converted slaves (Juster 1914, II, 72f). Constantius II made the circumcision of a slave a capital offense, and forbade Jews from buying slaves of any other religion (Jones 1964).

To sum up, some Jewish farmers converted to other religions whereas others became *ammei ha-aretz* and slowly were outcast from the Jewish communities. In contrast, those Jewish farmers who became merchants remained Jews. Our model predicts that the increasing proportion of merchants with respect to farmers was the result of conversions that selected many Jewish farmers out of Judaism. Consistent with this prediction, Tables 1 and 2 indicate that the proportion of urban occupations among Jews grew from 200 and 650 at the same time when the size of the Jewish population was decreasing because of the conversions.

Migrations. As for migrations, the model makes the obvious prediction that Jews, both farmers and merchants, migrate when economic conditions worsen. Some Jewish migrations were the outcome of the persecutions ensuing from the revolts in the first century CE (Baron 1952, 210; Herr and Oppenheimer 1990, 133-35). However, migrations were also prompted by economic reasons. At the beginning of the third century, taxes became higher in the Roman Empire, whereas wages were higher and prices were lower in Babylon than in Palestine (Jacobs 1990). Jewish farmers left Palestine and Egypt and migrated mainly to Babylon, which became the center of Jewish religious and economic life.⁴² Jewish leaders provided a lot of religious reasons against this migratory movements but they partly failed to convince the Jews not to leave Palestine (Herr and Oppenheimer 1990, 133-135). This historical evidence is consistent with Result 4 (i). Notice that in contrast to Kuznets' argument, the Jews who left Palestine were mainly farmers who remained farmers when they moved to Babylon (Neusner 1990b, 437).

Consistent with Result 4 (ii), around the eighth century, Jews became almost entirely an urban population. Since the late ninth century, as they became merchants, they voluntarily migrated to Muslim Spain and towns in Europe. During the tenth century, they spread to Champagne and South Germany. The documents from the Cairo Geniza and the rabbinic Responsa supply a lot of evidence of the migrations of the Jews motivated by increasing trade opportunities that enabled them to reach standard of living comparable to the upper classes in Spain and Germany (Agus 1965; and Ben Sasson 1976, 393-402). The Jews could also be found in many places in Mesopotamia and Egypt. At that time (eighth-tenth centuries), they generated a network of trade that was all linked to Babylon and Baghdad.

The Jews who were engaged in long-distance trade were literate and had high human capital (Agus 1965, p. 7; Goitein 1967). In fact, from the Cairo Geniza documents and the rabbinic Responsa we know that they were doing their business by writing letters, they were involved in complicated transactions, moneylending, partnerships and interest-rate calculations that required sophisticated understanding of trade rules with both Jews and non-Jews, and trade over many commodities in many languages in different countries. Some of the traders were also the religious leaders of the Jewish communities. Thus, selection certainly occurred with the most educated Jews moving into the high-skill international trade activities.

However, it is not that Jews were a local minority and they suddenly moved to new occupations. They moved voluntarily to new locations since they had the skills that enabled them to engage in those occupations with high returns to their human capital. Yet, they became a minority in all the places where they settled since their comparative advantage was limited to few skilled occupations. Still, even by the end of the twelfth century, 70 percent of the Jews remained in Mesopotamia and there they engaged in many urban occupations. Thus, migration

⁴²In 238 CE, the citizens of the village in Terachia in Palestine wrote to the Roman governor Gordianus: "We will run away from the houses and a substantial harm will be caused to the Treasury" (Herr 1990, 134).

was an endogenous choice, and not exogenous as Kuznets maintained, and the minority status of the Jews since the third century was the result of their choice to migrate.

7 Concluding Remarks

The novel contribution of this paper is to provide a simple economic rationale for the transition of Jews from farming to urban, skilled occupations from the eighth to the tenth century. Our argument is consistent with the main historical facts about the Jews in the first millennium. The transformation of Judaism into a religion that required each Jewish man to be able to read the prayers and learn the Torah, and later the Mishna and the Talmud, made the Jewish people during the first millennium a literate ethnic group in a world where the rest of the population was illiterate. This transformation occurred at a time when Jews were farmers, and therefore, cannot be attributed to a human capital investment made in order to engage in a particular occupation or to enable potential migration. Education was an exogenous hedge in the formation of Jewish religion that we take as given. Based on this fact, we argue that the occupational transition was the outcome of the religious transformation.

An important support to our theory comes from the fact that the size of the Jewish population reduced substantially at the time when they were farmers and they had to invest in children's education. The timing of these changes—first the transformation of Judaism and the educational reform, later the occupational transition, and lastly the migrations to the growing economies of Western Europe—brings further support to our human capital/occupational choice theory. In particular, this sequence of events contradicts the widely accepted historical view that Jews did not engage in agriculture and specialized in trade and finance due to restrictions and prohibitions or because of their minority status.

We acknowledge that we focus on changes that occurred over a very long period of time and many centuries ago for which it is difficult to find reliable economic evidence. In particular, we cannot build time series on literacy rates, occupational distribution, migrations, and conversions among Jews and non-Jews during the first millennium so that alternative theories can be formally evaluated. Given the questions we address, looking at cross-section or time-series data on the nineteenth or twentieth century would not be useful. However, there is enough evidence to support the hypothesis that the occupational transition of the Jews was a result of the transformation of the religion many centuries beforehand. The fact that even today Jews are highly visible in high-skill occupations all over the world may be to some extent the outcome of this transformation that occurred almost two millennia earlier.

During the Middle Ages a large proportion of the Jews specialized in moneylending. The conventional view is that this was the result of restrictions imposed on Jews from engaging in occupations except moneylending, and prohibitions on non-Jews from engaging in moneylending (Roth 1938). Our paper raises the possibility that alternative hypotheses related to acquired skills and human capital may provide a different explanation for the ethnic distribution of moneylending in the Middle Ages.

Also, it remains a topic to explore whether an argument similar to the one we made in this paper might also be relevant in early modern and modern times for the German and Scandinavian Lutherans and the Calvinists, who among the Christian groups were highly literate.

8 Appendix A: Analysis of the Model

We solve the model to get the predicted dynamic path of the Jewish population until the Muslim period, and then we solve the model assuming that the demand for urban occupations (merchants) θ^M in the world increases.

Children's Education (e) The first-order conditions for the optimal level of education provided to the son according to religion (J or NJ) and occupation (F or M) are as follows:

$$\begin{aligned} JF &: x_t - p'(e_t) \geq 0 \\ JM &: x_t - p'(e_t) + w^F \alpha e_t^{\alpha-1} (e_{t-1} E_t^{JM})^{1-\alpha} \geq 0 \\ NJF &: -p'(e_t) \geq 0 \\ NJM &: -p'(e_t) + w^F \alpha e_t^{\alpha-1} (e_{t-1} E_t^{NJM})^{1-\alpha} \geq 0 \end{aligned} \quad (7)$$

To solve for the education level e_t , we assume that the cost of education is given by:

$$p(e) = e^\gamma \quad \gamma > 1, \quad (8)$$

and we normalize the minimum required level of education $e_{\min} = 1$, such that $x_{\min} = \gamma$.

Let us first focus on farmers. From (7) and (8), the optimal education levels for children of Jewish farmers (JF) and non-Jewish farmers (NJF) are, respectively:

$$\begin{aligned} e_t^{JF} &= \begin{cases} (\frac{x_t}{\gamma})^{\frac{1}{\gamma-1}} & \text{if } x_t > x_{\min} = \gamma \\ 0 & \text{otherwise} \end{cases} \\ e_t^{NJF} &= 0 \end{aligned} \quad (9)$$

Next, let us consider merchants. Since we assume that there is no heterogeneity among non-Jewish merchants, it follows that the average education level among them is $E_t^{NJM} = e_{t-1}$. Therefore, the equation for the optimal education level of children of non-Jewish merchants (NJM) is given by the first-difference equation:

$$e_t^{NJM} = \left(\frac{w^F \alpha}{\gamma} \right)^{\frac{1}{\gamma-\alpha}} (e_{t-1}^{NJM})^{\frac{2(1-\alpha)}{\gamma-\alpha}}. \quad (10)$$

To get a steady-state level of education we assume that $\frac{2(1-\alpha)}{\gamma-\alpha} < 1$, such that $\gamma > 2 - \alpha$. This condition says that the marginal cost of education (γ) should be large relative to the education externality effect imposed by E^{NJM} . To describe a stationary economy regarding non-Jewish economic activity, we assume that the initial level of education of Jewish and non-Jewish merchants is the steady-state solution of (10) for e :

$$e_0^{r0M} = \left(\frac{w^F \alpha}{\gamma} \right)^{\frac{1}{\gamma-2+\alpha}}. \quad (11)$$

Using this as an initial condition for the education of Jewish fathers, we can solve the dynamic equation for the level of education provided by Jewish merchants to their children as:

$$\gamma(e_t^{JM})^{\gamma-1} = x_t + w^F \alpha (e_t^{JM})^{\alpha-1} (e_{t-1}^{JM} E_t^{JM})^{(1-\alpha)} \quad (12)$$

Let the endogenously determined cross-section distribution of e_t^{JM} be $Z_t(e_t^{JM})$ and, hence, the mean value of education in (12) is given by:

$$E_t^{JM} = \int e_t dZ_t(e_t^{JM}). \quad (13)$$

Proposition 1 *Suppose that the initial education level among Jewish and non-Jewish merchants is the same, $e_0^{r0M} = (\frac{w^F \alpha}{\gamma})^{\frac{1}{\gamma-2+\alpha}} \geq e_{\min} = 1$. Then, for all $t > 0$ the education level of all Jewish merchants is higher than that of non-Jewish merchants and Jewish farmers. If $\alpha < 0.5$, there exists a stable steady-state level of education.*

Proof: Differentiation of equation (12) implies that e_t is increasing with e_{t-1} , since the derivative is given by:

$$\frac{de_t}{de_{t-1}} = \frac{w^F \alpha (1-\alpha) (e_t^{JM})^{\alpha-1} (e_{t-1}^{JM})^{-\alpha} (E_t^{JM})^{(1-\alpha)}}{\gamma(\gamma-1)(e_t^{JM})^{\gamma-2} - w^F \alpha (\alpha-1) (e_t^{JM})^{\alpha-2} (e_{t-1}^{JM} E_t^{JM})^{(1-\alpha)}}.$$

Since the initial level of education among Jewish merchants is the same as that of non-Jewish merchants, and equal or higher than that of Jewish farmers, then $e_t^{JM} > e_t^{NJM}$, for all $t > 0$.

For $\alpha < 0.5$, the denominator is larger than the numerator at a constant level of e . Hence, the slope at the steady-state levels of e and E is between zero and one. The assumption that $\alpha < 0.5$ is very reasonable since it means that the son's contribution to output production is smaller than that of his father.

Occupation Comparing the utility for each individual by religion and occupation, and assuming equal taxes by occupation, we get the following immediate result:

(*NJF*) Given that non-Jewish farmers' education level is $e_t = 0$, their income (earnings) as farmers or merchants is the same and, hence, they remain farmers.

(*NJM*) Non-Jewish merchants prefer to stay merchants since given their positive levels of education $e_{t-1} > 0$, their earnings (and utility) are higher than those of non-Jewish farmers.

(*JF*) Jewish farmers with $e_{t-1} = 0$ are like non-Jewish farmers and, therefore, they stay farmers.

Jewish farmers with $e_{t-1} > 0$ prefer to become merchants. To see this, note that their earnings if they stay farmers and if they become merchants are given by

$$w^F - p(e_t^F) - \tau_t^{JF} + x_t e_t^F + x_t e_{t-1} < w^F [1 + e_t^\alpha (e_{t-1} E_t^{rM})^{1-\alpha}] - p(e_t^M) - \tau_t^{JM} + x_t e_t^M + x_t e_{t-1}.$$

If taxes in the two occupations are the same, the children's optimal education level provides a higher utility for merchants, since they could always choose the education level for their children e_t^F provided by farmers. Hence, the above inequality always holds for $e_{t-1} > 0$.

(*JM*) Jewish merchants prefer to stay merchants since given their positive levels of education $e_{t-1} > 0$, their earnings (and utility) are higher than those of Jewish farmers.

Conversion In general, a Jewish adult individual will convert to a non-Jewish religion if,

$$c_t, e_t, o_t \max u(c_t, e_t, r_t = 1; s_t) < c_t, e_t, o_t \max u(c_t, e_t, r_t = 0; s_t). \quad (14)$$

Jewish Farmers (JF)

A Jewish farmer ($r_{t-1} = 1, x_t > 0$) will convert and become a non-Jewish farmer ($r_t = 0$) if,

$$w^F - e_t^\gamma - \epsilon h_t - \tau_t^{JF} + x_t e_t + x_t e_{t-1} < w^F - \tau_t^{NJF} - \pi x_t,$$

where the r.h.s is the utility if $r_t = 0$. This condition implies that the value of x_t should satisfy the following condition for the JF to convert:

$$x_t < \frac{e_t^\gamma + \epsilon h_t + \tau_t^{JF} - \tau_t^{NJF}}{e_t + e_{t-1} + \pi}.$$

Obviously, higher taxes on Jewish farmers increase the proportion of conversion to a non-Jewish religion. From now on, we will consider the case in which taxes on Jews and non-Jews are the same.

From (9), if $x_t < \gamma$, the Jewish farmer will not invest in his children's education (e_t) and he is an *am ha-aretz* ($h_t = 1$). Hence, for that case the condition for conversion is,

$$x_t < \frac{\epsilon}{e_{t-1} + \pi}.$$

Obviously, if the adult individual is not educated ($e_{t-1} = 0$), a higher value of $x_t = \frac{\epsilon}{\pi}$ is the threshold level of the attachment index that determines conversion. Assuming that the levels of ϵ and π are close, so that $\frac{\epsilon}{e_{t-1} + \pi} \leq 1$, we get the following results:

- (i) Jewish farmers with $x_t \in [0, \frac{\epsilon}{e_{t-1} + \pi}]$ convert to a non-Jewish religion and do not educate their children.
- (ii) Jewish farmers with $x_t \in [\frac{\epsilon}{e_{t-1} + \pi}, \gamma]$ remain Jews but do not provide their children with education, and therefore, they are *ammei ha-aretz*.
- (iii) Jewish farmers with $x_t = \gamma$ provide their children with the minimum level of education $e_{\min} = 1$. In this case, the threshold value for conversion is given by $\frac{1}{1 + e_{t-1} + \pi}$, which is less than γ and, hence, they will not convert.
- (iv) Jewish farmers with $x_t \geq \gamma > 2 - \alpha$ will not convert since their attachment index to Judaism x_t is always higher than the threshold value for conversion. To see that note that $e_t^{JF} = (\frac{x_t}{\gamma})^{\frac{1}{\gamma-1}}$ if $x_t > x_{\min} = \gamma$. Hence, the equation for the threshold level of conversion implies that,

$$(\frac{x_t}{\gamma})^{\frac{\gamma}{\gamma-1}} > (\frac{1}{\gamma})^{\frac{1}{\gamma-1}} x_t^{\frac{\gamma}{\gamma-1}} + x_t e_{t-1} + x_t \pi,$$

that never holds for $x_t \geq \gamma$.

We can compute the proportion of Jewish farmers who convert at each date t . The probability that a Jewish farmer with e_{t-1} education will convert is given by

$$G\left(\frac{\epsilon}{e_{t-1} + \pi} \mid x_{t-1} > 0 \text{ or } r_{t-1} = 1\right).$$

The more educated farmers are less likely to convert. Hence, to get the total rate of conversions we have to integrate the above probability over the cross-section distribution of education among Jewish farmers. If we assume that at the initial condition the proportion of Jewish farmers with no education ($e_{t-1} = 0$) is high, then the conversion rate among Jews is high. Therefore, Jewish farmers with very low levels of x_t convert and, since the mean of the conditional distribution G increases with x_t , the conjecture is that the proportion of conversion among Jewish farmers is decreasing.⁴³

Jewish Merchants (JM)

Jewish merchants convert if the following inequality holds,

$$\begin{aligned} & w^F(1 + (e_t^{1M})^\alpha (e_{t-1} E_t^{1M})^{1-\alpha}) - p(e_t^{1M}) - \tau_t^{1M} + x_t e_t^{1M} + x_t e_{t-1} \\ < & w^F(1 + (e_t^{0M})^\alpha (e_{t-1} E_t^{0M})^{1-\alpha}) - p(e_t^{0M}) - \tau_t^{0M} - \pi x_t. \end{aligned}$$

Since $e_t^{1M} > e_t^{0M}$, this inequality never holds if taxes on Jewish and non-Jewish merchants are the same, and, hence, Jewish merchants with any positive level of attachment do not want to convert to a non-Jewish religion.

⁴³This model generates a complicated Markov stochastic process for the individual probability of conversion and the aggregate conversion rate. A formal proof of this result is left to another paper.

9 Appendix B

TABLE 4—DISTRIBUTION OF NONAGRICULTURAL LABOR FORCE

Country (year)	($\frac{\text{Jews in nonagr. jobs}}{\text{Jewish labor force}}$ %)	($\frac{\text{Non-Jews in nonagr. jobs}}{\text{Non-Jewish labor force}}$ %)
Poland (1931)	96	47
Soviet Union (1926)	96	27
United States (1940)	98	82
Latvia (1930)	99	47
Germany (1933)	99	83
Czechoslovakia (1930)	91	73
Hungary (1930)	97	52
Rumania (1930)	96	37
Bulgaria (1926)	99	31
Canada (1931)	99	71

Source: This table reproduces Table 2 in Kuznets (1960, p. 1608).

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