

Caveat for the reader

This file contains two papers. The former presents most of the historical evidence, whereas the latter presents the model and some historical evidence. These two papers were initially one long paper, but we were asked to split it into two. That's why I am sending the two papers together so that the reader can see the entire project.

*Economic Outcomes of Religious Transformations:
The Occupational Transition of the Jews in the First Millennium*
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&

*From Farmers to Merchants:
A Human Capital Interpretation of Jewish History*
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Maristella Botticini and Zvi Eckstein

Economic Outcomes of Religious Transformations: The Occupational Transition of the Jews in the First Millennium*

Maristella Botticini[†] and Zvi Eckstein[‡]

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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. When urbanization expanded in the early Muslim Empire, Jews moved to the cities because of their comparative advantage in urban, skilled occupations.

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 minority in many urban centers and towns? When and why did this occupational selection and demographic characteristics become the distinctive mark of the Jews?¹

The distinctive occupational and residential structure of the Jews has attracted the attention of scholars of Jewish history. Israel Abrahams (1896) and Cecil Roth (1938)

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[†]Boston University, Department of Economics, and Research Fellow, CHILD, Università di Torino (Italy). E-mail: maristel@bu.edu

[‡]Tel Aviv University, University of Minnesota, and CEPR. E-mail: eckstein@post.tau.ac.il

¹See Botticini and Eckstein (2004) for the human capital model on which this paper is built.

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.

Simon Kuznets (1960) also addressed these questions. Like Nathan 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. 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. 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. Yet, Jews did not remain farmers despite their minority status.

The historians Salo Baron (1937; 1952), Haim Hillel Ben-Sasson (1976), and Moshe 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 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.”² After the destruction of the Temple in 70 CE, Judaism changed from a religion centered around 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. The monumental work of Shlomo 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.

Based on this historically documented nexus between education and Judaism, we argue that Jews invested more in their children’s education and many of them preferred to become merchants given the higher returns to literacy in trade. Yet, the demand for merchants restricted the proportion of Jews employed in urban occupations. When urbanization expanded (as it did in the early Muslim empire), the Jews moved to the cities where the returns to their human capital are high. 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 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.

2 Common Explanations

The Restrictions Argument. “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” wrote Cecil Roth (1938, 228), the prominent scholar of Jewish history.³ According to this view, the Jewish people did not engage in agricultural occupations since they were prohibited from owning land, and guilds’ regula-

²It 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.

³Roth was certainly not the first scholar who put forth this argument. Earlier, 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.”

tions 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 permitted to engage.

Since then, this argument has become the widely accepted explanation among scholars and the public for the occupational selection of the Jewish people: this selection was mainly the outcome of restrictions and prohibitions.

The Economics of Small Minorities. Instead of restrictions and prohibitions, Kuznets (1960) argued that the economic structure of the Jewish people is the result of an endogenous choice. 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. For Kuznets, this would explain why in most countries where the Jewish people lived in the early twentieth century (eastern Europe, the Soviet Union, the United States, and Eretz Yisrael), an overwhelming proportion (95 to 99 percent) of them were engaged in urban, skilled occupations (Kuznets, p. 1608, Table 2).⁴

3 Occupational Transition

Do the argument based on restrictions and Kuznets' explanation hold true for the period in which the occupational selection of the Jewish people into urban, skilled jobs occurred? To answer this question, we need first to describe when and where this occupational transition occurred.

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 Eretz Israel (where they were a majority) and elsewhere (where they were a minority) was farming.^{5, 6} The information on their occupational distribution in the three main centers of Jewish life in the classical period—Palestine, Babylon, and Egypt—comes from the following sources. For Palestine there are the writings of the Jewish warrior Josephus Flavius, and the huge number of references to farming and agriculture in the Mishna. In fact, one entire volume of the six forming the Mishna (*Zeraim*) is devoted to the rules that, according to the sages and the rabbis, the Jewish farmers had to follow. For Babylon the information comes from later indirect evidence in the debates of the rabbis and scholars from the Talmud Bavli and from the land tax that the Jews had to pay in

⁴Before Kuznets, Max 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 (p. 1604).

⁵The 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.

⁶Browne (1936), Malamat (1976), Tadmor (1976), Safrai (1976a), and Fuchs and Sevenser (1995).

the Persian empire under the Parthian and the early Sasanian rulers (Baron 1952; Neusner 1965, vols. I and II). Information on the large Jewish community in Egypt is supplied by the descriptions of the philosopher Philo in the first century CE and the evidence from the papyri (Tchericover 1945; 1961).

[TABLE 1 HERE]

Of course, in the cities, such as Jerusalem, Alexandria, Babylon, and Rome the Jewish people were also engaged in crafts and trade. But there is no question that at this time and everywhere, like the majority of the world population most Jews derived their income and wealth from agriculture.

Agriculture remained the main occupation of the Jewish population living in numerous countries from the second throughout the fifth centuries. Both the Talmud Yerusalmi and the Talmud Bavli—the main source of information for this period—still contain many references to the rules of farming and agriculture (Newman 1932, 33–47; Neusner 1965, vol. II, p. 14).

The transition away from agriculture into crafts, trade, and moneylending started in the Talmudic period, especially in Babylon (Baron 1937, vol. 2, 244).⁷ The Talmud Bavli has many more references to rules and debates regarding crafts and trade than the Talmud of the Land of Israel. In the fifth–sixth centuries the Jews abandoning agriculture moved into the towns, and became small shopkeepers and artisans in the tanning, linen, silk, dyeing industries, and glassware making. The *Amoraim* (the scholars in the academies in Babylon) were the first to enter the most skilled occupations as traders and merchants. From many discussions in the Talmud it is clear that although the Jews deemed important to own land, they were aware that trade was more profitable (Beer 1974, 38).

The key period of urbanization occurred in the Muslim Empire during the Abassides rulers from the mid-eighth and the early ninth centuries (Lewis 1993). Many cities developed, and Baghdad became the main center. Urbanization in Iraq, Iran, Egypt, and the other lands under Muslim rule led Jews to migrate from small villages to towns and cities, so that 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, such as handicrafts, jewellers, tanning, dyeing, shipbuilding, corn and cattle dealing, bookselling, and tax farming. They also became 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) and in moneylending.

The occupational transition is amply documented in two impressive sources that illustrate the social and economic life of the Jewish communities in Babylon, Egypt, and Palestine from the ninth to the fourteenth centuries. The Cairo geniza documents refer to the thousands of contracts (sales, marriage deeds, loans, business partnerships), wills,

⁷In contrast to Palestine and Babylon, we do not have much information on the occupational structure of the Jewish community in Egypt since after the revolts and massacres in the second century, that community was almost wiped out.

letters, and court records that were found in a synagogue in old Cairo in Egypt and were first edited by Schlomo Goitein (1967) who wrote on the social and economic history of the Jews in the Mediterranean (mainly in Egypt), and by Moshe Gil (1997) who used the Geniza material for studying Palestine and Babylon. From the geniza material it is clear that most Jewish people were no longer engaged in agriculture in the lands of the Muslim Empire.

The second source is known as the *responsa* literature and refers to the written replies and rulings by the *Geonim*, the heads of the academies in Babylon, in reply to the letters sent to them from the Jews everywhere. When a Jewish individual or household needed advise on a specific matter and the local rabbi could not help, it was customary to send a letter to the *Gaon* together with a monetary gift to support the academy. The Gaon after debating the matter with the students and the other scholars in the academies sent back a written reply with his ruling or advise on the matter. Two key pieces of information come from the *responsa*. First, in 787 CE the Geonim of the two academies of Sura and Pumpedita (the leading academies in Iraq) abrogated a Talmudic law and decreed that debts from orphans (and women's dowries) could be exacted also from movable property, whereas before that time only landed property could be claimed by creditors (Mann 1919, 311). This decree was dispatched to all Jewish communities in the diaspora. Some time later, in about 832 the Gaon R. Moses explained in a responsum that the ruling was motivated "by the current situation in which most (Jewish) people do not own land" (Brody's article in Shenaton haMishpat haIvri 11-12). Second, there are a number of questions addressed to *Geonim* by farmers, which shows that there were still Jews engaged in agriculture during the Muslim period (Gil 1997, pp. 593-596). Yet, the number of these *responsa* compared to the ones dealing with crafts, trade, and moneylending is small, which indicates the shift away from agriculture into urban and skilled occupations. As Gil (1997, p.) nicely points out, it cannot be a selection bias that explains this reduction in the material dealing with agriculture among Jews in the Muslim period. If agriculture was the main occupations of the Jews at that time, somehow *a lot* of material should have appeared in the *responsa*, exactly like three-four centuries earlier a lot of material pertaining to agriculture was discussed in the Mishnah and the Talmud.

When in 1170 Benjamin of Tudela wrote his travel itinerary describing the Jewish communities in many locations, the transition away from agriculture into urban occupations had reached a full-fledged stage. He found scholars devoted to the study of the Talmud and learned people among Jews in most of the places he visited. The Jews were officials of Pope Alexander in Rome, physicians in Amalfi, dyers in Brindisi, artisans in silk in Thebes and Salonika, merchants, tanners and physicians in Constantinople, glassmakers in Antioch and in Tyre (where they also owned maritime vessels), and handicraftsmen and dyers in Sidon, Jerusalem, Bethlehem, and Jaffa.

To sum up, *all* scholars of Jewish history agree that almost all Jews were farmers in the first half of the millennium, whereas at the end of the millennium a small proportion of them remained in agriculture and the greatest majority became craftsmen, artisans, merchants, doctors, and moneylenders. These urban, skilled occupations remained the distinctive mark of the Jews throughout history.

4 Restrictions on Jewish Economic Activities

Does the argument based on restrictions hold true during the Arab and Muslim expansion when the Jewish population moved away from agriculture into trade? Table 2 summarizes the evidence on legal restrictions and prohibitions regarding Jewish economic activities in the first millennium. We distinguish among three main types of restrictions: on land ownership, on slave ownership, and on the types of occupations the Jews could engage in.

[TABLE 2 HERE]

Before the rebellions in the first and second centuries (70, 115, 135 CE), there were no legal restrictions anywhere imposed on Jewish economic activities. After the revolts and until the Arab expansion, some restrictions were imposed on the Jewish people in the lands of the Roman and Byzantine empires. For example, the Jews could not enter the civil service or the law profession. In contrast, no restrictions of any kind were imposed on the large Jewish community living in Babylon under the Parthian and the Sasanian rulers (Neusner 1965).

During the Arab and Muslim period, at the time when the occupational transition occurred, there were no legal restrictions on any Jewish economic activity. This is true in all lands belonging to the Muslim Empire where non-Muslims *could* own land as long as they paid the land tax (Gil 1992; Morony 1981). Also, Jewish people were not prohibited from owning and employing slaves in farming. In fact, some Jews were actively involved in the slave trade, and even the heads of the academies owned slaves (Gil 1997, pp. 603–8). Lastly, there were no legal restrictions on the occupations the Jews could choose (Lewis 1984; and Cohen 1994).

The legal codes, however, only indicate what the legal background was. They do not portrait how people actually behaved. For example, there might have been unwritten social norms that, even in the absence of legal prohibitions, made it difficult for Jewish households to own land and to engage in agriculture or any other specific occupation. To exclude this possibility we have the contracts, land transactions, business partnerships, and wills from the Cairo geniza, and the letters from the Responsa literature, which provide a lot of evidence that any occupation, craft and trade was available and indeed chosen by the Jews in the Muslim Empire (Goitein 1967). At the same time, the same documents refer to land holdings belonging to Jews and land transactions among them, which is direct evidence that the Jews not only *could* but also *did* own land in the Muslim period (Gil 1997).⁸ To sum up, the restrictions argument does not pass the test of the historical facts at the time when the occupational transition occurred.

⁸Additional historical evidence makes the restrictions argument unconvincing. First, even if the Jews could not own land, they could have worked as tenants (most non-Jewish individuals did not own land and worked as tenants throughout the first millennium). In fact, this is what happened in Eretz Israel just after the revolts against the Romans when a portion of the land holdings belonging to Jewish farmers were confiscated, and some of them became tenant-farmers (Heinemann 1990, 269). Second, in the late Roman and early Byzantine empires other groups (e.g., the Samaritans) were discriminated against land ownership and, yet, they did not become merchants (Osman 1976, 138). Third, it seems paradoxical that restrictions pushed the Jewish people into more profitable occupations, such as crafts and trade.

The fact that there were no legal restrictions on Jewish economic activities in the Muslim period, does not mean that Muslims and non-Muslims were equal under Muslim law. Non-Muslim people had to pay the poll tax, which was a tax levied on each household head. In the tenth century, the poll tax amounted to 3.4 *dirhems* per month, about 5 percent of a teacher's salary at that time. For the Jewish community, the collection of this tax was a communal responsibility, that is, the Muslim rulers assessed the total amount to be paid by the Jewish community as poll tax, and then the leaders of the community distributed the tax burden among each household heads. The poll tax, however, was levied regardless of the occupation of the household head (Goitein 1967).

5 Demographics

Information on demographic trends and patterns is needed to show that Kuznets' explanation (the economics of small minorities) does not pass the test of historical facts. Before examining demographics, we want to point out that for the size of the Jewish and non-Jewish populations in the relevant locations in the first millennium, we relied on the works of the leading historians and demographers (e.g., Baron 1971; Feldman 19??; and DellaPerola 2001). While there is disagreement among scholars on specific numbers, there is a general consensus on the trends and the relative size of the populations in selected locations at given times.⁹

From Table 3 it is clear that in Babylon and Mesopotamia, the Jews were a minority well before becoming merchants in the eighth century: they were a minority in the first-third centuries when most of them were farmers, and they remained a minority in the eighth century when most became craftsmen and merchants. Their status as a minority could not have been the reason for their occupational transition.¹⁰

[TABLE 3 HERE]

At the same time, in Eretz Israel the Jewish people remained engaged in agriculture regardless of whether they were the majority or a minority. Table 4 shows that up to the end of the third century, the Jews formed the majority of the population there, and Table 1 indicates that most of them were farmers. But even when they became a minority in the fourth century, agriculture remained their main occupation (Herr and Oppenheimer 1990, 109). Later, in the Byzantine Empire, there were urban areas but the Jews were living mainly in Galilee as farmers (Herr 1990).

[TABLE 4 HERE]

⁹We built these tables after a careful reading of the references listed in the tables' footnotes, where we also explain from which historical sources these numbers derive. In some cases, as the references provide conflicting data, we had to make a decision about what evidence to accept and reject. The numbers we report should be considered as ranges of values, instead of exact figures.

¹⁰The related claim by Weber that the Jews voluntarily chose to segregate and to become an urban population in order to maintain their religious rules is contradicted by groups, such as the Amish in the United States, who remained farmers and yet maintained their religious cohesiveness and group identity.

The same is true in Egypt and Syria, where large Jewish communities lived in the first century (Table 5). They were a minority there—one of the many minorities—and yet most of them were engaged in agriculture (the only notable exception being Alexandria, which hosted a large urban Jewish community).

[TABLE 5 HERE]

It should also be noted that during the first millennium there were many other minorities that kept their distinctive characteristics yet living in villages as farmers (Cohen and Frerichs 1993). For example, in the fifth-sixth centuries there were in Palestine 1.5 million people and the majority were Christians. Yet the minorities such as Druses, Hellenistic pagans, Samaritans, some Arabic tribes, and the Jews themselves kept their religious identity and group cohesion while remaining farmers.

In addition to demographic information on specific locations, Tables 3–5 show a major demographic trend in the size of the world Jewish population: it decreased from about 4.5 million in the first century CE to about 1.2 million in the Muslim period. The reduction was the outcome of deaths during the revolts in the first-second centuries, and conversions during the first half of the millennium. The main rationale behind conversions is explained in Botticini and Eckstein (2004).

6 Reform 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 CE more and more male Jews were able to read (and some to write), and at the end of the millennium, the greatest majority of male Jews were literate. This was the outcome of an educational reform that accompanied the development of rabbinical Judaism, which completely transformed Judaism into a religion centered around the reading and the study of the Torah, the Mishna, and the Talmud, and in which the rabbis, the sages, and the scholars in the academies became the religious, political, and judicial leaders of the Jewish communities all over the world.

Judaism Before 70 CE. The development of Jewish educational institutions was a slow and long process that occurred between the third century BCE and the first century CE in Eretz Israel when the majority of the population was rural and farming was the main occupation.

In earlier times (about 515–200 BCE), academies for higher learning were established in Jerusalem to prepare the priests for the Temple, but their access was restricted to a very small group of people. Schools for higher education were founded in Babylon, Jerusalem, and later in other towns but there is no direct information on how many students attended them.¹¹

¹¹Swift (1919, pp. 86–98), Drazin (1940), Ginzberg (1943, pp. 8–11), and Morris (1977).

In the first century BCE, the president of the Sanhedrin Simeon ben Shetah promoted the establishment of free secondary schools throughout Palestine, which were supposed to prepare young adults (16 or 17 years old). Orphans and children whose fathers did not have the time or the knowledge to provide them with some basic education, however, did not receive the necessary primary education required to meet the standards of admission to the secondary schools. The establishment of mandatory primary schooling is attributed to the high priest Joshua ben Gamla who some years *before* the destruction of the Temple, issued an ordinance that made primary education universal and compulsory for boys over six or seven.¹²

It can be speculated why an educational reform occurred in Judaism at this time. Baron (1952, p. 274–79) attributed the emphasis on schooling and education to a development within the religion. 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. The Sadducees, who included the high priests in the Temple in Jerusalem, the aristocratic landowners, and the wealthy merchants, only accepted the Written Torah (the first five books of the Bible). In contrast, the Pharisees aimed to expand learning and the study of the Written and Oral Torah among all Jews (Feldman 2002). When in 70 CE the Temple was destroyed, the Sadducees lost the 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 participate in the rebellion against Rome in 66–70 CE, became the dominant group within the Jews.

Regardless of the motivations behind the establishment of these educational institutions, one fact is uncontroversial: it was a change that occurred within the Jewish religion, was prompted by the religious leaders, and was focused on religious instruction and literacy. The main goal was to make every male child to be able to read the Torah. The educational reform occurred in Palestine at a time (third century BCE—first century CE) when half of the world Jewish population lived in Eretz Israel and they were farmers, and it was accepted by Babylonian Jews who were also mainly farmers at that time. It is hard to see an economic motive for a religious and educational reform that was mainly promoted for a farming society.

The enactment of compulsory primary schooling was the first step of the reform. There is no evidence that the ruling by Joshua ben Gamla was immediately implemented in Palestine, Babylon, or in other locations. However, his ruling became a religious law that any Jewish father was asked to obey. The next step of the educational reform was again a

¹²This is the quotation in the Babylonian (?) Talmud that refers to the decree of Joshua ben Gamla: “However, that man is to be remembered for good, and his name is Joshua ben Gamala; 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 and that boys of the age of six and seven should be entered.” [Baba Batra 21a, cited in Greenberg (1960, p. 1261).]

development within the religion, as we describe in the next subsection.

The Mishna, the Talmudic, and the early Gaonic Period (70–638 CE). 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, sacrifices, and ceremonies that could only be performed by the priests in the Temple. The rabbis and sages belonging to the Pharisees who left Jerusalem and established the new center of religious life in the yeshiva and the Sanhedrin at Jabneh, made the reading and teaching of the Torah the core of Judaism, and they stated that the worship of God was achieved not only by prayer but also by study.¹³

These sages (*Tannaim*) had their center of activity in the yeshiva, which functioned as an academy, a high court, and a parliament, where the sages discussed the matters of religious and civil law submitted to them, expounded and discussed the Bible and the sacred law, and issued rulings (Goitein 1971, p. 196). In the yeshiva in Israel the scholars organized the vast body of Jewish Oral Law accumulated through the centuries in a systematic way, until Rabbi Judah ha-Nassi completed their work by redacting the Mishna in about the year 200 CE (Ebner 1956). The Mishna consists of six volumes of rules: *Zeraim* deals with the rules for farming, *Moed* with feasts, *Nashim* with marriage and divorce, *Nezikin* with financial issues, *Kedeshim* and *Teharot* with sacrifices and other ritualistic issues.

During this time, the synagogue became the center of learning and reading the Torah. Instruction meant religious instruction as the main goal of educating the children was to prepare them to read, once adults, in the synagogue during the weekly service.¹⁴ An entire tractate of the Mishna (“*Megillah*”) is devoted to the rules regarding the reading of the Book of Esther (“*Megillah*”) and the Torah in the synagogue.¹⁵ Synagogues had existed in Eretz Israel well before the destruction of the Temple; archeological findings or literary sources (e.g., Josephus, New Testament) indicate the existence of synagogues in the first century BCE (in Herodium, Gamla, Jerusalem, Nazareth), and in the first century CE (in Dor, Caesarea, Jericho, Masada) (Levine 1982). However, after the destruction of the Temple many more synagogues were built in towns and even villages in Eretz Israel, and especially in Galilee where most Jews moved after the revolts against the Romans (e.g., in Chorazin, Capernaum, Qiryat Sefer, Migdal, and Hammath-Tiberias) (see Levine 2000).

It is during the Tannaitic period that membership in the Jewish community became identified with the knowledge of the Torah. In earlier times, *am ha-arets* (literally “people of the land”) referred to a Jewish individual who disregarded tithing and the norms of ritual

¹³Drazin (1940, 25), Safrai (1968), and Telushkin (1991).

¹⁴A 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 (Greenberg 1960, 1277; and Goldin 1960, 158).

¹⁵The *Megillah* was read in Hebrew and translated into Aramaic by a translator at the public reading during the month of Adar. The choice of the month of Adar enabled rural folks who lacked education to have a person visit them and read the *Megillah* to them, or alternatively the farmers could go to the synagogues in the nearby town to hear it recited. The *Megillah* was to be read from a scroll made of parchment, written with ink in Hebrew square characters. Non-Hebrew speaking Jews, like those living in the towns in Asia Minor or along the Syrian coast where Greek was the vernacular, were permitted to read the *Megillah* in their vernacular (Rabbinowitz 1931, p. 19).

purity and sacrifices (*am ha-aretz lemitzvot*). Under the influence of the redactor of the Mishna, Rabbi Judah the Prince, at the end of the second 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.¹⁶ To be an “*am ha-aretz letorah*” in a Jewish community meant to be considered an outcast.

Christianity grew within Judaism but in the first century CE the two religions did not differ significantly. In fact, in the first two centuries, there were many groups within Judaism (Jews, early Christians, Samaritans, Essenes, Zealots, etc), and up to the time of the Bar Kokhba revolt in 135, the Roman rulers themselves did not distinguish among these groups.¹⁷ After about 150 CE, these groups started departing from each other. For Christianity, faith replaced obedience to the Law.¹⁸ One century earlier Paul’s major goal had been 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 pagans who converted to Christianity whereas they were still binding for Jewish Christians. The Samaritans, on the other hand, did not accept the Mishna (and later the Talmud) and kept considering sacrifices an important part of their religion. Rabbi Gamliel II established that the meat butchered by the Samaritans was not kosher and therefore he officially declared them outside of the Jewish community.

After the redaction of the Mishna, from the third to the fifth centuries in Israel the *Amoraim* (the scholars in the yeshiva after the Tannaim) debated, discussed, and clarified the rulings in the Mishna. Their opinions were collected in the Talmud Yerusalmi, which was redacted in about 400 CE. While there are also rules about trade, the Jerusalem Talmud is mainly devoted to agriculture; a farming society was the target audience for whom the rabbis and the Amoraim in Israel elaborated their rulings regarding agriculture.

The implementation of the educational reform received a major push at this time. Two different and independent sources support this claim. First, the Talmud reports that the grandson of Rabbi Judah worked to establish an education system in Israel despite the financial difficulties of his times. To accomplish this goal, he asked three distinguished scholars to travel to many locations and to appoint teachers of children in many towns and villages (Aberbuch 1983, p. 30-31). The Jerusalem Talmud contains three other relevant rulings: one is about a communal tax to provide for the wages of teachers of the Torah and the Mishna, another is about the requirement that even unmarried people with no children who resided in a town, had to pay for the wages of teachers of the Torah and Mishna, and the third is about the possibility that the community as a whole can fire a teacher if he did not follow the parents’ instructions (Gafni 1990, pp. 107–109).¹⁹

The second source of evidence of the spreading of primary education among the Jews in Israel in Talmudic times comes from the archeological discoveries on synagogues. During the Talmudic period, the reading of the Torah became more spread among Jews through the attendance of the local synagogues. The archeological evidence in Table 6 shows that a

¹⁶Oppenheimer (1977), and Haas (1989, 149).

¹⁷Cohen (1987); and Neusner (1990c).

¹⁸Neusner (1987, 1990c).

¹⁹The quote refers to “*sekhar sofrim ve-mishenim*” (Jerusalem Talmud, Peah 88 21).

lot of synagogues were built in the third-fifth centuries in Judaea, Galilee, and the Golan.

[TABLE 6]

Most of these locations can hardly be classified as cities, but they were rather small towns or villages of farmers. The archeological findings on synagogues are very important because from literary sources we know that children were taught in synagogues at this time in Israel (Safrai 1971; Aberbuch 1983, p. 41).

While Palestine remained important as center for the yeshiva, Babylonia (Iraq) grew in importance as the new center of Jewish religious and academic life. Like their counterparts in Palestine, the *Amoraim* in Babylon collected their opinions and comments on the Mishna in the Talmud Bavli (the Babylonian Talmud), completed around 500 CE. Unlike the Talmud of the Land of Israel, the Talmud Bavli has more material dealing with crafts and trade. Unlike the Jerusalem Talmud, which describes a communal organization of primary education, the Babylonian Talmud puts more emphasis on the parents' responsibility for paying for their children's education. In fact, a father was obligated to pay for his son's education and was required to teach him, or to have someone teach him, a craft (Goitein 1962, p. 121; Gafni 1990, pp. 107-109).

Like in the case of Eretz Israel, another source of information on the extent of religious instruction and primary education of children comes from the archeological evidence from the synagogues, which provides information independently from the discussions in the Talmud. Synagogues were also built in Mesopotamia and Egypt (Levine 1982, table p. 199).

During the Talmudic period, the leadership of the Jewish communities in Babylon became totally entrusted to the religious leaders and the scholars in the yeshiva. The exiliarch who held the political and administrative power over the Jewish community there, used the rabbis as bureaucrats in its administration. For example, the rabbis and the scholars in the academies became judges in the local courts, market inspectors, and poll-tax collectors (Morony p. 317). The rabbis were also responsible for the management of communal institutions such as the synagogues and the schools (Neusner 1965, p. 61; *Talmudic Judaism* p. 135).

The growth of the yeshiva in Babylon and the growing number of scholars and students in the academies indirectly show that more students must have gotten some primary education, without which they could not even enter the academies. Related to the yeshiva, the institution of the *kalla* indicates that education was becoming more spread among the Jews in Iraq from the end of the fourth century. The Kalla months were two months a year (Ellul and Adar, i.e., March, and August, at the end of the harvesting season) when Jews from everywhere were invited to visit the academy in Babylon where a specific section of the Talmud, accounced in the previous months, was read and discussed by the head of the academy and the scholars gathered there. During the *kalla* in the spring, the questions sent from the Jewish communities everywhere in the world were also read and discussed by the scholars. The written answers (*teshuvot* = *responsa*) to these questions were then sent back after Passover through the merchants travelling from the Near East to everywhere. The *responsa* of the scholars were an institution already existing in Talmudic times but

they do not constitute a separate literature from the Talmud; in contrast, they form an integral part of the Talmud. It is after the Talmud was redacted in about 500 and after the Amoraim were succeeded by the *Geonim* (the new heads of the academies) that the responsa became a separate body of literature. For more than five hundreds years, from the time the Babylonian Talmud was compiled in about 500 to the eleventh century when the last Babylonian Gaon was elected, the Gaonic responsa are the main source of direct information on the social, religious, and economic life of the Jews in Babylon and in other locations.

In regards to Jewish education, the responsa provide more information on the Babylonian yeshiva than the primary schools. Yet, from the responsa there is evidence that there were teachers who taught small children everywhere, even in the villages in Mesopotamia (Asaf 1925). These teachers were among the community officials (together with rabbis, judges, and heads of synagogues) listed at the end of letters of excommunication that the Geonim sent to various communities in the world. Thus, the teachers were an integral part of the communal bureaucracy in the Jewish communities.

The evidence from the early Gaonic responsa is very important because it comes before the Muslim period. By showing that more Jews educated their children in the period before the urbanization occurring in the Muslim period, the responsa support the claim that the Jews were investing in their children's religious literacy and education *before* the transition away from agriculture into trade.

The Arab and Muslim Period (638–1170 CE). There are two main sources of information for the spread of primary education in the Jewish communities during the Arab and Muslim period: the responsa of the Geonim described earlier, and the documents from the Cairo geniza. Both types of sources confirm the common pattern among the Jewish communities in the Arab and Muslim period: basic literacy among male Jews became almost universal.

Sherira Gaon (ca. 967-1006) wrote that “as a rule a Jew knows the Hebrew script” (Mann 1919, p. 325). This responsum was given in the context of legal documents signed by witnesses. The question had to deal with whether Jewish individuals who signed documents as witnesses understood the content of these documents. Sherira argued that some witnesses did not understand the content of what they were signing but, at the same time, asserted that every Jew knew the Hebrew script, which they learned in the primary schools or in the synagogues.

In the synagogues, however, Jewish children did not learn only the Hebrew script, as clearly indicated in the responsum of Hay Gaon (ca. 1007-1038) “One can teach the young children of the synagogue, while teaching Torah, Arabic script and arithmetic; but without the teaching of Torah, one should not teach these. And one should avoid, as far as possible, teaching the children of gentiles in the synagogues; but if there is a fear it may cause outrage, then it should be permitted, so as to keep the peace” (Asaf 1925, vol. II, p. 27). This responsum is important for three reasons. First, it confirms that even in the Gaonic and Muslim period, the synagogue continued to be one of the major institution among Jews for providing primary education to children. Many other responsa refer to schoolchildren as

the “children of the synagogues.” Second, the responsum indicates that there was demand for education that went beyond just learning the Hebrew script. Third, even non-Jews were interested to send their children to Jewish schools to learn non-religious topics.

The responsa literature also seems to indicate that basic literacy became almost universal among the Jews at this time, involving both the urban and the rural people. In fact, some responsa mention that there were teachers of small children (*melamdei tinokot*) everywhere, and even in the villages there were teachers and learners of Torah (Asaf 1925, pp. 21-22).²⁰

The thousands of letters, contracts, wills, and written transactions from the Cairo Geniza confirm the picture regarding primary education among Jews given in the responsa, but on a larger scale. From these documents Goitein (1971, p. 174) concluded that in the Jewish communities everywhere “elementary education was universal to a very remarkable degree, but its standards seem to have been rather poor.” The standards were poor in the sense that the ability to read and basic writing skills was the major goal of primary education. Thus, the letters written and/or signed by artisans and small shopkeepers were not written in the beautiful cursive script, but in the large script typical of books that were read and taught in primary schools. The art of writing in beautiful cursive script was taught only in advanced schools and was geared toward four types of professions: government officials, physicians, religious scholars, and merchants.

The universality of primary education among Jews in the tenth-thirteenth centuries is supported by the endless number of references to school fees and teachers mentioned in documents even from small towns and villages, and by the appointment of teachers for orphan and poor children at community expenses. The school fees were listed in the budgets of wealthy and humble households. A wife from a very poor household, for example, claimed that her husband did not behave as a proper father because he did not pay the school fees for their sons. References to hiring teachers and teachers’ salaries are found in many letters, even from the little town of Damira, the provincial town of al-Mahalla, or the small village of Qalyūb (Goitein 1971, p. 174, 187, 193).

In addition to the cost of providing his own children with a Jewish education (2 dirhems per month per child), 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. “Teacher of the orphans” (the name assigned to those who taught orphans and poor children at community expenses) are mentioned in records from Old Cairo, Jerusalem, Damascus, and Baghdad (Goitein 1971, p. 186).

In the world described by the Cairo Geniza documents, primary instruction was given in the synagogue, in the house of the teacher, or in the house of the child’s parents in the case of wealthy and prominent families. Small communities and villages had to invite a teacher by promising a minimum weekly salary, whereas in towns and cities teachers competed one against the other to attract students (Goitein 1971, p. 186).

After acquiring basic literacy in primary schools and/or synagogues, Jews merchants, physicians, and government officials gained higher skills in both reading and writing to the extent that they could write and discuss about sophisticated religious arguments, as shown

²⁰For example, in the responsa of Hai Gaon, he refers to “teachers (*garsai*) of the villages” that taught the Talmud despite not being well-versed in Scriptures.”

in the many letters from the Cairo Geniza. Being a scholar and being a merchant was often the same thing among the most educated Jews (Goitein 1971, p. 195).

This description by Joseph rōsh ha-seder ben Jacob, a Jewish scholar from Iraq, writing in Egypt around 1150, summarizes in a beautiful way the level of education among Jews at that time. According to this scholar, in his times there were four types of people: uneducated persons, the broad masses, scholars and doctors (Goitein 1971, pp. 205-6). The masses have learned to read the Pentateuch and Saadya's prayerbook. The scholars have studied other sections of the Bible and the codified law. The doctor was someone familiar with the Mishna, the Talmud, and their commentaries. Thus, one thousand years after the religious and educational reform prompted by the Pharisees and culminated with the decree of Joshua ben Gamala before the destruction of the Temple, most Jews had some basic literacy and a significant number of them, as merchants and scholars, had acquired higher levels of education and learning.

Primary Education among Non-Jews. Almost universal primary education seems to have been unique of the Jewish people in the first millennium.

In the Roman Empire, primary schools were widespread in the cities but primary education was neither compulsory nor universal. In particular, the lower socio-economic groups in the cities and the rural folks were illiterate (Marrou 1982, chapters 4 and 7).

No records of primary schools or education have survived for Western Europe after the fall of the Roman Empire until the end of the millennium (Ritchie 1976, p. 21-23). The clergy and the monks, the clerks employed in the kingdoms' bureaucracies, and the merchants had access to primary and more advanced education through private tutors and some schools located in the main cities. But the great majority of the European population, being rural, was illiterate.

There is no information on the universality of primary education in Iran and Iraq under the Parthian and Sassanian rulers. In contrast, there is a lot of information on the education institutions in the Muslim empire. With the aim of spreading the new religion to as many people as possible, the Muslim rulers promoted the establishment of primary schools (*Maktab* or *Kuttāb*), and by the end of the eighth century there was a fairly widespread system of primary schools (Dodge 1962, p. 3; Nakosteen 1964, pp. 44-47). Especially in earlier times, Jewish and Christian teachers were recruited to teach in the Muslim schools non-religious matters. The very basic education provided in the Muslim primary schools, sometimes attached to the mosque, was geared toward preparing the child to copy few passages of the Qur'an and to memorize them, and to provide some basic literacy and arithmetic. In the Muslim world, however, the institutions of higher learning, the *Madrash*, (the corresponding of the Babylon academies for the Jews) were not established until about 1020. Among the populations where the Jews lived in the first millennium, the populations under Muslim rule in the eighth to the thirteenth centuries were the most similar to the Jews when it comes to having institutions of primary education. Providing a child with primary education, however, was not a religious law among the Muslims, and the spread of higher education that occurred among the Jews from the Talmudic period on, occurred only five centuries later among the Muslims with the establishment of the *Madrash*.

7 Urbanization

The Arab and Muslim expansion brought an acceleration in urbanization. New cities and administrative centers were founded in Iraq and Iran. The main centers established by the Umayyad dynasty were Basra and Kufa, whereas in the late eighth and early ninth centuries the Abbasids rulers developed Baghdad and Samarra (Lapidus 1981, p. 203?). The center of the empire was transferred from Syria (the Umayyads had their capital in Damascus) to Babylonia and later to Baghdad. The figures about population size in Table 6 indicate that the Near East under Muslim rule was highly urbanized, at least in comparison to Europe.

[TABLE 6 HERE]

The growth of new cities, towns and administrative centers increased the demand for urban and skilled occupations in the lands under Arab and Muslim rule. The Jews in Eretz Yisrael and Babylon moved to the urban centers controlled by the Islamic rulers, abandoned agriculture, and became engaged in crafts and trade. Notice that the rabbis and the *Amoraim* (the scholars in the academies) were merchants in Babylon well before the Muslim period. In other words, the most educated and literate among the Jews had already left agriculture before the increasing urbanization in Iran and Iraq under Muslim rule. The growth of cities and towns in the lands of the Muslim Empire made available the high-skilled occupations to a larger number of literate and educated Jews.

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?

8 The Returns to Jewish Education

We argued 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.

At the turn of the first millennium, Judaism became a religion centered around reading the Torah in the synagogue. The emphasis on literacy and religious education increased significantly under the pressure of the rabbis and scholars from the second to the fifth century. Certainly not all the Jews were able to engage in the sophisticated debates involved in the reading of the Mishna and the Talmud. Only a selected group became highly literate, attended the academies in Eretz Israel and Babylon during the fourth-sixth centuries, and became the religious leaders of the communities. Yet, by implementing little by little the

educational reform prompted by the religious leaders such as Simeon ben Shetah and Joshua ben Gamala, an increasing number of Jews acquired a basic literacy that enabled them to read and to write). By the eighth century, most Jews had a basic literacy, which may seem modest by the standards of our times, but it is impressive when compared to the widespread illiteracy that characterized most of the population everywhere in the first millennium.

But does the ability to read the Bible help engage in urban, skilled occupations? In other words, what were the *economic* returns of this *religious* literacy?

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; 1993). Literacy was a pre-condition for the use of community sanctions among Jewish merchants. Only a Jewish merchant 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 the Jews in literacy and education enabled them to exploit the network externality at a great extent (Mann 1925).

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.

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 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).

After the Jews invested in literacy and education, they had the skills to engage in urban and skilled occupations, which is exactly what they did in the eighth century when the growth of cities in the Muslim Empire made amply available these high-skill occupations. Notice that 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.

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. Some of the 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. 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). 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).

Since the late ninth century, as many Jews became craftsmen and 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 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.

9 Conclusion

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.

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.

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	80-90%	some	some
	Mesopotamia	60-70%	many	some
	Egypt	??	??	??
	Roman/Byzantine Empire ^b	??	??	??
638–1170	Palestine	10-15%	many	many
	Muslim Empire ^c	10-15%	many	many
	Western Europe	5-10%	many	many

Sources: Benjamin of Tudela (1170), Abrahams (1896, ch. 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), Lewis (1976; 1984), Malamet (1976), Safrai (1976a), Tadmor (1976), Morony (1981, p. ??? and 152), Udovitch (1981), Avi-Yonah (1984, p. 20-23), Dan (1990), Hamel (1990), Jacobs (1990), Gil (1992; 1997), Cohen (1994), 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. 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 It includes all lands under Muslim rule, including Mesopotamia and North Africa, but not Palestine.

TABLE 2—RESTRICTIONS ON JEWISH ECONOMIC ACTIVITIES

Time	Location	Land Ownership	Slave Ownership	Occupations Prohibited
0–200 CE	Palestine	None	None	None
	Mesopotamia	None	None	None
	Egypt	None	None	None
	Roman Empire ^a	None	None	None
200–638	Palestine	Some	Some	Civil service
	Mesopotamia	None	None	None
	Egypt	Some	Some	Civil service
	Roman/Byzantine Empire ^a	Some	Some	Civil service
638–1170	Palestine	None	None	None
	Muslim Empire ^b	None	None	None
	Western Europe	None	None	None

Sources: See Table 1.

^a It does not include Palestine and Egypt.

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

TABLE 3—JEWISH AND TOTAL POPULATION IN IRAN AND IRAQ (IN MILLION)

Period	Total Population	Jewish Population
3 rd century (Sasanian Empire)	8	0.8 – 1.2 (most were farmers)
8 th century (Muslim Empire)	8 – 10	0.8 – 1.2 (transition from agriculture into crafts and trade)
12 th century (Muslim Empire)	?	0.8 (most held urban, skilled occupations)

Source: Neusner (1965, Vol. II, p. ???, vol. I, p. 14–15), Issawi (1981, pp. 376, 381).

TABLE 4—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 (1990).

^a Mostly were Christians.

TABLE 5—JEWISH AND TOTAL POPULATION IN OTHER REGIONS (IN MILLION)

Region	Period	Total Population	Jewish Population
Syria ^a	2 nd century (Roman Empire)	3 – 4	0.1
	8 th century (Muslim Empire)	3 – 4	?
	12 th century (Muslim Empire)	?	0.024
North Africa (with Egypt)	1 st century (Roman Empire)	10 – 12	1
	2 nd century (Roman Empire)	10 – 12	0.1
	8 th century (Muslim Empire)	7 – 9	few
	12 th century (Muslim Empire)	7 – 9	0.07

Source: Issawi (1981, pp. 376, 381), B. F. Musallam (1981, p. 432).

^a Includes Syria, Jordan, and Lebanon.

TABLE 6—SYNAGOGUES IN ERETZ ISRAEL, 200–750 CE

<i>Date of construction</i>	<i>Location</i>	<i>Region</i>	
3 rd century	Horvat Shema	Galilee	
	Nevoraya	Galilee	
	En-Gedi	Judea	
	Eshtemoa	Judea	
	Gush Halav	North of Meiron	
Mid-3 rd –4 th centuries	Merot	Galilee	
	Bet Alpha Galilee	Galilee	
	Hammat Tiberias	Galilee	
	Gush Halav	Galilee	
	Khirbet Shema	Galilee	
	Hammat Gader	Galilee	
	Maoz Hayyim	Galilee	
	Rehov	Galilee	
	Bet Shean	North Galilee	
	Qatzrin	Golan	
	Horvat Sumaqa	Carmel range	
	Horvat Rimmon	Shephelah	
	4 th century	Hirvat ha-Amudim	Eastern Galilee
		Maoz Hayim	Beth-Shean Valley
Horvat Susiya			
Gaza			
Zumimra		Lower Golan	
3 rd –5 th centuries	Anim	Golan	
	Yiafia	Golan	
	Kefar Hananiah	Golan	
	5 th century	Horvat Kanef	Lower Golan
En Neshut		Lower Golan	
Kazrin		Lower Golan	
Assalieh		Lower Golan	
6 th century		Dabiya	Lower Golan
	Umm el-Kanatir	Lower Golan	
	Horvat Dikke	Lower Golan	
7 th century	Rehov	Beth-Shean Valley	
7 th - 8 th centuries	Beth-Shean	Beth-Shean Valley	

TABLE 7—POPULATION SIZE IN SELECTED CITIES IN NEAR EAST

City	Time Period	Population (in Thousands)
Baghdad	8 th –9 th centuries	600–1,000
Basra	8 th –9 th centuries	200–600
Isfahan	8 th –9 th centuries	100
Kufa	8 th –9 th centuries	400
Nishapur	9 th century	100–500
Qayrawan	9 th century	100
Samarra	8 th –9 th centuries	1,000

Source: Andrew Watson (1981, p. 56, footnote 45).

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

Maristella Botticini* and Zvi Eckstein[†]

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(Preliminary and Incomplete)

1 The Model

The basic setup is a two-period overlapping generations model with no population growth. Given the historical period and problem we are dealing with, the model considers only fathers and sons (with fathers making all the decisions), and analyzes the choices of both Jewish and non-Jewish adults regarding their own religion and occupation, and the level of their children's education, taking the number of children in a household as given. The main assumption that distinguishes the Jewish people is the higher utility they derive from their children's Hebrew literacy (education). Without indicating at the outset the location, we consider individuals making these choices during the first millennium at one of the locations where the Jewish communities mainly settled during this period.

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 set by the rulers. Before the establishment of the Muslim Empire (638 CE), the number of urban occupations is constant whereas there is no limit on the number of people who can engage in agriculture. Furthermore, we assume that before the educational reform within Judaism (around 200 CE), Jewish and non-Jewish farmers and merchants have the same level of education and income.

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 and receiving a religion-related education e_s from his father. In the second period, the child becomes an adult, whose education level we indicate with e , and who makes decisions regarding the education level of his children, e_s , his own occupation, o , and his religion, r . We assume that there are two religions, Jewish ($r = j$) and non-Jewish ($r = n$).

*Boston University, Department of Economics, and CHILd, Università di Torino. E-mail: maristel@bu.edu

[†]Tel Aviv University, University of Minnesota, and CEPR. E-mail: eckstein@post.tau.ac.il

A Jewish child receives an exogenous taste parameter, x , which weights the value of belonging to the Jewish religion in the utility function. This taste parameter is a random draw from a first-order Markov process with a smooth density,

$$\begin{aligned} & g(x \mid x_f) \geq 0, \text{ for all } x, x_f \in (0, x^{\max}] & (1) \\ \text{such that, } & g(x = 0 \mid x_f) = 0, \text{ for all } x_f \in (0, x^{\max}] , \\ & \int_0^{x^{\max}} g(x \mid x_f) dx = 1, \text{ for all } x_f \in (0, x^{\max}] , \end{aligned}$$

where x_f is the taste parameter of the child's father. We assume that the mean of x increases with x_f , and that the value of the taste parameter is bounded above by x^{\max} .¹ The taste parameter x of a child whose father is non-Jewish (because born non-Jewish or because converted) is equal to 0.

For an adult Jewish individual whose father was Jewish, the state variable, s^j , is given by his education level e , and his taste parameter for the Jewish faith, that is, $s^j = (e, x)$. For an adult non-Jewish individual whose father was non-Jewish, the state variable is given by $s^n = (e, x = 0)$.²

We model the utility function to reflect the importance of the educational religious reform within Judaism. For simplicity, the utility of an adult is assumed to be linear with the following structure:

$$\text{A J individual with J father } (r_f = r = j): u^j(c, e_s; e, x) = c + x(e_s + e) - \epsilon h \quad (2)$$

$$\text{A J individual who converts } (r_f = j \text{ and } r = n): u^{jn}(c, e_s; e, x) = c - \pi x \quad (3)$$

$$\text{A non-J individual } (r_f = n \text{ and } r = n): u^n(c, e_s; e, x = 0) = c. \quad (4)$$

where c is the family consumption. In (2), the educational reform within Judaism is captured by the interaction of the preference parameter x with the level of education in the family; that is, the utility from being a Jew is increasing with the sum of the individual's education and of his son's education, $e_s + e$. This is because the Jewish religion emphasizes the importance of learning and reading as part of the Jewish practice.

The term ϵh captures the subsequent development within Judaism that made illiterate individuals (*ammei ha-aretz*) "outcast" in the Jewish communities starting from the second-third centuries CE. We set $h = 1$ if the adult Jewish individual is *am ha-aretz*, that is, if he or his son cannot read the Torah (either $e_s = 0$ or $e = 0$), and $h = 0$ otherwise. The community penalty if a Jew is *am ha-aretz* is equal to $\epsilon > 0$.

¹This specification of the intergenerational transmission of religious traits is similar to the one in Bisin and Verdier (2000). The taste parameter x is given to an individual as a draw from a distribution that depends on his father's taste for Judaism, x_f . To make the model interesting, we assume that all children born Jewish get some positive level of attachment to Judaism, so that the density at $x = 0$ is equal to zero. For the simulation at page 10, we assume that $\text{Ln}x \sim N(\mu + \alpha x_f, \sigma^2)$ for $x \in [0, x^{\max}]$. The value of x^{\max} is set such that the choice of a Jewish father regarding the education level of his children would not lead to zero family consumption as it becomes clear below.

²If the father is non-Jewish, we assume that the adult has zero taste for Judaism.

If a Jewish individual converts (see 3), he does not get any utility from his and his son's education (yet, the education of both still contributes in production). The term πx in the utility of a converted Jew represents the cost of conversion ($\pi \geq 0$). In contrast, the conversion of a non-Jewish individual to Judaism is assumed to have zero cost. The utility of a non-Jewish family (in 4) depends only on consumption.

A Jewish individual 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. This level represents the ability to read the Torah and to do basic writing and arithmetic. Without loss of generality, we normalize $e^{\min} = 1$. The cost of providing education to the son is given by $p(e_s) = \gamma(e_s)^\theta$, where $\theta > 1$. The cost of minimal education ($e^{\min} = 1$) is then equal to γ , and it can be viewed as the opportunity cost of the time the child spends in school instead of working with his father, as well as the fixed cost of the teacher and the school space (in the "heder" or in the synagogue). Hence, $p'(1) = \gamma\theta$ is the marginal opportunity cost of providing the child with basic Jewish education.

As mentioned earlier, there are two occupations: farming (F) and trade (merchant = M). Let $w(o = F) = w^F > 0$ and $w(o = M, e_s; e, x) = w^M$ 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 the farmer's productivity, and by assumption, the wage in agriculture is equal for each farmer independently of his characteristics and is equal to the constant w^F .³

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. Based on these assumptions, the earnings for merchants are,

$$w^M(e, e_s) = w^F[1 + Ae_s^\alpha e^{1-\alpha}]. \quad (5)$$

A farmer spends his income on family consumption, children's education, and a tax τ^{rF} that depends on occupation and religion.⁴ As such, the farmer's budget constraint is,

$$c^{rF} + \gamma(e_s)^\theta + \tau^{rF} \leq w^F \quad (6)$$

Equivalently, a merchant's budget constraint is given by,

$$c^{rM} + \gamma(e_s)^\theta + \tau^{rM} \leq w^F[1 + Ae_s^\alpha e^{1-\alpha}] \quad (7)$$

where τ^{rM} is the tax paid by a merchant with religion r . Note that if $e = 0$, the merchant's optimization problem is the same as that of the farmer. Hence, we analyze here only the case when for an adult merchant $e > 0$.

³This 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.

⁴One can extend the model to allow for many types of occupations that require education by setting A in (5) to be different for different occupations. Equivalently, it is possible to set A to be different across locations. We will use this simple extension in the discussion following the model.

1.1 Non-Jews

First, we focus on the choice of education and occupation of non-Jewish individuals. It is clear that all non-Jewish farmers do not educate their sons ($e_s = 0$), since the son's education does not provide any benefit (neither in production nor in utility). Meanwhile, the optimal education level that a non-Jewish merchant gives to his son is obtained by maximizing utility subject to (7). The first order condition is given by,

$$-\theta\gamma e_s^{\theta-1} + w^F A\alpha e_s^{\alpha-1} e^{1-\alpha} \geq 0. \quad (8)$$

Given the standard assumptions above on the parameters, there exists $e_s > 0$ that solves (8).

As for the choice of occupations, the son of a non-Jewish merchant would like to be a merchant, whereas the son of a non-Jewish farmer does not gain by changing occupation and becoming a merchant. Hence, given our assumption that the total, as well as the occupation-specific, populations are constant for non-Jews (and Jews), the initial split of the population would hold in equilibrium.

Given that the merchants' initial level of education is positive ($e > 0$), there exists a dynamic path of e for non-Jewish merchants that converges to a steady state level $e_s = e = [\frac{w^F A\alpha}{\theta\gamma}]^{1/(\theta-1)} = e^*$. From equation (8) we get that $e_s = [\frac{w^F A\alpha}{\theta\gamma}]^{1/(\theta-\alpha)} e^{(1-\alpha)/(\theta-\alpha)}$, and since $\theta > 1$, for all $e > 0$, this function crosses the line $e_s = e$ from above uniquely at e^* .

This result implies that the non-Jewish population is in a steady state where farmers and merchants have no reason to change their occupations, earnings in each group is constant, and population is also constant. This is a simple way to describe the world non-Jewish population in the first millennium.

We further assume that the non-Jewish population is at a stationary constant income during the first millennium. Since the level of education cannot be quantified in absolute terms, we simplify by setting the level of the merchants' education at the steady state, e^* , equal to a number. We have already normalized the minimum level of education required by the Jewish religion to be $e^{\min} = 1$. It would simplify the analysis further if we assume that the steady-state value of e_s, e^* , is equal to $e^{\min} = 1$. As such, each farmer's income is w^F and each merchant's income is $w^F(1 + A)$.⁵ Hence, A measures the rate of difference in income between farmers and merchants in the first millennium. We can estimate A from data on average income differences between rural and urban households at that time. This completes the equilibrium description of the non-Jewish population.

1.2 Jewish Farmers

We now solve for the education and conversion decisions of Jewish farmers. For a Jewish farmer, the optimal education level to provide to his son is independent of his own's

⁵The merchant's earnings are $w^F(1 + e^*A)$. It should be noted that $e^* = 1$ is an identifying assumption that we cannot defend by relying on historical evidence. However, if one thinks about education as a discrete level variable (not continuous as we assume in this model for convenience), then the assumption on e^* is not a significant additional restriction.

education level but depends on his taste parameter (attachment index) x , such that,

$$\gamma\theta e_s^{\theta-1} \leq x, \quad \text{with equality if } x \in [x^{\min}, x^{\max}], \quad (9)$$

where x^{\min} is defined by $\gamma\theta(e_s^{\min} = 1)^{\theta-1} = x^{\min} = \gamma\theta$, and $e_s = 0$, for all $x < x^{\min} = \gamma\theta$. The main insight from (9) is that Jewish farmers with attachment value x less than the marginal opportunity cost of children's education $\gamma\theta$, would choose *not* to provide education to their sons. Hence, the model predicts that there are four types of Jewish farmers's households according to the educational level:

- (i) illiterate (*am ha-aretz*) households with both father and son being illiterate ($e = 0$ and $e_s = 0$),
- (ii) illiterate (*am ha-aretz*) households with the father being illiterate but the son receiving education ($e = 0$ and $e_s \geq e^{\min}$),
- (iii) illiterate (*am ha-aretz*) households with the father being literate but the son receiving no education ($e \geq e^{\min}$ and $e_s = 0$),
- (iv) literate Jewish farmers who provide education to their children ($e > e^{\min}$ and $e_s > e^{\min}$).

As for the decision to convert to another religion, a Jewish farmer will convert if the utility as a Jew is lower than, or equal to, his utility as a converted individual. That is, if

$$\begin{aligned} w^j(c, e_s; e, x) &< w^{jn}(c, e_s; e, x) \\ &\text{or} \\ w^F - \gamma(e_s)^\theta - \epsilon h - \tau^{jF} + x(e + e_s) &< w^F - \tau^{nF} - \pi x, \end{aligned} \quad (10)$$

From (10), a Jewish farmer would convert if his level of x satisfies the following condition,

$$x < x^* = \frac{\gamma(e_s)^\theta + \tau^{jF} - \tau^{nF} + \epsilon h}{\pi + e_s + e}. \quad (11)$$

The joint solution of (9) and (11) for Jewish farmers, conditional on the state $s^j = (x, e)$, provides a full characterization of the farmers' decisions on education and conversion. The optimal education choice (9) defines, for $x \geq x^{\min} = \theta\gamma$, the solution for e_s as a function of x , that is, $e_s = [\frac{x}{\theta\gamma}]^{\frac{1}{\theta-1}}$. It is then possible, for each of the four types of Jewish farmers's households defined above (*i-iv*), to find the "reservation value of x ", x^* , for remaining Jewish and not converting, as a function of the individual's education, e , and of his level of attachment to Judaism x ,

$$\begin{aligned}
x^*(e = 0, x < x^{\min}) &= \frac{\tau^{jF} - \tau^{nF} + \epsilon}{\pi} \\
x^*(e = 0, x \geq x^{\min}) &= \frac{\gamma \left[\frac{x}{\theta\gamma} \right]^{\frac{\theta}{\theta-1}} + \tau^{jF} - \tau^{nF} + \epsilon}{\pi + \left[\frac{x}{\theta\gamma} \right]^{\frac{1}{\theta-1}}} \\
x^*(e > 0, x < x^{\min}) &= \frac{\tau^{jF} - \tau^{nF} + \epsilon}{\pi + e} \\
x^*(e > 0, x \geq x^{\min}) &= \frac{\gamma \left[\frac{x}{\theta\gamma} \right]^{\frac{\theta}{\theta-1}} + \tau^{jF} - \tau^{nF}}{\pi + e + \left[\frac{x}{\theta\gamma} \right]^{\frac{1}{\theta-1}}}.
\end{aligned} \tag{12}$$

It is clear from (12) that Jewish farmers with low x and low education, e , are more likely to convert. For *all* Jewish farmers (types i–iv above) the main gain from conversion is the reduction in taxes, $\tau^{jF} - \tau^{nF}$. For illiterate Jewish farmers (types i–iii above), there is an additional gain because of the reduction in the community penalty, ϵ , which an illiterate Jewish individual will no longer pay once converted. For Jewish farmers who educate their sons, the gains from conversion also include the reduction in the cost of providing their sons with education. These gains are weighted against the marginal utility cost of conversion. This cost includes the cost of conversion (πx), as well as the loss from no longer enjoying the utility of being Jewish ($x(e_s + e)$). Hence, the reservation value of x, x^* , depends on the gain per-unit of cost of conversion, relative to the level of Jewish attachment, x .

Proposition 1 provides the characterization of the education and conversion decisions conditional on the state $s^j = (e, x)$ for all Jewish farmers.

Proposition 1: Conversion and education of Jewish farmers.

Case I: Suppose that the parameters are such that $\frac{\tau^{jF} - \tau^{nF} + \epsilon}{\pi} < x^{\min} = \gamma\theta$.

A literate Jewish farmer ($e \geq 0$) will make the following choices:

- (i) *He converts, $r = n$, and does not educate his children ($e_s = 0$), if $x \in (0, \frac{\tau^{jF} - \tau^{nF} + \epsilon}{\pi + e})$.*
- (ii) *He does not convert, $r = j$, and he does not educate his children ($e_s = 0$), if $x \in (\frac{\tau^{jF} - \tau^{nF} + \epsilon}{\pi + e}, x^{\min})$.*
- (iii) *He does not convert, $r = j$, and he educates his children ($e_s > 0$) such that $e_s = (\frac{x}{\gamma\theta})^{1/\theta-1}$, if $x^{\max} \geq x \geq x^{\min}$.*

Case II: Suppose that the parameters are such that $\gamma\theta e_s^{\theta-1} = x^{\min} < \frac{\tau^{jF} - \tau^{nF} + \epsilon}{\pi}$.

A literate Jewish farmer ($e \geq 0$) would make the following choices:

- (i) *He converts, $r = n$, and does not educate his children ($e_s = 0$), if $x \in (0, \frac{\tau^{jF} - \tau^{nF} + \epsilon}{\pi + e})$.*
- (ii) *He does not convert, $r = j$, and does not educate his children ($e_s = 0$), if $\frac{\tau^{jF} - \tau^{nF} + \epsilon}{\pi + e} < x^{\min}$ and $x \in (\frac{\tau^{jF} - \tau^{nF} + \epsilon}{\pi + e}, x^{\min})$.*

(iii) He does not convert, $r = j$, and he educates his children such that $e_s = (\frac{x}{\gamma\theta})^{1/\theta-1}$, if $x^{\max} \geq x > (\frac{\tau^{jF}-\tau^{nF}+\epsilon}{\pi+e}) > x^{\min}$.

Proof: See Appendix.

Proposition 1 becomes simple to understand by looking at Figure 1.

[FIGURE 1 HERE]

There are two lines for each case. The first is the x^{\min} horizontal line; below this line, $e_s = 0$ whereas above it we get $e_s > 0$. The second is the line $\frac{\tau^{jF}-\tau^{nF}+\epsilon}{\pi+e}$, which crosses the vertical line ($e = 0$) at the point where $x = \frac{\tau^{jF}-\tau^{nF}+\epsilon}{\pi}$. The area below $\frac{\tau^{jF}-\tau^{nF}+\epsilon}{\pi+e}$ is where $r = n$ and $e_s = 0$. If $\frac{\tau^{jF}-\tau^{nF}+\epsilon}{\pi+e} < x^{\min}$, then there is the range of x where $r = j$ and $e_s = 0$.

Using this full characterization of the Jewish farmer decisions, one can use the density function of x , $g(x | x_f)$ to derive the dynamic stochastic distribution of education among non-converted Jews from the initial condition where the Jews have the same education as non-Jews. We will come back to this dynamic description of the Jewish population later in this section.

Proposition 1 gives additional insights. The key parameter in the model is the relative gain from conversion $\frac{\tau^{jF}-\tau^{nF}+\epsilon}{\pi}$. In case I, it is small and in case II it is large. The first insight is that, in both cases, the proportion of conversions among *non-educated* farmers is larger than among *educated* farmers. This proportion of conversions can be calculated using the conditional density of x , (1), jointly with the marginal density of x_f .

The second insight is that in case I, it is possible that both educated and non-educated farmers do not convert and do not educate their children. The value of x of those Jewish farmers who do not educate their sons is lowest among the Jews. In this case, the higher the education level of the Jewish individual, the lowest is the probability of conversion. But a large proportion among these Jewish farmers have low x , and, hence, would choose not to educate their children ($e_s = 0$). Hence, the proportion of Jewish farmers who convert in the next period will be large. In contrast, in case II, all the Jews who do not convert, educate their sons, if e is not too large. Hence, when the relative gain from conversion is high, there is a higher proportion of conversion among Jews but fewer Jews are illiterate.

The third insight from Proposition 1 is that the model predicts that there would be Jewish farmers who educate their sons, whereas all *non-Jewish* farmers are illiterate and do not educate their sons. This result implies that only Jewish farmers would prefer to become merchants. We come back to this point after we solve for the education and conversion choices of Jewish merchants.

1.3 Jewish Merchants

For a Jewish merchant with $s^j = (e > 0, x > 0)$, the optimal level of education to provide to his son is given by the solution of the following first order condition,

$$x - \theta\gamma e_s^{\theta-1} + w^F A\alpha e_s^{\alpha-1} e^{1-\alpha} = 0. \quad (13)$$

Given that for non-Jewish merchants their education level is positive, (using equation 8) for all $s^j = (e > 0, x > 0)$ the optimal e_s is positive. If $e \geq e^{\min} = 1$, then $e_s \geq e^{\min} = 1$, and all Jewish merchants will educate their sons. Formally, we state the education choice of Jewish merchants in the following *Lemma*.

Lemma 1: For all $s^j = (e > 0, x > 0)$, there exists a unique function $e_s(e, x)$ that solves equation (13) such that, for any given $e = e^0 > 0$, $e_s(e = e^0, x) > e_s(e = e^0, x = 0)$. Therefore, when his education is larger or equal to that of a non-Jewish merchant, a Jewish merchant invests more in his son's education than a non-Jewish merchant.

Proof: Rewrite equation (13) as, $x = \theta\gamma e_s^{\theta-1} - w^F A \alpha e_s^{\alpha-1} e^{1-\alpha}$ where the r.h.s is monotonically increasing in e_s . The solution for e_s^n in equation (8) is the same as here but with $x = 0$. Hence, using the result from the non-Jewish merchants' education choice, for all $x > 0$ and $e > 0$, $e_s > e_s^n$, and e_s is unique. This establishes the result for the case when Jewish and non-Jewish merchants have the same education. From the solution equation above, it is clear that e_s is increasing in e . ■

As for the decision to convert, a Jewish merchant will convert if the utility as a Jew is lower than, or equal to, his utility as a non-Jewish. That is, if

$$\begin{aligned} w^j(c, e_s; e, x) &\leq w^{jn}(c, e_s; e, x) \quad \text{or} \\ w^F[1 + A(e_s^j)^\alpha (e^j)^{1-\alpha}] - \gamma(e_s^j)^\theta - \epsilon h - \tau_t^{jM} + x(e^j + e_s^j) &< \quad (14) \\ w^F[1 + A(e_s^n)^\alpha (e^j)^{1-\alpha}] - \gamma(e_s^n)^\theta - \tau_t^{nM} - \pi x, & \end{aligned}$$

a Jewish merchant will convert.

Note that if the initial level of education of the Jewish merchant (the level of education of Jewish merchants before the religious reform, e^*) is higher or equal to e^{\min} , *Lemma 1* implies that $h = 0$ and the Jewish merchant always educates his son, $e_s > 0$. Equation (14) implies that a Jewish merchant will convert if

$$x < \frac{[w^F A (e_s^n)^\alpha (e^j)^{1-\alpha} - \gamma(e_s^n)^\theta] - [w^F A (e_s^j)^\alpha (e^j)^{1-\alpha} - \gamma(e_s^j)^\theta] - \tau^{nM} + \tau^{jM}}{e^j + e_s^j + \pi}. \quad (15)$$

In order to show that the model allows for the conversion of Jewish merchants, we have to show that a Jewish merchant with $s^j = (e^j, x)$ will choose e_s^j and e_s^n such that (15) is satisfied. e_s^j should satisfy equation (13) and e_s^n should satisfy equation (8). We look for a solution where we use the optimal education level to characterize the values of the parameters and x for which Jewish merchants would convert. Using the equation for the optimal education level in (15), we get that a Jewish merchant with $x \in [0, x^*)$ convert where x^* is given by,

$$x^* = \frac{w^F A (e^j)^{1-\alpha} (1 - \frac{\alpha}{\theta}) [(e_s^n)^\alpha - (e_s^j)^\alpha] - \tau^{nM} + \tau^{jM}}{e^j + e_s^j (\frac{\theta-1}{\theta}) + \pi}. \quad (16)$$

Proposition 2: Conversion and education of Jewish merchants.

Suppose that the initial level of education of Jewish merchants (the level of education of Jewish merchants before the religious reform), is equal to $e^* = [\frac{w^F A \alpha}{\theta \gamma}]^{1/(\theta-1)}$, which is higher or equal to e^{\min} , and that the taxes levied on Jewish merchants are higher or equal to that of non-Jews ($-\tau^{nM} + \tau^{jM} \geq 0$). Then:

(i) All Jewish merchants provide education to their sons. Starting at the time of the educational reform, the education level among Jewish merchants is increasing, and all Jewish merchants have higher education than non-Jewish merchants.

(ii) If $-\tau^{nM} + \tau^{jM} = 0$, then no Jewish merchant will convert.

(iii) For large enough $-\tau^{nM} + \tau^{jM} > 0$, some Jewish merchants will convert but the proportion of conversions is decreasing with e^j .

Proof: See Appendix.

The main insight from Proposition 2 is that for the case of no tax difference between Jewish and non-Jewish merchants, *no Jewish merchant would convert* ((ii) above). Obviously, there exists a large enough tax differential between Jews and non-Jews that would make Jewish merchants with low enough x to convert. The point is that the even in this case, Jews with more education are less likely to convert.

An important and immediate result of Proposition 2 is that an educated Jew, whose father was a Jewish farmer, would always prefer to become a merchant, since given that $e^j > 0$, he would have higher income as merchant for any level of x . Furthermore, the choice of these Jews would be the same as that described above for Jewish merchants.

1.4 Occupations and Social Dynamics

So far we discussed the supply of labor for each occupation for a given initial occupation, education and religion of each individual.

Regarding the demand for rural and urban occupations, we make the following assumptions. First, the size of the population in trade (merchant's) occupation, and in each location, is assumed to be exogenously determined. The world population is assumed to be of constant size.⁶ Second, we set the beginning of the analysis at about the year 200 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 about 4.5 million people. During the first half of the millennium the number of urban occupations is assumed to be a constant fraction (about 5 percent) of the world population. The Jewish and non-Jewish proportional number of merchants at the initial period is assumed to be the same (about 5 percent). At the beginning of the Muslim empire (seventh–eighth centuries), the demand for urban occupations (craftsmen and merchants) increased substantially.

⁶Table ?? 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.

The following statement summarizes the equilibrium properties of the occupational distribution of the Jewish and the non-Jewish populations provided by the model:

All non-Jewish and Jewish merchants do not wish to change their occupation. Hence, until the Muslim period there is no occupational transition among the Jewish and the non-Jewish farmers. However, the model predicts that all educated Jewish farmers, $e^j > 0$, will become merchants only if there is an exogenous increase in the world demand for these occupations. Furthermore, if there is an exogenous increase in the demand for merchants, then the educated ($e^j > 0$) Jewish farmers are the only population in the world that would switch occupations and become merchants.

The above statement provides the main result of the model. That is, the religious-educational reform is the main reason for the occupational transition of the Jews from farmers to merchants and other urban occupations in the new centers in the newly established Muslim empire.

However, the religious-educational reform also had an effect on the Jewish population size.

Jewish population and education dynamics. The implication of the model regarding the effect of the educational reform on conversion of Jews and the interaction of conversion with their occupational choice can be used as a way for testing the main hypothesis. In propositions 1 and 2 we characterized the choice of religion and education of Jews. Using these propositions, the assumptions on the size of the total population, the demand for occupations and the initial conditions on education among Jews, it is possible to derive the equilibrium stochastic distribution of Jews, by their educational level, from the time of the religious reform onwards.

Formal derivation of the stochastic dynamic distributions of conversion and that of the Jewish population by education is complicated. However, based on propositions 1 and 2 there are two general implications one can derive on the size of the Jewish population:

1. *The number of Jewish farmers is decreasing continuously because of conversions. Starting from the educational reform, the probability that $x \in (0, \frac{\tau^{jF} - \tau^{nF} + \epsilon}{\pi + e}]$ is non-zero for all $e \geq 0$, and, therefore, some Jewish farmers in each generation would convert.*

2. *If the tax difference between Jewish and non-Jewish merchants is small, then the conversion among Jewish merchants is zero. As such, the proportion of Jewish merchants is increasing as the number of Jewish farmers decreases because of conversions.*

In addition, it is straightforward to use propositions 1 and 2 with certain parameter values to simulate the conversion rate and the education distribution among Jewish farmers and merchants. Based on these simulations, we can draw the following results regarding the conversion rate and the distribution of education levels among Jewish farmers using specific parameter values:⁷

1. We could easily find many combinations of the parameters such that the conversion rate at the time of the reform is the largest (8 to 20 percent), and the conversion rate for later generations is about 2 to 5 percent, depending on the parameter values. In 20 to 25

⁷We set the initial level of farmers to zero. We use case I of proposition 1 where the distribution of x is on the domain of $x \in (0, x^{\max} = 5)$, using the distribution $\ln x \sim N(\mu + \alpha x_f, \sigma^2)$, $\theta = 2$, $\gamma = 1$ and we vary the other parameters. The program in fortran is available at the URL:

generations (400 to 500 years), the model with these parameters predicts that the Jewish farmer population is reduced from about 4 million to about 1 million. Note that the model with very low level of tax differentials predicts that no merchant would convert. Hence, if the initial Jewish merchants population is of 200 thousands (about 5 percent of the Jews), then they become about 20 percent of the Jews in the seventh century.

2. Jewish farmers are divided into four types. The largest (more than 50 percent) are families where both the father and sons are educated. The second and the third types are families where either the father or the son are literate. These two groups have almost equal proportion (10 to 20 percent each) for many parameter values. The fourth group is where neither the father nor the son are educated. In most simulations this group is less than 10 percent of the Jewish farmers population.

3. Most simulations show that the conversion rate and the proportion of family types by education level are almost constant after the third generation following the religious reform.⁸

Network externality - . Greif (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. Following Lucas (1985)'s specification of the human capital externality in production, we can extend the model such that the earnings for merchants increase with the average level of literacy among merchants, E . Explicitly we can change the merchants earning to be $w^F[1 + AE^\eta e_s^\alpha e^{1-\alpha}]$. When $\eta = 0$ the model is the same as above and with $\eta > 0$ the earning of merchants gain from network externality. This specification has several implications that are summarized by the following proposition (TO BE DONE).

2 Historical Evidence on Conversions and Population Size

For historical evidence on education and occupations see Botticini and Eckstein (2004 "History paper").

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.

For conversions and trends in Jewish population, we provide here the evidence. First, notice that both the size and the geographical concentration of the Jewish population underwent significant changes throughout the first millennium (Table 1).⁹

⁸The stability means that the percentage by state does no change at the first two digits. These simulations have a low level of α (the dependence of x on x_f .)

⁹We 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.

TABLE 1—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: See Botticini and Eckstein, Paper A.

^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.

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. For the Jews in the Roman Empire, the key events were the two rebellions against Rome.¹⁰ 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 1). Based on the data suggested by historians, though, these massacres account for less than half of

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 1 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 1) agree with the *pattern* that emerges from Table 1.

¹⁰The 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).

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. However, none of these episodes was large enough to account for the 2 million Jews who converted. 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 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 the result 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 the theoretical predictions, 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 1).¹¹ 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.¹²

¹¹One of the predictions of Rapoport and Weiss (2002)’s model is consistent with this historical fact.

¹²As 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

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.

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, the historical evidence indicates 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.

3 Appendix: Proofs

Proof of proposition 1:

Case I: (i) and (ii). This result is immediate from first and the third equations in (12) and from (??). The condition in (i) implies that the results are the same either $e = 0$ or $e > 0$. (iii) is a bit more complicated. Starting from (iii), where $e = 0$, we get from the second line of (12) after multiplying numerator and denominator by $[\frac{x}{\theta\gamma}]^{\frac{-1}{\theta-1}}$ that,

$$x^*(e = 0, x \geq x^{\min} = \theta\gamma) = \frac{\frac{x}{\theta} + [\tau^{jF} - \tau^{nF} + \epsilon][\frac{x}{\theta\gamma}]^{\frac{-1}{\theta-1}}}{\pi[\frac{x}{\theta\gamma}]^{\frac{-1}{\theta-1}} + 1}$$

and

$$x^*(e = 0, x = x^{\min} = \theta\gamma) = \frac{\gamma + [\tau^{jF} - \tau^{nF} + \epsilon]}{\pi + 1}. \tag{17}$$

The first equation in (17) implies that as x goes up, x^* approaches $\frac{x}{\theta}$. But this approach the line with a slope $\frac{1}{\theta}$, which is always below x . At $x = x^{\min} = \theta\gamma$, $x^* = \frac{\gamma + [\tau^{jF} - \tau^{nF} + \epsilon]}{\pi + 1} < \theta\gamma$. The proof of this is by contradiction. Suppose that $\frac{\gamma + [\tau^{jF} - \tau^{nF} + \epsilon]}{\pi + 1} > \theta\gamma$. Then, we get that

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).

$\frac{\gamma}{\pi} + \frac{\tau^{jF} - \tau^{nF} + \epsilon}{\pi} > \theta\gamma + \frac{\theta\gamma}{\pi}$. This is a contradiction, since, by assumption $\frac{\tau^{jF} - \tau^{nF} + \epsilon}{\pi} < \theta\gamma$ and $\frac{\gamma}{\pi} < \frac{\theta\gamma}{\pi}$, since $\theta > 1$. Hence, for all $x \geq x^{\min} = \theta\gamma$, x^* is below x and no conversion occurs. Since $x^*(e = 0, x \geq x^{\min} = \theta\gamma) < x^*(e > 0, x \geq x^{\min} = \theta\gamma)$. This complete the proof of (iii).

Case II. (i). Start with $e = 0$. Then the result is immediate from the first equation in (12). (ii). Start with $e = 0$. Since from (12) as x goes up, x^* approaches $\frac{x}{\theta}$, and, since, it is possible to show that $\frac{dx^*}{dx} > 0$ for $x > \frac{\tau^{jF} - \tau^{nF} + \epsilon}{\pi}$, then for all $x > \frac{\tau^{jF} - \tau^{nF} + \epsilon}{\pi}$, $x > x^*$, and conversion is not optimal. This also proves for the case where $e > 0$. ■

Additional results for Lemma 1: The existence of the unique solution follow from Lemma 1 where $x = 0$. The reason is that $x > 0$ just shift the value of e_s up such that,

$$\frac{\partial e_s}{\partial x} = \frac{1}{\theta\gamma(\theta - 1)e_s^{\theta-2} - w^F A\alpha e^{1-\alpha}(\alpha - 1)e_s^{\alpha-2}} > 0,$$

using total derivatives of (13). The partial derivative with respect to e is given by,

$$\frac{\partial e_s}{\partial e} = \frac{-w^F A\alpha e^{-\alpha}(1 - \alpha)e_s^{\alpha-2}}{-\theta\gamma(\theta - 1)e_s^{\theta-2} + w^F A\alpha e^{1-\alpha}(\alpha - 1)e_s^{\alpha-2}} > 0.$$

It is immediate that the value of $\frac{\partial e_s}{\partial e}$ is decreasing with e since the denominator goes up and the numerator goes down. ■

Derivation of x^* (16) for merchants:

>From (13) we derive the following relation for the cost of education for Jewish merchants:

$$[x + w^F A\alpha(e_s^j)^{\alpha-1}(e^j)^{1-\alpha}](e_s^j/\theta) = \gamma(e_s^j)^\theta.$$

Equivalently, from (8) we derive the following relation for the cost of education for converted Jewish merchants:

$$w^F A\alpha(e_s^n)^{\alpha-1}(e^j)^{1-\alpha}(e_s^n/\theta) = \gamma(e_s^n)^\theta.$$

Insert these conditions into (15) and rearranging we get that the condition for conversion is:

$$x < \frac{w^F A(e^j)^{1-\alpha}(1 - \frac{\alpha}{\theta})[(e_s^n)^\alpha - (e_s^j)^\alpha] - \tau^{nM} + \tau^{jM}}{e^j + e_s^j(\frac{\theta-1}{\theta}) + \pi}.$$

Proof of Proposition 2: (i) is basically a repetition of Lemma 2.

For (ii): From equation (16) it is the case that the first term is negative since α/θ is less than one and $e_s^n < e_s^j$ from 2.1 above. Hence, for this case there is no positive x^* .

For (iii): From Lemma 1, starting from the educational reform e_s^j increases above e_s^* and it is increasing with e^j . Note that the Jewish merchants become non-Jewish merchants and the total population of merchants stays constant. A full proof requires to write the stochastic difference equation for the merchant population.

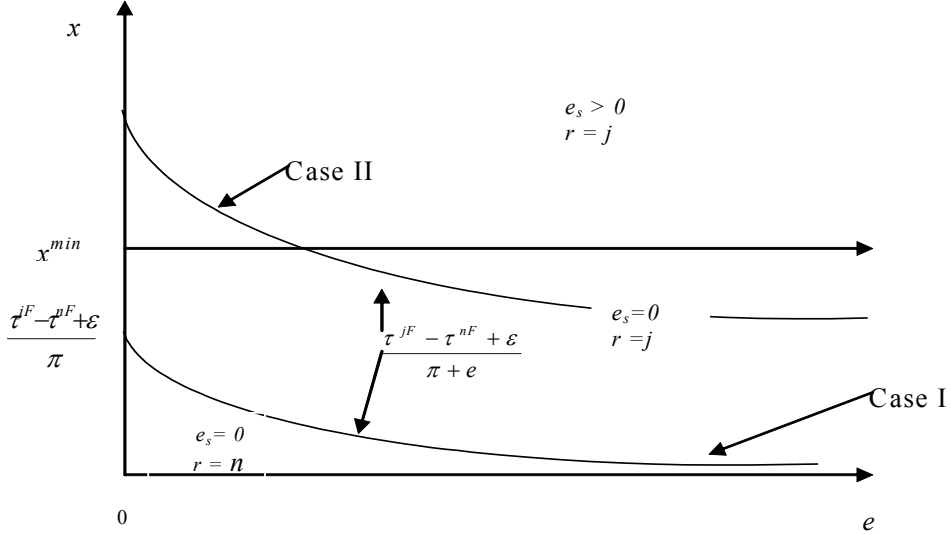


Figure 1: Education and Conversion of Farmers (Proposition 1).

Figure 1:

can be calculated using the conditional density of x , (1), jointly with the marginal density of x_f .

The second result is that in case I we get the possibility that both educated and non-educated farmers stay Jewish and do not educate their children. The value of x of the farmers that do not educate their sons is lowest among the Jews. In this case, the higher the education of the father the lowest is the probability of conversion. But a large proportion among them would have low x , and, hence, would choose $e_s = 0$. Hence, the proportion of Jewish converts next period would be large. In case II all the Jews who don't convert educate their sons, if e is not too large. Hence, when the relative gain from conversion is high, there is a higher proportion of conversion among Jews but less Jews are not educated.

The third point is that the model predicts that there would be Jewish farmers that educate their son where all non-Jewish farmers are not educated and do not educate their sons. This result implies that only Jewish farmers would prefer to be merchants and to leave the farming to a trade related job. We come to that after we solve the education and conversion choice of Jewish merchants.

1.3 Jewish Merchants

We now solve for the education and conversion decision of Jewish merchants. For a Jewish merchant with $s^j = (e > 0, x > 0)$, the optimal level of education of his son is given by the