Community Origins of Industrial Entrepreneurship in Pre-Independence India*

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Abstract

We argue that community networks played an important role in the emergence of Indian entrepreneurship in the early stages of the cotton textile and jute industry in the late 19^{th} and early 20^{th} century respectively, overcoming the lack of market institutions and government support. From business registers, we construct a yearly panel dataset of entrepreneurs in these two industries. We find no evidence of entry patterns being affected by price shocks or pre-industrial accumulation of wealth or experience in trading in the corresponding upstream sector. Firm directors exhibited a high degree of clustering of entrepreneurs by community. The dynamics of entry is consistent with a model of network-based dynamics.

1 Introduction

Historical differences in the timing and the determinants of industrialization across countries has been an important area of research in economic history. Most of this research has focused on developed countries. The first industrial revolution in Britain was market-driven, with atomistic agents setting up industrial firms. Entrepreneurs responded to high wages and adopted capital intensive technology (Allen 2009). The intellectual revolution of the Enlightenment generated useful knowledge by skilled workmen and inventors that could be used effectively by potential entrepreneurs in an institutional setting that provided the right incentives (Mokyr 2009). The state did not intervene directly to promote industrialization. Secure property rights and a Parliament enacting favourable laws secured well-functioning markets in a period of radical technological and social transformation (Bogart and Richardson 2008).

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In contrast, countries like Germany and United States saw more direct involvement of the state. High tariffs on manufactured goods to protect infant industries were widely used in both countries. In 1875, the average tariff in the USA was about 30% and in Germany 6%. After the tariff reform of 1879 in Germany, the average rate of tariff rose to 8% and the average tariff on manufactured goods was 13% in 1913 (O'Rourke 2000). Webb (1980) estimated effective protection for the German iron and steel industry at 37-70% at the turn of the century, one of the key industries of the second industrial revolution of the late 19^{th} century. In 1885, some of the highest tariff rates were in the United States: 40% on cotton textile, 35% on iron and steel and over 70% on sugar, spirits and tobacco (Irwin 2007).

In more backward countries such as Russia, industries developed in the 1890s with the state creating a favourable environment (Markevich and Nafziger 2017). Spending on industrial development was very small, but tariffs were raised across the board to increase revenue as well as to protect industry. The government subsidized railway construction and had favourable policies to attract foreign capital (Kahan 1967). In Japan after the Meiji restoration of 1868, the state coordinated interactions between the financial sector and industry, facilitated import of machinery and technological know-how as well as quick adoption and dissemination of new technology. A tax reform in 1873 that discontinued payments to the samurai, made way for investment in the modern sector (Perkins and Tang 2017). Policies towards industrialization in Japan and later on in East Asia exemplify intervention by developmental states when markets are missing. The state regulated entry, subsidized credit and provided tax incentives to favoured industries.

Countries that are less developed today were slower to industrialize, in the absence of both well-functioning markets and interventionist states. However, the vacuum has often been filled by ethnic networks which exchange intermediate inputs, share know-how, connections and capital; overcoming contractual moral hazards via informal community enforcement mechanisms. The role of community networks in early industrialization of less developed countries has not received comparable emphasis in the literature. Section 2 describes historical evidence on the limited role of state and market institutions in 19^{th} century industrialization in India, suggesting a possible role of community networks in filling this gap. The importance of community networks in solving contract enforcement in trade has been eloquently described in the work of Greif (2006). Social networks have been instrumental in economic activity in Africa (Fafchamps 2003) and in Chinese trade (Rauch 2003).

In the Indian context, social networks are defined by occupation based caste or religious groups. These groups engaged in the same occupation, married within the group; intra-group relationships

manifested high levels of trust, mutual help, economic transactions and sharing of information. Indian caste networks have been important in credit and insurance (Banerjee and Munshi 2004; Munshi 2011). Social networks also play a role in labour markets as shown in the context of hiring and referrals (Beaman and Magruder 2012) as well as migration flows (Munshi 2003).

The role of social networks in industrial entrepreneurship has been researched less thoroughly. Gupta (2014) shows that British and Indian networks in early industrialization in India were typically segregated into different sectors. Business historians have accumulated case study evidence on entry into industry from trade starting from the second half of the 19^{th} century (Goswami 1985; Rudner 1994, and Timberg 1978; Tripathi and Mehta 1990; Tripathi 2004). This literature focused on particular entrepreneurs and their communities. A limitation of these rich historical accounts is the lack of quantification. There is no systematic evidence for the industrial sector as a whole or any particular industry at the entrepreneur level.

In this paper, we focus principally on the cotton textile industry, the leading industry in the 19^{th} century where Indian entrepreneurs emerged; we also later examine the early evolution of Indian entrepreneurs in the jute industry after 1918. For both industries, we construct a yearly panel dataset from business registers of directors of listed firms in upstream and downstream activities of the concerned industry, and code their respective community identities from their names. This enables us to construct a yearly panel data set of active entrepreneurs by community, track their backgrounds prior to entering the downstream industry and examine patterns of community homophily in the composition of firms. We use this evidence to understand the role of community networks in the process of entry into the downstream industry, while controlling for the role of price and other industry-wide shocks and community characteristics such as prior experience, literacy, population size or outside options.[1]

We use two pieces of quantitative evidence to assess the role of communities. First, we examine the extent to which entrepreneurs clustered by community within firms. Given the high degree of interdependence among entrepreneurs within the same firms, this is a natural way to assess the extent to which problems of trust and cooperation among principal shareholders and executive officers were overcome by partnering with members of the same community. Second, we test a model of entry dynamics based on productivity-enhancing help provided by incumbent entrepreneurs to new entrants from their own community. The model is appropriate for early stages of industrialization with stable

[1]The data pertains to the stock of active entrepreneurs in different years, which includes the effects of entry as well as exit. However, entry flows dominate exits, so we interpret changes in the stock of active agents as reflecting entry forces throughout the paper.

market growth and a given set of communities with stocks of potential entrepreneurs with stationary outside options. Such early stages are typically characterized by growing incumbent stocks from each community. The model generates network-based dynamics of the incumbent stock which exponentially amplify over time differences in initial presence of different communities. The network effect can be identified by the presence of a non-linear divergence effect for incumbent stocks, while controlling for year dummies (which include the effect of price and other industry-wide shocks) and community dummies (which capture differences in community-specific characteristics such as education, ability, wealth and outside options).

Besides community networks, we also examine the role of some other factors argued by some authors to be relevant for emergence of early industrial entrepreneurship, such as pre-industrial accumulation of wealth (Marx 1887, Banerjee and Newman 1993) or experience in related upstream trading sectors (Sutton and Kellow 2010, Sutton and Kpentey 2012).

We start by examining evidence for emergence of entrepreneurship in cotton textiles for the first three decades following 1860. Industry price movements do not play a significant role in predicting entry patterns, nor do prior upstream presence of the community during the US Civil War (a proxy for prior trading experience and profit). 66% of entrepreneurs active during 1860-70 had no prior upstream experience in baling and trading raw cotton, a proportion which rose to 79% and 91% in the subsequent two decades. On the other hand, we find a high degree of community-based clustering of entrepreneurs in the composition of downstream firms: on average 60% or more entrepreneurs belonged to the same community within any firm. The evolution of presence of active entrepreneurs from different communities during early stages exhibited the nonlinear amplification of early community presence predicted by the network model. We use yearly data for stocks of active entrepreneurs at the community level from 1866 until 1890. The nonlinear network effect is statistically significant and quantitatively large: an additional active entrepreneur from a given community in 1866 was associated with 1.6 additional entrepreneurs from the same community in 1880, and 4.4 additional entrepreneurs in 1890.

The assumptions of the network-based model ceased to apply after 1890, owing to saturation of entrepreneurs from each community in Greater Bombay where most of the entry since 1860 had been located. The period from 1890-1910 featured entry in a cascade-like manner by a single (Vania) community outside the Greater Bombay area, following a drop in profitability of moneylending activities, their principal (prior) outside option. The evolution of community stocks is therefore no longer successfully predicted by the network dynamic model using 1865 as the initial year. However, the new

firms of this specific community in the new locations exhibited even stronger clustering than those that had entered earlier. Hence community networks continued to characterize the evolution of the cotton textile industry all the way until 1910. Thereafter the industry saw very little increase in the stock of entrepreneurs in these two locations with the onset of the First World War, followed by a decline during the interwar period.

We go on to examine entry patterns of Indian entrepreneurs into the downstream jute industry, which occurred in Eastern India after the end of the First World War. The subsequent decade witnessed a spurt of entry from entrepreneurs in different Indian communities, a process interrupted by the onset of the Great Depression during the early 1930s. We therefore examine the data for entry into jute for the period 1919-1930, and find patterns remarkably similar to those observed earlier in the cotton textile industry. Pre-industrial presence in the upstream trading sector during the First World War did not correlate with subsequent entry into the downstream sector; nor do price movements help explain these entry patterns following 1919. Firms exhibited high degrees of clustering by community for newly entering Indian entrepreneurs; the dynamic network continues to successfully predict the evolution of entrepreneur stocks.

Section 2 describes the historical background of the emergence of industrial entrepreneurship in India during the 19^{th} century, and the role of various communities in Western India that played a role in the development of the cotton textile industry. Section 3 explains the data and provides some relevant descriptive statistics for the cotton industry. The theoretical model is presented in Section 4, and the empirical results for the cotton industry in Section 5. Section 6 then provides evidence from the jute industry after the First World War, while Section 7 concludes.

2 Emergence of Indian Entrepreneurship in the 19^{th} Century

From the middle of the 19^{th} century, modern enterprises were set up in banking and insurance, coal and gold mines, tea and coffee plantations and also manufacturing industries such as cotton and jute textiles. In the 1850s, a cotton textile firm set up by an Indian entrepreneur in Bombay and a jute textile firm was set up by a British entrepreneur in Calcutta. But industrial investment did not pick up for another decade. Table 1 shows the importance of banking and insurance in companies registered in India (Rupee Companies) in the early phase. By 1880s, Rupee investments were more diversified. Textiles, including cotton and jute, had emerged as the largest sector; by 1900 it accounted for just

under half of total Rupee investment.

Table 1: Share of Modern Sectors in Paid up Capital raised in India (%)

	Banking & Insurance	Transport	Mining & Plantation	Textiles	Food Industries
1851-65	35	7	20	12	0.6
1881	14	5	23	37	2
1890	13	8	19	46	1.8
1900	13	9	14	47	1.6

Source: Rungta 1970 (Appendix 8, 17)
Note: Textiles include the upstream and downstream of cotton and jute (95% of the mills are classified as specializing in one product until 1865, thereafter 60%). Rungta (p284-85) notes that many of the firms were classified as multiple textiles if they showed capacity to produce more than one variety: cotton, jute, hemp, silk and wool. In practice only six produced a variety. The rest produced cotton textiles.

The two main cities of industrial development were Bombay in Western India and Calcutta in the east. Industrial investment was segregated by British in Calcutta and Indians in Bombay. The development of a major import substituting industry, cotton textiles, was initiated by Indian entrepreneurs. These entrepreneurs came from Indian trading communities in and around the city of Bombay. Cotton textiles was the largest sector, employing 17% of the workforce in Bombay city in 1901.

By early 19^{th} century several trading communities had a presence in and around Bombay city. The Bombay Presidency comprised of the modern provinces of Maharashtra and Gujarat. Surat had been the early settlement of the East India Company. Bombay became the next major settlement in western India. Individuals from different trading communities acted as agents of the company and worked as a contact between the Company and the local consumers and producers. A few of these traders were involved in the Indian Ocean trade and became the main exporters of opium to China. Others were involving in local banking and money lending. The hinterland of Bombay was India's cotton producing region. Raw cotton from the region was sold in the regional market and exported to Europe in periods of high demand. There were five Indian communities in Bombay city by mid 19^{th} century: Parsis, Bhatias, Hindu Banias and Jains[2], Baghdadi Jews, Bohra and Khoja Muslims, besides the Europeans.

The American civil war of 1861-65, saw a big rise in export of raw cotton from India to Britain, as India replaced the United States as a source of raw cotton for the British textile industry. This provided a big impetus for investment in cotton press and baling to prepare raw cotton for export.

[2]Though belonging to different religions, the term Vanias is used for both Hindus and Jains trading groups.

With the end of the civil war, exports declined and the trade in raw cotton became less profitable. The following decades saw entry into the downstream industry of textile production. After legalization of limited liability joint stock companies, investment in joint stock companies in cotton textiles became an attractive option, and cotton mills were set up in the city of Bombay. A number of early entrepreneurs were from the Parsi community. But other Indian merchant communities of Bombay were also present. European firms had a larger presence in the upstream sector of cotton press and baling that sold raw cotton for export. In the downstream industry, their presence was overshadowed by the Indian merchant groups. Morris (1982, p.580) suggests that European capital did not exceed more than 10-20% of total investment in the industry in Bombay.

Community as a Source of Capital

The cost of setting up a cotton mill was significant. Although there was a formal banking sector and the Indian trading communities had shares in banks, the latter did not provide long term capital to industry; their lending was limited to short term working capital loans. The business historian Tripathi (2004) writes:

> "The tight hold of the mercantile interests on the sources of industrial finance could have been loosened, had there been an efficiently functioning stock market and an alternative source of credit, such as banks organized on modern lines. Such institutions were woefully underdeveloped at the turn of the century."

There was no formal stock exchange before 1875. Shares were sold by a handful of brokers in the metropolitan cities in open spaces. The value of individual shares was typically high and could be bought by wealthy merchants and European residents in India. When the Bombay stock exchange was established in 1875, the number of brokers increased and the value of the average share came down, making purchase of stocks more widely available. High dividends of 10-15% offered by textile firms, made such investment comparable to the profit rate in trade and money lending (Rungta 1970, p.158).

However, community connections were important in selling shares. The capital for the first cotton mill in Bombay set up by Parsi entrepreneur C.N. Davar was raised by 50 of Bombay's leading merchants; the majority of investors were Parsis (Morris 1983, p. 574). When Ranchhodlal tried to set up a textile firm, merchants in Ahmedabad were not willing to invest in his firm. Ranchhodlal, a Brahmin by caste, was an outsider to the local merchant communities. Similarly, when Tata, a Parsi,

offered shares of the first cotton mills outside Bombay city to a prominent Marwari trader, the response was negative (Tripathi 2004, p. 121). Even for a late entrant in 1897 such as Lalbhai from the Jain community, friends and family were the main source of capital (Tripathi and Mehta 1990, p. 90). The capital market thus remained highly segmented despite the presence of a stock exchange. To quote Roy and Swamy (2016, p.146):

> "The typical industrial firm in 1900 was a company with shareholding of family and friends as well as the public and managed by another firm, which was a partnership or a company closely held by the same family or on rarer occasions, a trust. The company had a legal entity as a public body, but it was managed like personal property."

Machinery had to be imported and information about purchase of textile machinery was necessary. The potential entrepreneurs often lacked knowledge of the technology of textile production and also needed trained technicians from Britain to set up and run the mills. Information was an important component in decisions to become a textile entrepreneur. A few early entrepreneurs had to set up links with the cotton machinery producers for machinery and engineering support.

Credit to buy machinery was also available from the machinery producers in Britain (Rutnagar 1927, p 9) From the 1890s, several agencies were set up that made it possible to start a textile mill without going directly to a machinery producer in Britain (Rungta 1970, pp. 157-8). But these agencies did not appear during the period we are considering (1860-90), so the early entrepreneurs could not acquire knowhow by engaging agents from the market. Information was passed on mainly through social connections.

Community as a Substitute for Contract Enforcement and State Intervention

In 1858, India came under Crown rule. This ended the 100-year rule of the East India Company and formally integrated India into the free trade regime of the British Empire. Under Company rule, the share of revenue from trade taxes had been small. As a part of the Empire, India committed to the principles of free trade. At this point, British exports to India incurred tariffs of 5% on cotton piece goods and 3.5% on yarn. This was increased substantially in 1859 as revenue concerns overrode the free trade argument; on piece goods they were raised to 10% and on yarn to 5% (Harnetty 1972, p.7-10). The increase in import duties was strongly resisted by Manchester Chamber of Commerce. Under Crown rule, the British state in India was receptive to political lobbying by British interest groups. By 1862,

tariffs on cotton textiles had been lowered to the previous level (Harnetty 1972, p.26). Manchester also wanted compensating excise on Indian products on the ground that the 5% tariff offered protection to Indian producers which was contrary to the principles of free trade. Tariffs for revenue purposes combined with a countervailing excise tax on import competing goods in India was seen to conform to free trade principles and this was what Manchester lobbied for. Accordingly In 1882, import duties on cotton goods were scrapped altogether. Until the first World War, whenever import duties were imposed on cotton goods, countervailing excise on locally produced cotton textiles were also imposed. The early development of the Indian cotton textile industry was therefore not aided by protective tariffs as in the case of early industrialization experiences of USA, Germany and Russia.

British cotton textile interests also lobbied to get factory legislation in India in 1892. The legislation restricted working hours and employment of women and children, so that potential Indian entrepreneurs did not enjoy any advantage. Indian entrepreneurs opposed the excise duty and were critical of the Factory Act, but had no political voice at this time.

The second problem faced in industry and trade was contract enforcement. Legal institutions in the middle of the 19^{th} century were weak. There was no civil code for contract enforcement. During Company rule, problems related to contract enforcement appeared in different contexts: from the procurement of textiles from weavers to cultivation of opium and indigo, the East India Company adopted ad hoc solutions using customary systems. The Indian Contract Act was passed in 1872, but as with other legal interventions, it did not create an institutional setting similar to that in Britain. Roy and Swamy (2016) argue that Indian traders, creditors, and manufacturers largely continued to rely on pre-existing community norms and institutions that were outside the structure of formal British-Indian law. Community networks as described by Greif (2006) were the primary means of contract enforcement in trade and industry for the caste and religion based communities. Information and trust through the community network became a substitute for well-functioning public institutions.

Trading Communities in Bombay

The five principal trading communities comprised the Parsis, a small group of Zoroastrians who had migrated from Persia from the 8^{th} century, the Hindu Banias and Jains involved in trade and moneylending, the Muslim communities of Bohras and Khojas, Jews who had migrated from Baghdad in the 18th century and the Bhatias, a small Hindu sub-caste. The Banias and Jains were characterised by a high degree of economic and social interactions (including inter-marriage), and will thus be treated

as a single community group that we will hereafter refer to as Vanias. These five groups differed in initial endowments, e.g., education and specific sectors where they were active: some of them traded in opium and were involved in shipping, others in moneylending. However they shared their openness to European traders and were all active in raw cotton trade.

Parsis had the highest literacy compared to other communities, besides embracing western education. They were brokers of the East India Company and also acted as suppliers in many towns in the presidency. The Parsis moved early to Bombay city from the first Company settlement in Surat, when the Company established a settlement in Bombay. They established shipbuilding in Bombay and began to trade with China, mainly in raw cotton and opium. The Parsis were the dominant Indian group in the China trade; a few of them maintained offices in Shanghai. Kamenar (1998) suggests that the Parsis amassed enormous wealth through the opium trade, which ended with the Opium war; thereafter the community became more involved in trade in raw cotton. With the end of the monopoly of the East India Company in 1813, the number of European merchants in India increased, but did not diminish the presence of Indian merchants in the city of Bombay. Davar, the Parsi pioneer among cotton entrepreneurs, came from a Bombay based merchant family, which was involved in the opium trade and had acted as agents of the East India Company, exporting raw cotton and importing cotton cloth. Davar was involved in setting up the Commercial Bank of India in 1846. The family diversified into shipping in the Indian Ocean and set up cotton press and baling facilities.

The Parsis were not the only community that engaged with the Europeans. In $17th$ and $18th$ century, there was no difference between the Parsis and the Vanias, or Bohra and Khoja Muslims in Surat as far as business connections or regions were concerned (Das Gupta 2001). The Vanias had a large presence in Surat. Bhimji Parakh from the community of Vaishnava Banias was one of the most trusted brokers of the East India Company in Surat. The competition between the Parsis and the Vanias for the brokerage of the East India Company led to feuds between the families. Table 2 shows the importance of the various communities in Surat in the mid 18^{th} century.

The Vania migrants to Bombay had a monopoly on informal banking, where the returns were 12-22% in the period after the American civil war (Tripathi and Mehta 1990: p. 42). The opium trade from producing region of Malwa was another activity of the Indian merchants and yielded a rate of return of 15% (Ray 1994, p. 44). The returns in textile production had to be comparable to these outside options. The profit rate from Khatau Makhanji's Spinning and Weaving mill set up in 1897 was 12% (Tripathi and Mehta, 1990, p. 78).

Table 2: Non-European Trading Capital 1746 in Surat: Shares of communities (%)

	European protection	Independent	Total
Armenian	0	5.9	5.9
Jew	1.2	0	1.2
Parsi	9.9	0	9.9
Hindu*	18.8	30.5	49.3
Muslim	2	31.7	33.7
Total	31.9	68.1	100

Source: Guha (1984). * refers primarily to Bhatias and Vanias.

The Bhatias had an early involvement in the cotton textile industry. In the early 19th century, they moved from Kutch, the peninsula of Bombay Presidency to Bombay city, where they had trading connections from the 18th century. As a community, they were Hindu by religion, but less orthodox than other Hindu trading groups. Moolji Thackersey, a Bhatia, was one of the prominent members of the social reform movement in Bombay. The Bhatias were open to western education and were free of many of the practices of the more orthodox communities. One of these was foreign travel, a taboo in most orthodox Hindu communities. The Bhatias and the Parsis were able to travel to England and establish links with machinery producers (Tripathi and Mehta 1990, pp. 77-78).

There were also several Muslim communities engaged in trade in Bombay, such as the Bohras and the Khojas who were involved in shipping to Zanzibar and West Asia (Ray 1994, p. 41). When the Parsis withdrew from the China trade, the Khojas and the Baghdadi Jews filled the gap (Bagchi 1987, p.100). As the industry developed, a few acquired shares in the industrial firm in cotton textiles. Ebrahim Curimbhoy set up his own firm during the 1880s (Tripathi 2004 p.124). The Baghdadi Jewish group of the Sassoon family followed a similar path into textile production.

The Vanias were more prominent in the city of Ahmedabad, located close to Surat. In our analysis, Ahmedabad and surroundings is a different location from Bombay and surrounding regions. Both were located within Bombay Presidency. One is in the state of Maharashtra today and the other is in the state of Gujarat. Despite being involved in the coastal trade and in supplying export goods for shipping, they did not engage in foreign travel due to religious taboos and stayed away from the overseas China trade. They were also engaged in moneylending, where the return was high. This group waited until the fortunes of the industry were well established and the fortunes in money lending became uncertain.

A series of new laws passed by the colonial authorities from the late 1870s regulating moneylending, reduced the returns to such activities. As a consequence, the Vanias of Ahmedabad began to move into industry, nearly two decades after other communities. Once they began to enter the downstream cotton textile industry, they emerged as the largest group (Tripathi 2004, p. 116). We will verify these patterns in our own data subsequently. They ended up owning a larger share of the industry in Bombay Presidency (which included both Bombay and Ahmedabad) in 1911 compared to the Parsis (Bagchi 1994, p. 187). Nearly 80% of the spindles and 65% of the looms in 1898 were held by the Vanias. Rancholdlal's firm, which was set up early, alone accounted for 20% of the capacity (Mehta 1991: 195).

Community Characteristics vs Network Effect

A challenge to isolating the role of community networks in facilitating entry into industry is the problem of distinguishing trends resulting from a dynamic network effect from trends in underlying community characteristics. If some communities had privileged access to capital or enjoyed certain benefits due to their connections with the British in India, and these were growing at rates positively correlated with initial entry patterns, it would confound the effect of the dynamics generated by the social network itself. We now discuss the evidence relating to differential trends in trading experience, wealth, education, or outside options across the different communities.

The external environment or British policy did not favour any particular community. All potential entrepreneurs faced tariffs and excise on textiles. There is no evidence that any particular community was favoured by the British and gained certain advantage. All trading groups collaborated with the British in trade as suppliers of raw materials and distributors of British goods. The Bank of Bombay financed cotton traders in the early stages and later on provided short term capital to the cotton mills (Bagchi 1987, p. 110). It is difficult to argue that any particular community had better access to credit. All communities were involved in the management of the bank. Parsis, Bhatias, Baghdadi Jews, Hindu and Muslim merchants were on the board of directors between 1876 and 1920 (Bagchi 1987, Appendix). Several cotton textile firms belonging to different social groups enjoyed a high credit limit with the bank discounting bills or borrowing against goods (Bagchi 1987, p. 337-8). They all relied on getting deposits from the public on which interest was paid and on credit offered by British machinery exporting firms.

The accumulation of wealth in trade and contact with Europeans was a common feature of all the trading groups. They differed in initial endowment and outside options, which may have influenced

the timing of their entry. The merchant castes enjoyed higher literacy than the average for the region. But the Parsis were exceptional. In 1881, over 70% the Parsis were literate and 50% of the literates had secondary education. 99% of the literates among European Christians had secondary education. 5% of the literate Parsis and 4% of the literate European Christians had college education. Other communities were far less educated. The Hindu trading group had primary education and a very small proportion went to college. Table 3 shows the differences in literacy rate among the different religious groups. However, *the key point to note is that literacy rates do not materially change over time for any community.* Nor do we see differential growth in population in Bombay city (Table 4) where most of the cotton textile industry was located until the 1890s.

Table 3: Literacy by Community in Bombay Presidency (%)

	1881	1891	1901
Hindu[1]	10.9	11.8	11.2
Parsi	72.9	76.3	75.2
Jain	51.5	53.4	48.9
Jewish	52.0	54.2	-
Muslim[2]	6.8	9.2	7.3
Christian	38.9	44.4	36.5
Total Bombay Presidency	11.1	12.6	11.67

Source: Censuses of India

[1] Hindus include Bhatias and Vanias. The 1911 Census shows male literacy for Bhatias was 56% and Vanias 60%.

[2] Within Muslims, the 1911 Census shows male literacy rate of 41% among the trading communities of Muslim Bohras, Khojas and Memons.

Table 4: : Population Share in Bombay City by Community (%)

	1864	1872	1881	1891	1901
Hindu[1]	64.1	63.4	65	-	65
Bhatia	2.7	1.5	1.2	-	1.2
Parsi	6	6.8	6.3	5.8	6
Jain	1	2.3[2]	2.2	-	1.8
Jewish	-	0.4	0.4	-	0.7
Muslim	17.8	21.4	20.4	18.9	20.1[3]
European Christian	1	1.1	1.4	-	1.5

Source: 1872- 1891: The Gazetteer Bombay City and Island 1909.
[1] Hindu includes Bhatias.
[2] Includes Buddhists (only 2% of the Population in 1881). 1901 data comes from the Census.
[3] Includes Bohra 1.5% and Khoja 1.4%.

What about alternative options of the different communities? The common pre-industrial activity among these groups was trade in raw cotton. But they differed in other activities prior to 1850. The groups that were involved in the opium and cotton trade were exposed to common trade shocks. The trading communities of the Parsis, Bhatia, Baghdadi Jews and Muslim Khojas, who had also been involved overseas trade moved into alternative activities in response to these adverse shocks. For instance, the Opium Wars in China during the middle of the 19^{th} century reduced the involvement in opium for the Parsis. The Parsis mostly withdrew from the China trade to be replaced by the Khojas and the Baghdadi Jews (Bagchi 1987, p. 100). The competition from European shipping from the late 1860s with the opening of the Suez Canal, made shipping unprofitable for the Indian merchants. Circa 1860-1964, most of their trading activities were concentrated in raw cotton. As the boom in cotton trade during the American civil war ended, they then turned to the downstream industry.

There is no evidence of any significant change in outside options for these communities after the US civil war. However the experience of the Vania traders in Ahmedabad was markedly different. Their principal occupation was money lending until the late 1870s, where returns remained high until new legal changes affected moneylending. The peasant riots against moneylenders in 1875 in the Deccan region of Bombay Presidency, targeted to destroy debt records held by money lenders (Kranton and Swamy 1999). Following the riots, the government became increasingly concerned about agrarian distress from indebtedness and began to take the legal route to restrict moneylending. The Deccan Agricultural Relief Act of 1879, which regulated interest rates on loans to agriculture was the first

of a series of legal interventions. Consequently, industry became more attractive as a contender for investment for the moneylenders from the 1880s onwards: the Banias and Jains from Ahmedabad were latecomers to the (downstream) cotton textile industry. The size of their population was substantially larger than the Parsis, Bhatias and the Muslim trading groups in Bombay. Hence after 1890, this group came to dominate the industry. For this reason we define the early stage of the industry as lasting for 1865-1890, focused mainly on entry into the Greater Bombay region where the leading communities did not experience significant trends in outside options.

3 Cotton Industry: Data and Descriptive Statistics

Using business directories listing partners of listed firms, we collect data on names of every entrepreneur in Bombay Presidency (Greater Bombay and Greater Ahmedabad) at the point of entry, and track their previous and subsequent trajectories between 1860 and 1910. The data includes details of the firm that the entrepreneur is listed in: location and in many cases the paid-up capital. From the names of the entrepreneurs, we trace the community they belong to. Following the discussion in the preceding section, we classify communities principally on the basis of religion and caste. Within Hindus, we distinguish between the Bhatias and Banias. For reasons explained earlier, the term 'Vania' will include Hindu and Jain merchants.

We consider the early phase of development of the industry to determine the extent to which community connections were important. Until 1890 most firms were situated in Bombay city, so there is no possibility of confounding network effects with agglomeration effects. During this period only 6 out of 60 were outside Bombay city, 2 in Broach, 2 in Surat, one in Sholapur and one in Budnera. All towns are in Bombay Presidency. We treat the region of Bombay and surroundings as distinct from the region of Ahmedabad and surroundings. Hereafter, we refer to these locations as Greater Bombay and Greater Ahmedabad.

Figure 1: Downstream sector (1860-1890)

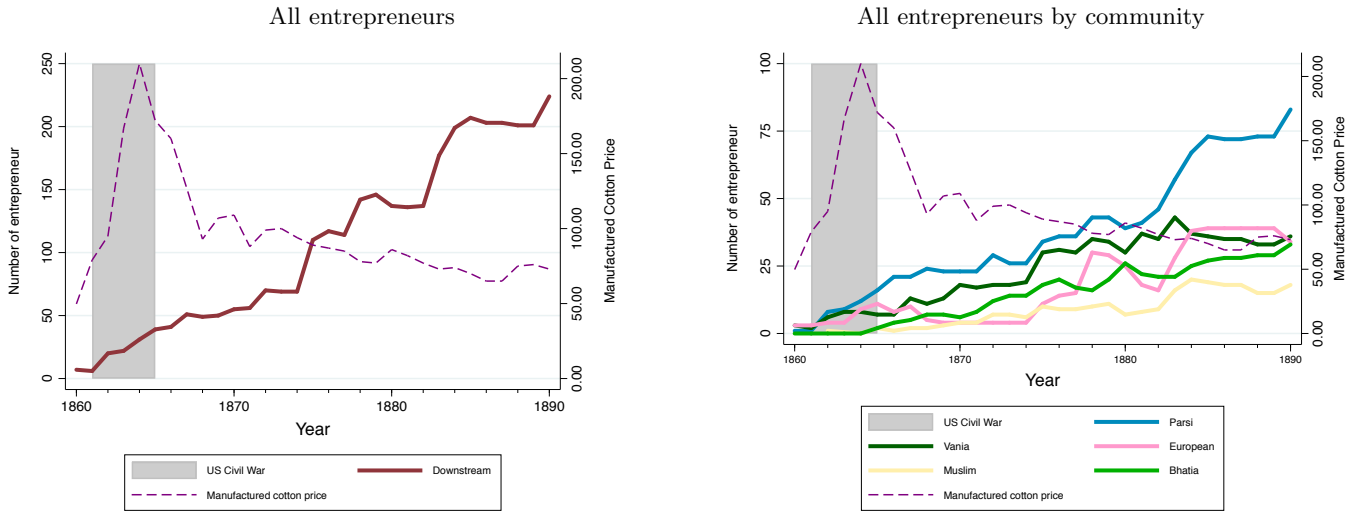


Figure 1 shows the evolution of the total number of entrepreneurs between 1860 and 1890, and the breakdown between different communities. It shows steady growth in the number of entrepreneurs entering in downstream industry between 1860-90. There is an upward spurt during 1875-80, followed by periodic spurts during the 1880s. We also observe the dominance of the Parsis at the initial stage and a pattern of non-linear divergence in the presence of different communities.

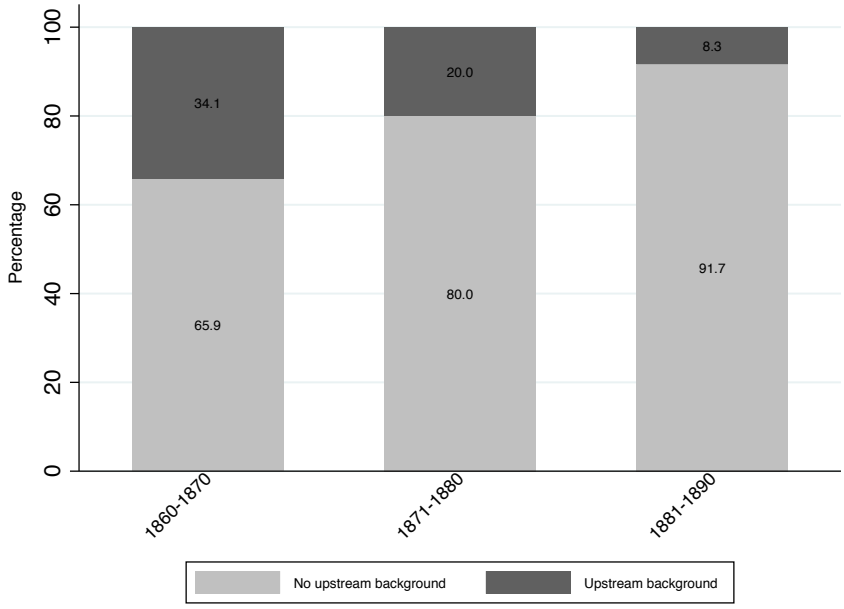
The role of prior wealth accumulation in the emergence of industrial entrepreneurship has been stressed by Marxian theories of 'primitive accumulation' (see Marx 1887, chapter 26 and Harvey 2005) as well as more recent theories of occupational choice in the presence of credit constraints and lumpiness of industrial capital (Banerjee and Newman 1993). The capital required to set up a textile mill was substantial. Morris (1982, p. 575) shows that it cost between Rs 500,000-one million to set up a textile firm in Bombay in the early phase. Table 5 shows the capital needed to set up an industrial firm. It shows that capital per firm in the downstream industry was twice as large as the capital in the upstream firm during 1860-90. The upstream industry focused mainly on baling raw cotton, and was technologically far less sophisticated than the downstream mills. For these reasons, we focus on entry into the downstream industry, and treat the upstream industry as a related pre-industrial trading activity. The substantial capital required to set up a firm in the downstream may explain why growth in entry was gradual and took almost a decade after the end of the Civil War to accelerate further. The opening of the stock market in 1875 may have facilitated the transition to a faster growth phase.

Table 5: Capital per firm in Rupees

	Upstream		Downstream	
Period	*mean*	*median*	*mean*	*median*
1860-1890	580,115	400,000	1,127,646	900,000
1891-1910	320,267	200,000	1,025,653	821,000

The role of prior experience in pre-industrial trade in entrepreneurship have been highlighted in the recent 'enterprise map' studies from some contemporary African countries, which suggest pre-existing upstream experience is an important determinant of entry into downstream industry (Sutton and Kellow 2010; Sutton and Kpentey 2012). To check the relevance of this, in the context of the Indian cotton industry during the 19^{th} century, we calculate the proportion of downstream entrants who had earlier participated in the upstream industry. Figure 2 shows that less than 35% of the downstream entrants had prior upstream experience. This proportion declined further over the subsequent periods. By 1890 less than 10% of the entrants had upstream experience.

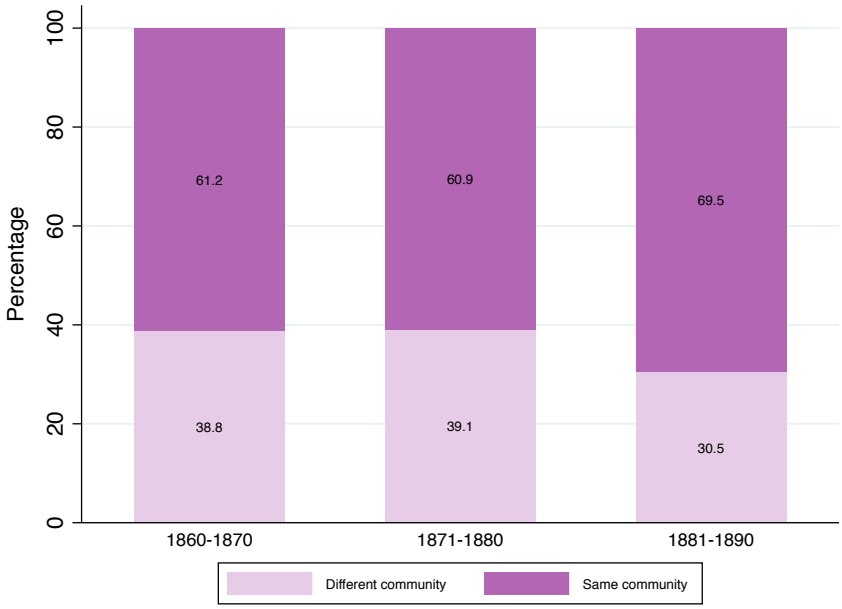
Figure 2: Relevance of upstream background in downstream entry



Next, we examine clustering by community within firms. Figure 3 shows more than half of all entrepreneurs within any firm belonged to the same community. Moreover, this proportion showed no tendency to fall over time; during the 1880-90 decade, it rose to 66%. This suggests the continued

importance of community links throughout successive decades, despite the growth of the stock market and banking activity in Western India.

Figure 3: Community concentration in firms at entry



We turn next to developing a theoretical model of entry dynamics generated by community networks, whose predictions can be tested using the data for the early period.

4 Network-based Model of Entry Dynamics

The model is closely related to Munshi (2011) and is a special case of Dai et al (2018) with a single destination sector. There are successive cohorts of potential (infinitely lived) entrepreneurs (or agents, in short) $t = 1, 2, ...$ who have a once-and-for-all opportunity to enter the downstream industry at date t. Their outside option is to continue pursuing their current occupation, e.g., trading or the upstream stage of the same industry. The agents belong to different communities $c = 1, ..., C$. Individuals within a community vary in their entrepreneurial ability ω, drawn from a log-uniform distribution whose mean varies across communities. Specifically, $\log \omega$ is distributed uniformly with mean $\log \omega_c$ and a constant density $s > 0$ on support $[\log \omega_c - \frac{1}{2s}, \log \omega_c + \frac{1}{2s}]$. We focus on early stages of the industry when there are some potential entrants who do not actually enter, i.e. entry thresholds derived below lie in the interior of the support of the distribution of ω, whence there remain further scope for entry flows to

increase in future. The profit of an agent with individual ability ω in their outside option is $\Pi_c \omega^\sigma$ where $\sigma \in (0,1)$.

We allow communities to differ in (levels of) underlying characteristics such as access to capital (borrowing cost r_c), ability (ω_c) and outside options (Π_c), while assuming the absence of any time trends in these characteristics. On the other hand we abstract from differences in population sizes of the stock of potential entrepreneurs across these communities. The historical evidence described in previous sections suggests this is a reasonable assumption for the early stage of the cotton textile industry in the Greater Bombay region. These assumptions fail to capture the experience of the Vanias in the Greater Ahmedabad region who experienced a sharp drop in their outside options in the early 1880s and thereby began to enter in large numbers from the mid-1890s onwards. Hence we shall use the model to generate predictions over the early stage of the industry until 1890.

Network effects in the downstream industry are represented by dependence of the total factor productivity (TFP) of any entrepreneur from community c at any date $T \geq t$ on the presence of incumbents from the same community at the end of the previous date $T-1$, denoted by n^c_{T-1}. A community c entrepreneur of ability ω will have a production function at date T:

$$y^c_T = A^c_T \omega^{1-\alpha} K^\alpha \tag{1}$$

where K denotes capital size chosen by the entrepreneur, $\alpha \in (0,1)$ represents diminishing returns to capital, and the 'community-based TFP' (CTFP) is represented by

$$A^c_T = A_0 \exp\{\theta n^c_{T-1}\} \tag{2}$$

Underlying this formulation is the assumption that incumbents from the same community share knowhow and help one another, to overcome the absence of government support or markets for knowhow or help. Moreover, exchanges of different community members complement each other, giving rise to the exponential form in which the size of the network enters (2). For instance, each entrepreneur relies on a given level of informal help $h > 0$ provided by other members to raise productivity or market access: $A^c_T = A_0(1+\gamma h)^{n^c_{T-1}}$, which reduces to expression (2) if we define $\theta \equiv \log(1+\gamma h)$. $\theta > 0$ is represents the strength of the network effect, manifested by a productivity spillover among network members. This formulation of spillovers differs from standard specifications of agglomeration spillovers in the economic geography literature, insofar as the domain of the spillovers is restricted to entrepreneurs from the same community (irrespective of location). In contrast, agglomeration effects are spillovers are location-specific but do not vary by community origins of the entrepreneurs involved.

It is of course plausible that active collaboration is limited to social groups (based on family ties, physical proximity or other sources of social association) which are smaller than the entire community. In that case the definition of network size for any given agent should be the number of incumbents from the same social group. If there are k social groups within the community, and m^c_{T-1} denotes the (average) number of incumbents from each social group, formulation (2) would be replaced by a specification of the form

$$A^c_T = A_0 \exp\{\theta' m^c_{T-1}\} \tag{3}$$

for a representative agent of community c, which reduces to (2) if we define $\theta = \frac{\theta'}{k}$.

The product price q_T at date T is the same across all communities. Each entrepreneur and community takes this price as given; we therefore abstract from possible collusive behavior. Capital size K^c_T is chosen by an entrepreneur of ability ω to maximize profits at each date, i.e., maximize $q_t A^c_T \omega^{1-\alpha} K - r_c K$. Hence profits and capital size in the downstream industry satisfy

$$\log \pi^c_T(\omega) = \log \omega + \frac{1}{1-\alpha}[\theta n^c_{T-1} + \log q_T] - \frac{\alpha}{1-\alpha}\log r_c + \log \mu + \frac{1}{1-\alpha}\log A_0 \tag{4}$$

$$\log K^c_T(\omega) = \log \omega + \frac{1}{1-\alpha}[\theta n^c_{T-1} + \log q_T] - \frac{1}{1-\alpha}\log r_c + \frac{1}{1-\alpha}[\log A_0 + \log \alpha] \tag{5}$$

where μ denotes $[\alpha^{\frac{\alpha}{1-\alpha}} - \alpha^{\frac{1}{1-\alpha}}]$.

Entry decisions are irreversible: once an agent enters the downstream industry he stays there for ever. It will be in the interest of every entrant to stay every period thereafter, so this assumption is not restrictive. Entry decisions are also myopic and selfish: each cohort t agent decides whether to enter based on a comparison of his own profit upon entering the industry at date t, with his outside option. Extending the model to accommodate foresight makes it more complicated, while reinforcing further the network effects. Hence myopia is a useful simplifying assumption. Similarly, extension to incorporate some altruism towards fellow community members will also reinforce the network effects at the cost of complicating the analysis considerably.

Hence a cohort t agent of ability ω will enter the downstream industry if $\log \pi^c_{T-1}(\omega) > \log \Pi_c + \sigma \log \omega$, i.e. if ω exceeds the threshold $\underline{\omega}^c_t$ given by

$$\log \underline{\omega}^c_t = \frac{1}{1-\sigma}[\log \Pi_c + \frac{\alpha}{1-\alpha}\log r_c - \log \mu - \frac{1}{1-\alpha}\log A_0 - \frac{1}{1-\alpha}\{\log q_t + \theta n^c_{t-1}\}] \tag{6}$$

Since we have normalized the size of each community to 1, the entry flow into the downstream industry at t is given by

$$e^c_t = \frac{s}{(1-\alpha)(1-\sigma)}[\theta n^c_{t-1} + \log q_t] + \delta_c \tag{7}$$

where δ_c is a 'composite' community characteristic equal to $\frac{s}{1-\sigma}[\log\mu + \frac{1}{1-\alpha}\log A_0 - \log\Pi_c - \frac{\alpha}{1-\alpha}r_c] + s\log\omega_c + \frac{1}{2}$, which depends on mean ability, outside options and capital access of community members. Hence the evolution of network size follows

$$n_t^c = n_{t-1}^c + e_t^c = Mn_{t-1}^c + P\log q_t + \delta_c \tag{8}$$

where $M \equiv 1 + \frac{s\theta}{(1-\alpha)(1-\sigma)}$ and $P \equiv \frac{s}{(1-\alpha)(1-\sigma)}$. M is the *network multiplier parameter* which exceeds 1 in the presence of network effects, and equals 1 otherwise. This parameter represents the incremental effect of higher network size in any cohort on the network size in the succeeding cohort. The difference equation (8) provides a simple expression for network size in any cohort as a function of size at some historically pre-determined cohort 0 size, which we summarize in the following Proposition.

Proposition 1 *The evolution of network size of community c given initial cohort size n_0^c is given by*

$$n_t^c = M^t n_0^c + \delta_c[\frac{M^t - 1}{M-1}] + P\sum_{k=0}^{t-1} M^k \log q_{t-k} \tag{9}$$

in the presence of network effects ($M > 1$), and

$$n_t^c = n_0^c + \delta_c.t + P\sum_{k=0}^{t-1} \log q_{t-k} \tag{10}$$

when they are absent ($M = 1$).

Network effects result in greater sensitivity of network size in later cohorts to initial network size: $\frac{\partial n_t^c}{\partial n_0^c} = M^t$ which is rising in t when $M > 1$, and constant otherwise. This reflects the network multiplier operating across successive cohorts, whereby one more member raises the number of members at the next cohort by M, the one after that by M^2 and so on. Initial differences in network size across communities will be progressively magnified across time, a pattern of growing divergence. When communities differ in characteristics summarized by δ_c, which appears as a community fixed effect in the entry equation (7), this divergence will grow linearly over time when network effects are absent, and exponentially otherwise.

Proposition 1 generates a strategy of identifying network effects when community characteristics (ability, access to capital or outside options) summarized by δ_c are fixed over time. Taking a quadratic approximation for $M^t = 1 + t\zeta + t^2\frac{\zeta^2}{2}$, (9) generates the following regression specification for dynamics of network size

$$n_t^c = [1 + \zeta t + \frac{\zeta^2}{2}t^2]n_0^c + \frac{1}{M-1}[\zeta t + \frac{\zeta^2}{2}t^2]\delta_c + P\sum_{k=0}^{t-1}(1 + \zeta k + \frac{\zeta^2}{2}k^2)q_{t-k} \tag{11}$$

in the presence of network effects ($\zeta > 0$). When network effects are absent, the regression is given by (10) instead, where quadratic time trends do not appear. Hence the significance of quadratic time trends, interacted either with initial network size n_0^c or community characteristic δ_c, indicates the presence of network effects. Since initial network size and community characteristics are perfectly collinear, we cannot identify these two effects separately. But this is unnecessary, as the significance of quadratic time trends with either identifies the presence of network effects. This would indicate a pattern of divergence between the size of different communities among incumbents that is growing faster than can be represented by differential linear time trends.

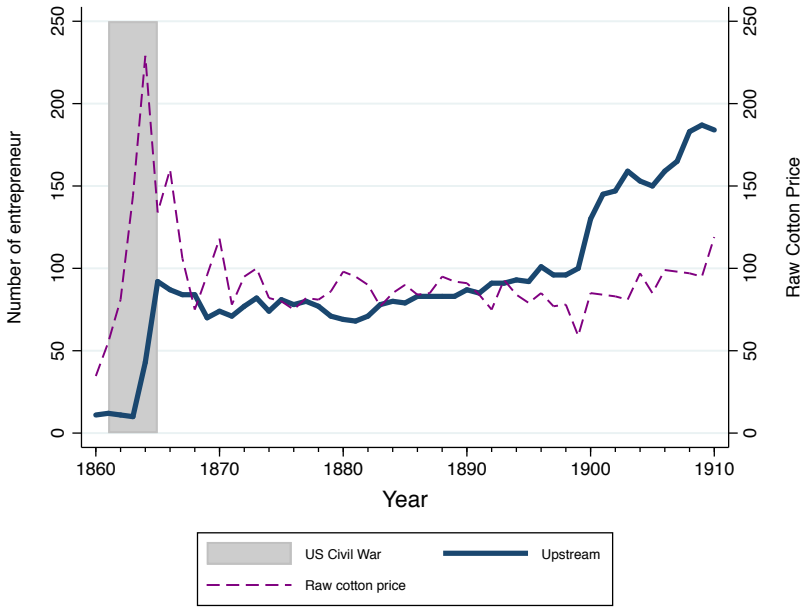
The key assumption underlying this identification strategy is that the community characteristics are not varying over time at different rates. For instance an alternative non-network-based explanation of the non-linear time varying effects of initial network presence n_0^c in (9) is that the latter is positively correlated with the growth of entry-facilitating community characteristics such as literacy, capital access or declining outside options. We have argued in the previous section that while the communities differed in the *levels* of these characteristics, there is no evidence that they differed in the rate at which they changed over time.

5 Empirical Results for Cotton Entry

5.1 The Early Phase 1866-1890

We focus initially on the early period in the development of the downstream industry, following the US Civil War years. The Civil War witnessed a boom in the upstream industry, resulting from a spike in the world price of raw cotton owing to the suspension of supplies from the US South. As Figure 4 shows, there was a sharp upward increase in the number of entrepreneurs and firms in the upstream, which purchased raw cotton, and baled them for export. Once the War ended, the price of raw cotton exports fell sharply, and the number of entrepreneurs in the upstream sector plateaued. In contrast, as Figure 1 shows, the downstream sector witnessed steady growth during the Civil War years, which continued once the War ended. It accelerated after 1875, with occasional periods of stagnation interspersed with rapid growth, resulting in a higher overall trend over 1875-90. The downstream industry followed a different trajectory from the upstream because the former was producing cotton yarn or cloth mainly for the domestic market rather than the international market. It is also evident from Figure 1 that growth of the downstream industry was not driven by movements in the price of manufactured cloth.

Figure 4: Upstream entrepreneurs (1860-1890)



We now test the model developed in Section using data for the downstream industry over 1866-1890. The initial presence of each community (date 0 in the model) is represented by number of entrepreneurs in the downstream industry in 1865. It also allows us to investigate the role of upstream presence during the Civil War years, to test the role of prior trading experience in the same sector and opportunity to earn large trading profits during the War years. We stop in 1890 for the reasons explained in previous sections: the model would fail to capture the experience of the Vanias whose outside options in moneylending contracted sharply in the 1880s, inducing them to enter in large numbers into the downstream cotton industry from the 1890 onwards.

Table 6 shows the presence of different communities in the upstream and downstream industry during the Civil War years. There were 38 entrepreneurs in 1865, dominated by Parsees, followed by European and Vania communities, and also featuring a small number of Muslims, Bhatias and other Indian communities.

Table 6: Stock of entrepreneurs at the end of the US Civil War (1865)

Community	Upstream	Downstream
Bhatia	9	2
European	41	11
Vania	9	7
Muslim	2	2
Parsi	26	16

Column 1 of Table 7 shows regression results for the following regression specification based on (11), run for the period 1866-1890:

$$n_t^c = \chi n_0^c * t^2 + \delta_c * t + \gamma_c + \nu_t + \epsilon_t^c \tag{12}$$

where n_t^c denotes number of incumbent entrepreneurs from community c in year t, n_0^c denotes average downstream presence of community c entrepreneurs in 1865 when the US civil war ended, and $t = 1$ corresponds to year 1866. δ_c, γ_c are community dummies, ν_t is a year dummy representing (current and lagged) price or other industry level shocks, and ϵ_t^c is an error term. Since community dummies and initial presence either downstream or upstream are perfectly collinear, initial presence by itself or interacted with linear time trend cannot be included in the regression once we include community dummies or their interaction with a linear time trend. Conversely, we do not include community dummies interacted with the quadratic time trend because the regression includes initial downstream presence interacted with the quadratic time trend. The logic for using this specification is that under the null hypothesis of no network effects (and community characteristics are not time-varying), (10) applies and the coefficient χ of the interaction of the quadratic time trend with either initial downstream presence or community dummies should be zero.

Column 1 in Table 7 shows this null hypothesis is rejected at the 1% significance level. Column 2 shows the coefficients of the quadratic and linear time trends, which imply that one additional entrepreneur presence in 1865 was associated with 1.6 additional entrepreneurs in 1880 and 4.4 additional entrepreneurs in 1890. Column 2 also shows that the estimated interaction of initial presence with the non-linear trend is unaffected if we replace the interaction of linear time trend with community dummies with initial presence instead. This suggests that variations in initial downstream presence fully capture the effects of unobserved community characteristics.

Column 3 additionally replaces the (non-interacted) community dummies with both initial downstream and upstream presence. The estimated network multiplier is unaffected. Hence initial presence

Table 7: Stock of entrepreneurs at community level (1866-1890)

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
n_0^c downstream $* t^2$	0.007***	0.007***	0.007***	0.007***
	(0.001)	(0.002)	(0.002)	(0.001)
n_0^c downstream $* t$		-0.062	-0.062	
		(0.038)	(0.055)	
n_0^c downstream			2.106***	
			(0.247)	
n_0^c upstream			-0.502***	
			(0.050)	
L1 Log cotton price ratio				7.177
				(4.449)
L2 Log cotton price ratio				10.693**
				(4.209)
Year dummies	Y	Y	Y	N
Community dummies	Y	Y	N	Y
Community $* t$	Y	N	N	Y
Observations	125	125	125	125
R-squared	0.960	0.952	0.902	0.934

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Intercept not reported

variables seem to proxy for the community dummies. The estimated coefficient of initial upstream presence is negative and significant, while that of initial downstream presence is positive and significant. This reinforces the evidence against hypotheses stressing the role of prior accumulation of sector specific trading skills or wealth. Finally, Column 4 replaces year dummies in Column 1 by lagged price ratio of manufactured goods and raw cotton. The two period lagged price ratio does significantly affect the evolution of stocks. However, the nonlinear network effect remains positive and significant at the 1 percent level.

5.2 Evidence from the Longer Time Span 1860-1910

Figure 5 extends the time plot of presence of different communities until 1910. Figure 6 breaks this down further between the Greater Bombay region and the Greater Ahmedabad region. There is a steep

surge of entry between 1895-1900 in both regions, accounted mainly by the Vania community, who collectively became the largest group in the industry. Figure 6 shows the emergence of the Greater Ahmedabad region as a new location for the industry, dominated almost entirely by the Vanias. The process of entry of these new groups resembles a cascade, being concentrated within a narrow 5-year period, consistent with the hypothesis of strong community networks.

Figure 5: Entrepreneur stocks in the downstream sector (1860-1910)

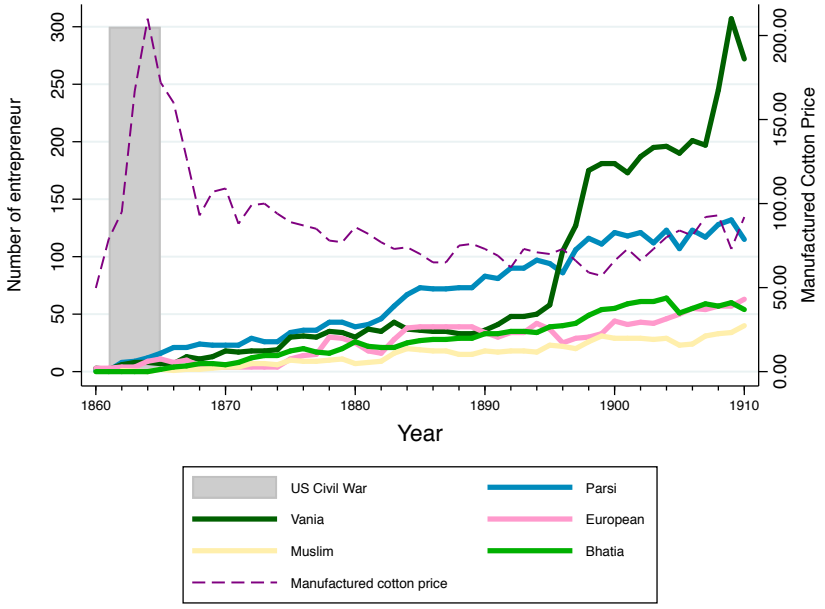
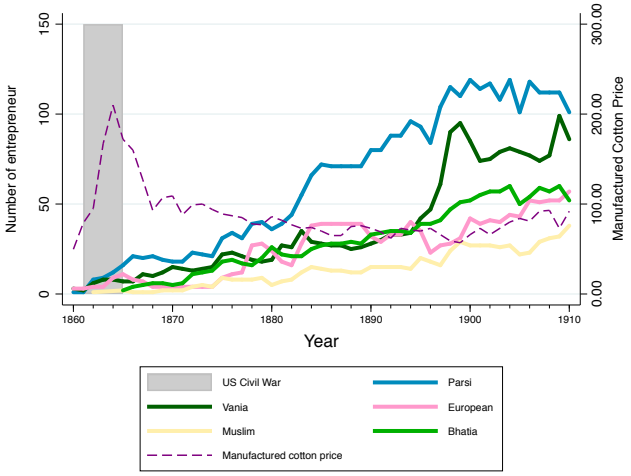
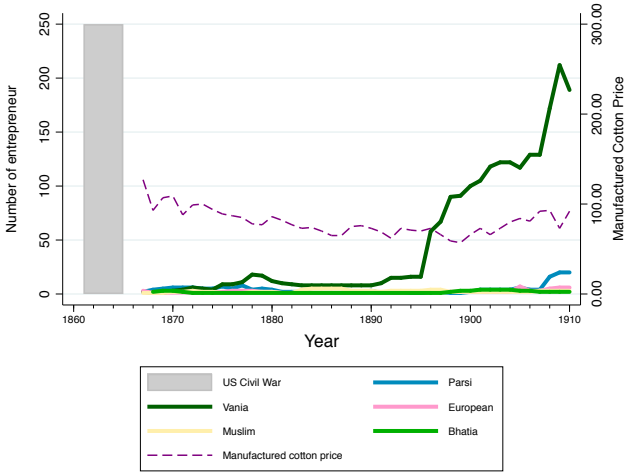


Figure 6: Entrepreneur stocks in the downstream sector by location (1860-1910)

Greater Bombay



Greater Ahmedabad



In effect the Vanias in the Greater Ahmedabad region represented the arrival of a new community, most likely due to the shrinkage of their moneylending business. As they were absent in the mid-1860s, the network-based model would obviously fail to capture this on the basis of presence in 1865. Other assumptions of the network model would also cease to be valid after some time, such as the scope for entry rates to continue to rise further. After some time, a community may have entered sufficiently to exhaust any further scope for their entry rates to rise further. Indeed, Figures 5 and 6 show that presence of different communities in the greater Bombay region tended to plateau after 1900, while Vanias continued to enter in the greater Ahmedabad region. For all these reasons it does not seem sensible to extend the regression in Table 7 to the longer time span.

However, to confirm our hypothesis that the growth of the industry beyond 1890 still featured the importance of community networks, we check the extent of clustering by community within firms until 1910 in Figure 7. The presence of the largest community among partners rose to above 75% after 1890. Figure 8 breaks this down by location. Entry into the greater Ahmedabad region after 1890 exhibits even larger clustering than the greater Bombay region, with nearly 90% of entrepreneurs from the same community. Moreover, prior upstream experience was even less important for the late entrants than for the previous entrants (Figure 9).

Figure 7: Community concentration in firms at entry (1860-1910)

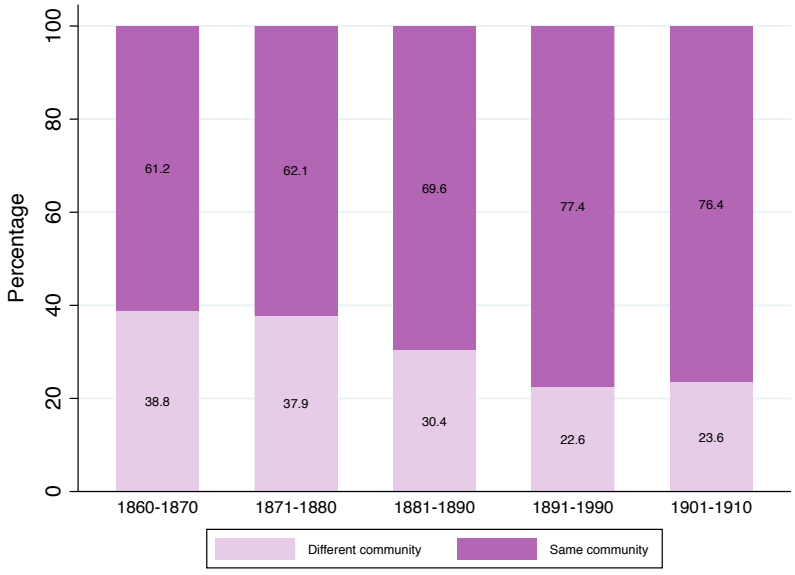


Figure 8: Community concentration in firms at entry by location (1860-1910)

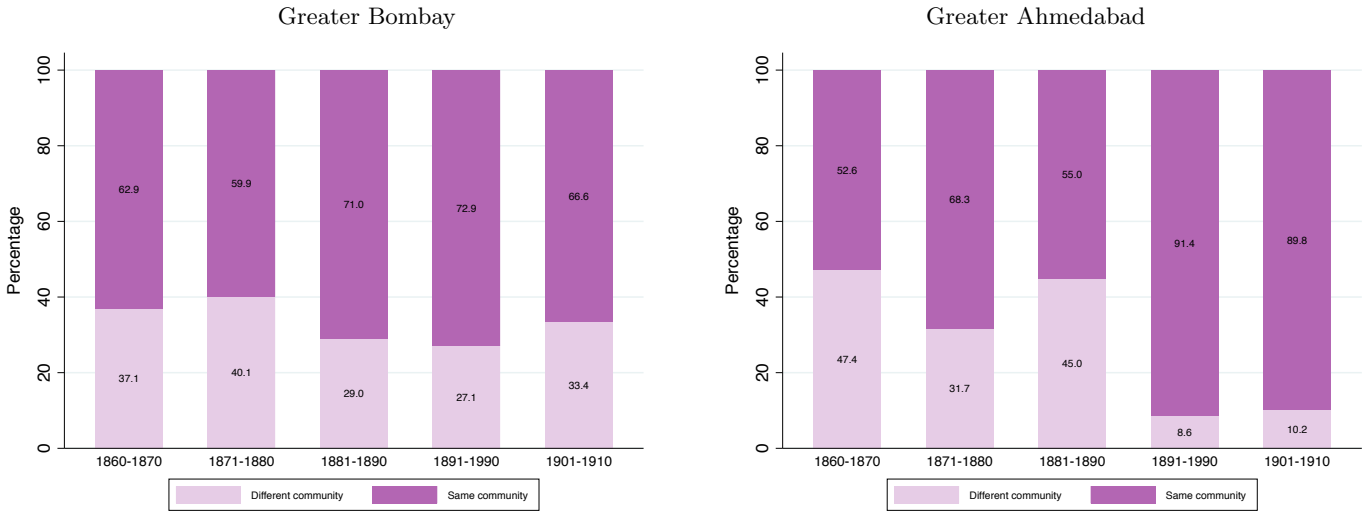
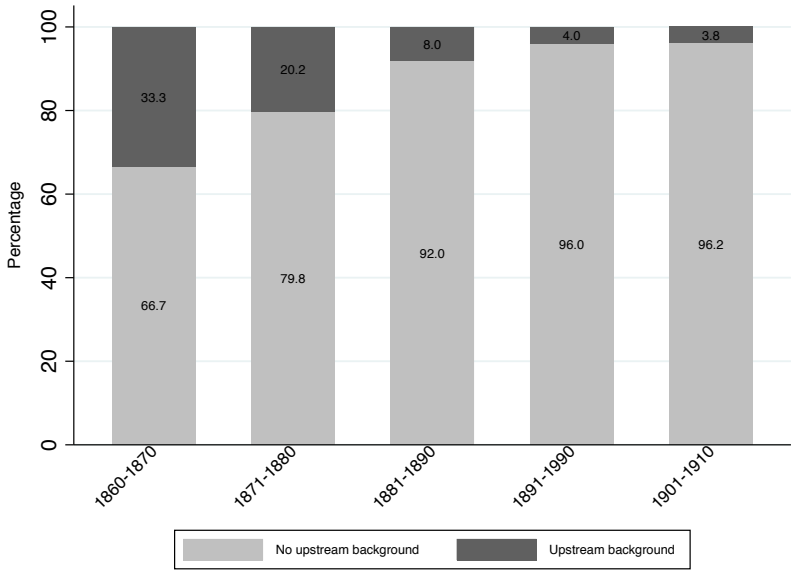


Figure 9: Relevance of upstream background in downstream entry (1860-1910)



6 Entry Patterns in the Jute Industry

Unlike Bombay, the commercial life of Calcutta was dominated by British firms. While Bombay was the hub of British capital, Calcutta was the centre of British firms in tea, coal and jute. The investors were British residents in India and in Britain. The industry we focus on is jute, for a number of reasons:

until 1930 this was the most important instance of entry by Indian entrepreneurs after cotton. Jute is also closest to cotton textiles in terms of technology and capital requirements. It developed with British entrepreneurship from mid 19^{th} century. Like tea, jute was mainly sold in the export markets and the British firms had an advantage in the export trade. In 1866, there were four British firms in jute. From the mid 1870s, the industry expanded rapidly and by 1900 there were 32 British firms, and no Indian firms. The situation changed with the first World War, following which Indian entrepreneurship became visible for the first time.

Indian presence in Calcutta's entrepreneurs has always been low compared to Bombay. The Marwari traders, the dominant group among Indian communities in eastern India, were involved in money lending, trade, brokerage and speculation and stayed away from industry until the first World War (Tripathi 2004, p.166) The futures market in opium, gold specie and later raw jute and hessian was started by the Marwaris and became the focus of speculation. Several Marwaris first created their wealth in the opium trade. Among them, Birla, Hukumchand and Chamaria were key players (Timberg 1978, p160-61). While the export trade in raw jute and jute textiles had been controlled by the Europeans before the war, from 1914 Marwaris traders Birla and Hukumchand became involved in this trade (Bagchi 1994, p.179).

Another market for speculation for the Marwaris was in shares (Goswami 1985). All British Managing Agency Houses which managed and controlled firms across various industries in eastern India, had Marwari brokers. The close contact of the Marwari families with British firms opened up a channel of their entry into the industry. Unlike cotton textiles, the entry of Indian traders into the jute industry happened mainly through acquisition of shares in British firms rather than starting new firms.

The first World War created a shock for the jute industry, just as the American civil war had been in the case of cotton half a century earlier. As demand for jute goods increased, raw jute prices rose; share prices of jute firms rose 8-10 times (Goswami 1985). Many British shareholders sold shares to their Marwari contacts. The Marwaris also lent short term capital to British firms against a collateral of shares. Both interactions allowed the Marwaris to get elected on the boards of British Companies. In 1918, of the 114 directors in British owned jute firms, only 3 were Marwaris. By 1924, of the 46 British firms, 19 had Marwari directors on their boards (Goswami 1985). Two Indian firms were set up in 1918 by Birla and Hukumchand. While Hukumchand's firm was primarily self-financed, capital for Birla's firm was raised more widely (Timberg 1978, p171). These initial stock of entrepreneurs opened up the way for further entry both into British firms and setting up of new Indian firms after the War,

which continued until the beginning of the Great Depression.

Figure 10 shows entry into the downstream jute industry from 1914 to 1930. Until 1918, only a handful of Indian entrepreneurs from three communities were present: Marwaris, Baghdadi Jews and Bengali. After 1918, there was a steep rise in Marwari entry.

Figure 10: Entrepreneur stocks in the Jute downstream sector (1914-1930)

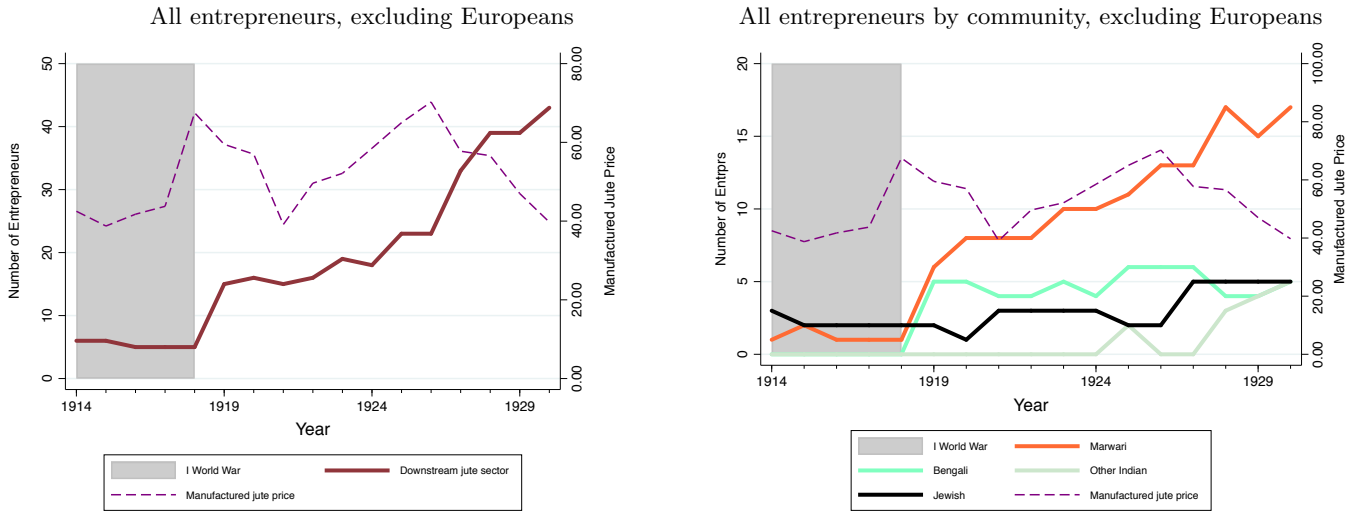


Figure 11: Relevance of upstream background in downstream entry

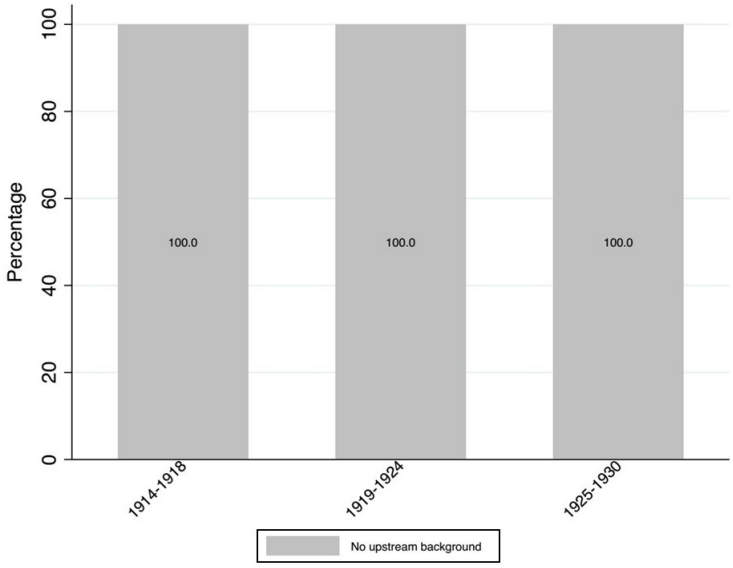


Figure 12: Community concentration in firms at entry (1914-1930)

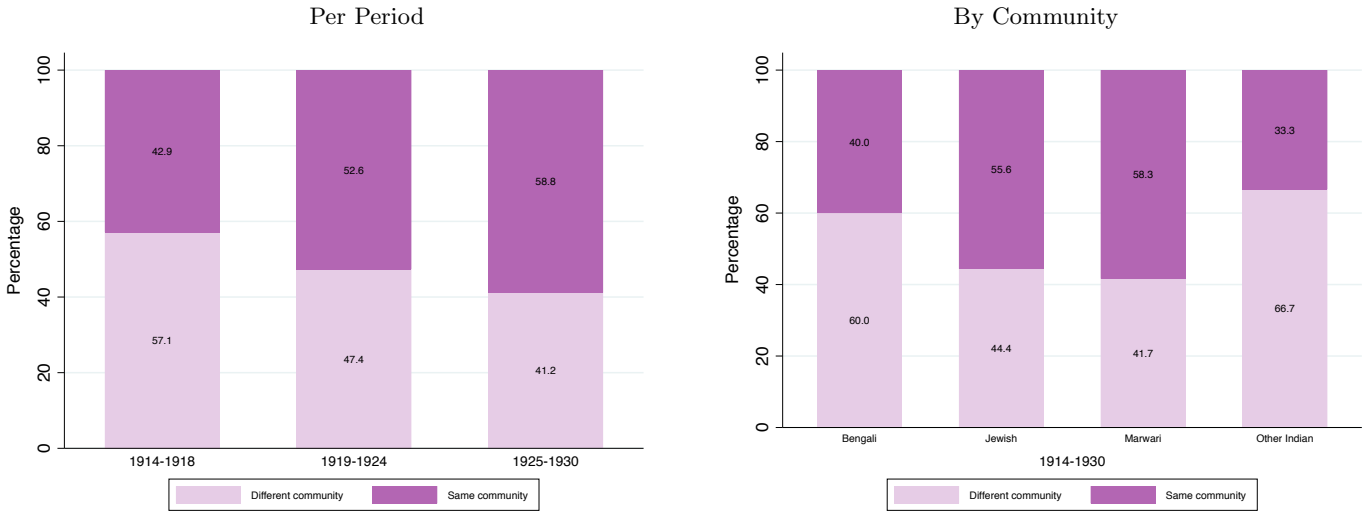


Figure 11 shows that Indian entrants hardly had any upstream experience at all. Figure 12 shows the extent of clustering by communities within firms. More than half the partners within the average firm belonged to the same community. The clustering was the largest (58%) among the Marwaris, the dominant Indian community. The extent of clustering was slightly smaller than observed in the early phases of the cotton textile industry. This is perhaps explained by the tendency of Marwari entrepreneurs to enter by acquiring shares in existing firms from British investors.

Finally, we test the model of network-based dynamics by using a regression specification analogous to that used for the cotton industry in Table 8. We find a similar significant positive effect of initial community presence interacted with the squared time trend. Once again at the initial stage of the development of the industry, social networks therefore appear to have played an important role.

Table 8: Stock of entrepreneurs at community level (1919-1930)

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
n_0^c downstream $* t^2$	0.005***	0.005***	0.005***	0.000
	(0.002)	(0.002)	(0.002)	(0.001)
n_0^c downstream $* t$		-0.077***	-0.077***	
		(0.023)	(0.023)	
n_0^c downstream			1.129***	
			(0.071)	
n_0^c upstream			0.614***	
			(0.081)	
L1 Log jute price ratio				1.791
				(1.275)
L2 Log jute price ratio				3.692
				(2.332)
Year dummies	Y	Y	Y	N
Community dummies	Y	Y	N	Y
Community $* t$	Y	N	N	Y
Observations	60	60	60	60
R-squared	0.995	0.993	0.988	0.992

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Intercept not reported

7 Concluding Comments

This paper has presented evidence from 19^{th} century India on the role played by community networks in early stages of industrialization in less developed countries, when supporting market institutions and state support are missing. We have put together data on individual entrepreneurs in the cotton and jute industry, thus filling a gap in the literature (e.g., Bagchi (1994, p. 185) states: "No detailed figures on the distributions of directorships among various Indian communities are available"). We use this data to show that community connections were important in early entry. Entrants tended to join firms dominated by entrepreneurs from the same community. Presence of communities in the early stages predict presence several decades later, consistent with the hypothesis that help provided by early incumbents facilitated entry of entrepreneurs from the same community. These results obtain despite

controlling for fixed differences in community characteristics, varying prices and other time varying shocks in the industry.

Related questions of interest that seem interesting include patterns of later evolution of these industries. In the case of cotton, we saw this consisted of emergence of new locations and new communities at the turn of the 19th century. Our network-based model was not suitable to model the arrival of new communities, or the interaction between different communities. Nor was it useful in testing whether community links became less important at later stages as market and state institutions developed.

Another related question is explaining causes of delayed entry by specific communities or delayed industrialization in specific regions. In the case of cotton, the later development of the greater Ahmedabad region is possibly explained by the disappearance of the primary pre-industrial occupation (moneylending) of the relevant community (Banias and Jains) following the Deccan riots in the 1870s. In similar vein, delayed entry into industrialization in South India by the community of Chettiars (after 1930s) is possibly explained by the decline of their moneylending activities in Burma in the wake of the Great Depression. Conversely, the early lead of the Bombay region may have owed to the earlier disappearance of profitable trading opportunities in opium and shipbuilding enjoyed by Western Indian business communities. Hence lack of pre-industrial accumulation of wealth or skill in related trading sectors seems unlikely to explain delayed industrialization in other regions. On the contrary, these delays probably arose precisely owing to the continued profitability of these pre-industrial trading opportunities, which reduced the incentive of the concerned communities to enter industry. Exploring this hypothesis remains an interesting task for future research.

References

[1] Allen, R.C. 2009. *The British industrial revolution in global perspective* (Vol. 1). Cambridge: Cambridge University Press.

[2] Bagchi, A.K., 1972. *Private investment in India, 1900-1939*, Delhi: Cambridge University Press & Orient Longman.

[3] Bagchi, A.K., 1987. *The Evolution of the State Bank of India: The era of the presidency banks, 1876-1920* (Vol. 2). Oxford University Press.

[4] Bagchi, A.K, 1994. European and Indian entrepreneurship in India 1900-30, in R.K. Ray, ed., *Entrepreneurship and Industry in India 1800-1947*, Delhi: Oxford University Press.

[5] Banerjee A. and Newman A., 1993. Occupational Choice and the Process of Development. *Journal of Political Economy* Vol. 101, No. 2. (Apr., 1993). pp. 274-298.

[6] Banerjee, A. and Munshi, K., 2004. How efficiently is capital allocated? Evidence from the knitted garment industry in Tirupur. *The Review of Economic Studies, 71*(1), pp.19-42.

[7] Beaman, L. and Magruder, J., 2012. Who gets the job referral? Evidence from a social networks experiment. *American Economic Review, 102*(7), pp.3574-93.

[8] Bogart, D. and Richardson, G., 2011. Property rights and parliament in industrializing Britain. *The Journal of Law and Economics, 54*(2), pp.241-274.

[9] Dasgupta, U. ed., 2001. *The World of the Indian Ocean Merchant, 1500-1800: Collected Essays of Ashin Das Gupta*. Oxford University Press, USA.

[10] Desai, A.V., 1968. The origins of Parsi enterprise. *The Indian Economic & Social History Review, 5*(4), pp.307-317.

[11] Fafchamps, M., 2003. *Market institutions in sub-Saharan Africa: Theory and evidence*. MIT press.

[12] Goswami, O., 1985. Then came the Marwaris: Some aspects of the changes in the pattern of industrial control in Eastern India. *The Indian Economic & Social History Review, 22*(3), pp.225-249.

[13] Greif, A., 2006. *Institutions and the path to the modern economy: Lessons from medieval trade*. Cambridge University Press.

[14] Guha, A., 1984. More about the Parsi Seths: Their Roots, Entrepreneurship and Comprador Role, 1650-1918. *Economic and Political Weekly*, pp.117-132.

[15] Gupta, B., 2014. Discrimination or social networks? Industrial investment in colonial India. *The Journal of Economic History, 74*(1), pp.141-168.

[16] Harnetty, P., 1972. *Imperialism and free trade: Lancashire and India in the mid-nineteenth century*. Manchester University Press.

[17] Harvey D., 2005, *The New Imperialism*. Oxford University Press.

[18] Irwin, D. A. 2007. Tariff incidence in America's gilded age. The Journal of Economic History, 67(3), pp. 582-607.

[19] Kahan, A. (1967). Government policies and the industrialization of Russia. *The Journal of Economic History, 27*(4), pp. 460-477.

[20] Kamenar, M. P. 1998. Parsis in Maritime Trade on the Western coast of India from 17th to nineteenth century in M. B. Mody (ed) *The Parsis in Western India: 1818-1920*, Allied Publishers: Bombay: pp. 129-145.

[21] Kranton, R.E. and Swamy, A.V., 1999. The hazards of piecemeal reform: British civil courts and the credit market in colonial India. *Journal of development Economics, 58*(1), pp.1-24.

[22] Kumar, D. and Desai, M., 1983. *The Cambridge economic history of India* (Vol. II) Cambridge.

[23] Markevich, A and Nafziger, S, 2017, The state and market in Russian industrialization, 1870-2010, in O'rourke, K. H and Williamson J. G, *Spread of Modern Industry in the Poor Periphery since 1871*, Oxford University Press: pp. 33-62.

[24] Mehta, M., 1991. *Indian Merchants and Entrepreneurs in Historical Perspective: With Special Reference to Shroffs of Gujarat,* 17^{th} *to* 19^{th} *Centuries*. Academic Foundation.

[25] Marx K., 1887, *Capital* (Vol. 1). Progress Publishers, Moscow.

[26] Mehta, S.D., 1953. *The Indian Cotton Textile Industry: An Economic Analysis*, GK Ved for the Textile Association, India.

[27] Mokyr, J., 2009. .*The enlightened economy. An economic history of Britain, 1700,* p.1850.

[28] Morris, M.D., 1965. *The emergence of an industrial labor force in India: A study of the Bombay cotton mills*, 1854-1947. Univ of California Press.

[29] Morris, M.D. 1983. "Growth of Large-scale Industry to 1947." In Dharma Kumar, ed., *The Cambridge Economic History of India, vol. 2*, Cambridge: Cambridge University Press: 553-676.

[30] Munshi, K., 2003. Networks in the modern economy: Mexican migrants in the US labor market. *The Quarterly Journal of Economics, 118*(2), pp.549-599.

[31] Munshi, K., 2011. Strength in numbers: Networks as a solution to occupational traps. *The Review of Economic Studies, 78*(3), pp. 1069-1101.

[32] Oŕourke, K. H. 2000. Tariffs and growth in the late 19^{th} century. *The Economic Journal, 110*(463), pp. 456-483.

[33] Perkins, D and Tang, JP, 2017, The East Asian Pioneers: Japan, Korea and Taiwan in O'rourke, K. H and Williamson J. G, *Spread of Modern Industry in the Poor Periphery since 1871*, Oxford University Press: pp. 169-196.

[34] Rauch, J.E. and Trindade, V., 2002. Ethnic Chinese networks in international trade. *Review of Economics and Statistics, 84*(1), pp.116-130.

[35] Ray, R.K., 1979.*Industrialization in India: growth and conflict in the private corporate sector, 1914-47*. Delhi: Oxford University Press.

[36] Ray, R.K., 1994. *Entrepreneurship and India in India, 1800-1947*. Delhi: Oxford University Press

[37] Roy, T. and Swamy, A.V., 2016. *Law and the economy in colonial India*. University of Chicago Press.

[38] Rudner, D.W., 1994. *Caste and capitalism in colonial India: the Nattukottai Chettiars* (p. 93). Berkeley: University of California Press.

[39] Rungta, S., 1970. *The Rise of Business Corporations in India 1851-1900* (No. 8). CUP Archive.

[40] Rutnagur, S.M. ed., 1927. *Bombay industries: the cotton mill. A review of the progress of the textile industry in Bombay from 1850 to 1926 and the present constitution, management and financial position of the spinning and weaving factories*. Indian textile journal.

[41] Sutton John and Nebil Kellow, 2010. *An Enterprise Map of Ethiopia*. International Growth Centre, London.

[42] Sutton John and Bennet Kpentey, 2012. *An Enterprise Map of Ghana*. International Growth Centre, London.

[43] Timberg, T.A., 1978. *The Marwaris, from traders to industrialists*. Stosius Incorporated/Advent Books Division.

[44] Tripathi, D. and Mehta, M., 1990. *Business Houses in Western India: A Study in Entrepreneurial Response, 1950-1956*, Jaya books.

[45] Tripathi, D., 2004. *The Oxford history of Indian business*. Oxford University Press.

[46] Webb, S. B. 1980 Tariffs, cartels, technology, and growth in the German steel industry, 1879 to 1914. *The Journal of Economic History, 40*(2), pp. 309-330.

8 Appendix

8.1 Data sources

We have several data sources which we collected and digitalized in function to our requirements. In this paper, we constructed firms and entrepreneurs panels for cotton and jute industry in India, between 1850 and 1930.

Our data gather information from before the first waves of industralization, documenting the presence of cotton merchants and jute balers, and up to 1930 with the impact of the Great Depression. In cotton sector, industralization started right after the American civil war, while in jute sector was more evident in early 1900s.

8.1.1 Cotton industry registers

"*The Bombay Almanac, Directory, and Register*", (1806 - 1868)

We construct the List of Merchants, from the records of firms and partners' names organised by professions for years: 1840, 1850, 1855, 1860, 1865. In this dataset is also available the list of Joint Stock Companies from 1860 onward.

" *Bombay Calendar and Almanac*", (1853 - 1861)

From this dataset we only use years 1860 and 1861, where we obtain: (i) the list of firms, location, and capital; (ii) the list of entrepreneurs and individual occupation.

"*Times of India Calendar and Directory (Bombay)*", (1862-1887)

We use this dataset for the period (1862 - 1884), where we collect: (i) the list of firms, location, and capital; (ii) the list of entrepreneurs and individual occupation.

"*Thacker's Indian Directory (Bombay)*", (1885 - 1960)

This is our main data source, which we use from year 1885 onward. From here we construct: (i) the list of firms, location, and capital; (ii) the list of entrepreneurs and individual occupation.

8.1.2 Jute industry registers

"*New Calcutta Directory*" (1856 - 1863)

We construct yearly cross sections between 1860 and 1869: (i) the list of firms, location, and capital; (ii) the list of entrepreneurs and individual occupation.

"*Thackers Bengal Directory*" (1863 - 1884)

From this dataset we construct yearly cohorts from 1870 to 1875, in addition to 1880. The information found in the directory is: (i) the list of firms, location, and capital; (ii) the list of entrepreneurs and individual occupation.

"*Thacker's Indian Directory (Calcutta)*", (1885 - 1960)

This dataset is used to obtain: (i) the list of jute balers; (ii) the list of firms, location, and capital; (iii) the list of entrepreneurs and individual occupation.

From 1885 to 1905 we collected data every five years, and form 1905 we construct our yearly cohorts up to 1930.

8.1.3 Cotton and jute prices

"*Index Number of Indian Prices*" India Office Records (1861-1931)

The most relevant pieces of information extracted from this source are the following:

Exported articles: (i) Cotton, Raw Broach (Bombay) per candy of 784 lb; (ii) Cotton, Manufactured Yarn 20s (Bombay) per lb and T. cloth (Bombay) per lb (only between 1874-1931); (iii) Jute, Raw Picked & Ordinary (Calcutta). Per bale of 400 lb.; (iv) Jute, Manufactured: Gunny bags (Calcutta). Per bale of 100 lb

Imported articles: (i) Cotton, Manufactured Grey shirtings (Calcutta) and Grey yarn Banner Mill (Calcutta)

8.1.4 Entrepreneur and firm panels construction

We first pooled yearly cross-section cohorts with all firms in upstream and downstream sector. From each firm we obtain the names of partners, directors and managing agents. Each of them were associated to a community origin, which defined the firm's community by simple majority. Raw and manufactured cotton (and jute) prices from the *Index Number of Indian Prices* were yearly assigned to entrepreneurs and firms panels.

Entrepreneurs panel collapses yearly information at individual level, as a single entrepreneur could be part of more than one firm in the same or different sector during the same year. Therefore, in our panel we are able to identify whether an entrepreneur is incumbent in one sector and later entrant in the other. Information on capital requirement is summarised at individual level as well.

Firms panel gathers all relevant information at entrepreneurs level, such us proportion of community origins yearly per firm. For each firm we assigned code or ID, which enables to track the same firm despite of firm's names changes. The location of firms is obtained from registered office address, and mills or presses location.

Cross section cohorts for cotton industry panels: (1860-61) *Bombay Calendar and Almanac*; (1862-1884) *Times of India Calendar and Directory (Bombay)*; (1885-1910) *Thacker's Indian Directory (Bombay)*; (1910-1930) for every five years *Thacker's Indian Directory (Bombay)*

Cross section cohorts for cotton jute panels: (1860-1869) *New Calcutta Directory*; (1870-1875) *Thackers Bengal Directory*; (1885-1905) for every five years *Thacker's Indian Directory (Calcutta)*; (1905-1930) *Thacker's Indian Directory (Calcutta)*