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FROM FARMING TO INTERNATIONAL BUSINESS:
THE SOCIAL AUSPICES OF ENTREPRENEURSHIP IN A GROWING ECONOMY

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ABSTRACT

Entrepreneurship has been traditionally concentrated in the hands of a few small communities in most developing economies. As these economies restructure, it is evident that these communities will be unable to satisfy the increased demand for new entrepreneurs. The analysis in this paper suggests that new business networks will compensate for the weak family background of first-generation entrepreneurs under some circumstances, supporting occupational mobility even in industries with significant barriers to entry. Using new firm-level data on the Indian diamond industry, the empirical analysis documents the important role played by an underlying community network in the expansion from agriculture to international business in one historically disadvantaged community over the course of a single generation.

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1 Introduction

Entrepreneurship – the successful establishment and management of new business – plays a critical role in the development process. Following Banerjee and Newman’s (1993) seminal contribution, the dominant view among development economists today is that inefficient credit markets can create substantial barriers to entry among potential entrepreneurs, with negative consequences for both growth and distribution. Although empirical tests of this hypothesis have provided mixed results (McKenzie and Woodruff 2002, Paulson, Townsend and Karaivanov 2006), it has nevertheless had a major impact on development policy, with numerous efforts initiated worldwide to provide micro-credit to fledgling entrepreneurs.

Most micro-credit initiatives focus on small business, such as managing a shop or engaging in petty trade, and the two studies listed above, for example, report a median investment of less than one thousand dollars among the enterprises that they sample. This paper is concerned, in contrast, with business activity at a larger scale that employs much greater amounts of both capital and labor. Within this class of potential entrepreneurs, a lack of business connections and commercial knowhow rather than liquidity might be the most significant barrier to entry (Dunn and Holtz-Eakin, 2000, make the same claim for the transition to self-employment in the United States). Business success in a developing economy requires a knowledge of the system; how to take advantage of legal loopholes and who to bribe. It also requires connections to buyers, sellers, bank loan officers, and other government officials. In such an economy, an individual who is born into a business *family* has a distinct advantage. The wealth that he inherits makes it easier to secure bank credit, while the experience and training that he receives from his father teaches him how to make connections and, more generally, how to exploit the opportunities that are available in the system. An entrepreneur who is born into a business *community* has an additional advantage, net of his family background, with community-based networks providing credit, insurance, and business connections to their members throughout the world (Fafchamps 2001, Rauch and Trinidad 2002).

It is consequently not surprising that entrepreneurship has been historically concentrated in the hands of a few communities in most developing economies. As these economies restructure and make the transition to a potentially steeper growth path, however, it is evident that these small communities will be unable to satisfy the increased demand for new entrepreneurs. The Indian economy, for example, has been growing rapidly since the early 1990s. A critical question for India’s long-term

growth prospects and its ability to emerge as a global economic power is whether and how it will be able to draw from a wider pool of entrepreneurial talent in the future.¹

Weber's (1958) pessimistic prognosis for India's economic future was not based on credit market imperfections, but on the rigid caste-based nature of Indian society, which he believed was inherently hostile to occupational mobility and, by extension, to business and entrepreneurship. This explained why Indian business was historically dominated by a single caste-group, the Vaishyas, and by non-Hindu communities such as Jains and Parsis. Modern historians such as Chandravarkar (1985) and Rudner (1994) have argued, in contrast, that occupational mobility has occurred on occasion, even in this caste-based society where connections are so important, when new entrepreneurial opportunities became available. In their view, mobility was historically facilitated through the endogenous formation of new networks in groups without a prior business background. This paper provides empirical support for this hypothesis by documenting the role played by a new community-based business network in supporting the expansion from agriculture to international business in one community – the Kanbi Patels – in one important Indian industry – the diamond industry – over the course of a single generation.²

India does not produce rough diamonds. The rough diamonds must first be imported, typically from Antwerp, and then cut and polished in factories and workshops, most of which are located in the city of Surat, north of Bombay. The polished diamonds are subsequently sold on the Bombay market to foreign buyers or shipped directly abroad. A combination of commercial acumen and cheap labor facilitated the rapid expansion of the diamond industry, which accounts for roughly 14% of India's total merchandise exports, and has competed with textiles, and more recently with computer software, as the country's top export industry over the course of the past three decades. It is estimated that approximately one thousand Indian diamond export firms employ over a million workers and that this industry accounts for as much as 85% of the rough diamonds cut and polished worldwide (60% by

¹Recently it has been suggested that there are “too many” entrepreneurs in India (Banerjee and Duflo 2007). However, it is unlikely that the petty entrepreneurs that Banerjee and Duflo observe will have the skills and the capacity to run a business at the scale that is considered in this paper. Similarly, Karlan and Valdivia (2006) show in a very interesting recent experiment that small amounts of entrepreneurship training have a significant impact on the business performance of self-employed individuals enrolled in a Peruvian micro-finance program. Once again, such interventions are unlikely to be sufficient to train potential entrepreneurs to run businesses that employ large numbers of workers and require high levels of commercial acumen.

²Although networks may serve a useful purpose when markets function imperfectly, these collective arrangements can give rise to dynamic inefficiencies that constrain the individual's response to new opportunities (Greif 1994, Kranton 1996, Rauch 2001). Recent evidence from urban India indicates that *traditional* caste-based networks can indeed *restrict* mobility (Munshi and Rosenzweig 2006). The analysis in this paper suggests, in contrast, that *new* networks might at the same time be forming to *facilitate* mobility in growing economies.

value) today (GJEPC 1998, Purani 2000).

Although much has been made of India's software industry and the growth of its economy more generally over the past decade, the diamond industry has also grown rapidly, at an average rate of 10% per year since the mid-1970s, for the most part outside the public eye. Diamond firms are notoriously secretive, partly due to the high value and hence the security concerns associated with their product. Diamonds, particularly rough diamonds, are also difficult to value objectively and can be easily swapped, and so diamond transactions rarely involve written contracts. Trust plays an important role in this industry, which is not surprisingly associated with a high degree of community networking, and with its low transparency, world-wide. Ultra-orthodox Jews historically controlled the Antwerp market and continue to control the New York market (Richman 2006), and in India two traditional business communities – Gujarati Jains from the town of Palanpur (known in the industry as *Palanpuris*) and *Marwaris* originally from the state of Rajasthan – have dominated the industry from its inception in the mid-1960s. The commitment problems that arise naturally with diamond transactions would suggest that there are enormous barriers to entry for outsiders in this industry. Nevertheless, the Indian diamond industry has undergone a dramatic change in its sociological composition – with the entry of a new community into the business – which we will attempt to understand in this paper.

Historically, the Palanpuris and Marwaris handled the business end of the industry, leaving the cutting and the polishing to Kanbi Patels (known in the industry as *Kathiawaris*). The Kathiawaris are farmers from Saurashtra in the interior of Gujarat, many of whom migrated to Surat to work as laborers in the diamond industry when it started to grow in the mid-1960s. Some of these migrants became manufacturing contractors, in charge of entire workshops or factories, and these contractors in turn brought more members of their caste to work in the Surat industry. Commitment problems arise at the manufacturing stage as well, with swapping of roughs being a common complaint, and so most Marwari and Palanpuri businessmen built long-term relationships with their Kathiawari contractors. In the late 1970s, a supply shock hit the industry with the opening of Australia's Argyle mines. This weakened DeBeer's monopoly power in the industry, with a commensurate increase in the supply of rough diamonds on the market. The story told by knowledgeable Indian diamond exporters is that the existing Marwari and Palanpuri networks were unable to grow fast enough to absorb the increased supply of rough diamonds, prompting some businessmen to open the door to the diamond trade to their trusted Kathiawari contractors. Bank credit has, until recently, been unavailable to diamond firms for good reason, due to the particular nature of this business. Thus, the critical step in the diamond

trading process is accessing rough diamonds on credit from abroad. Palanpuri businessmen, who had established branches in Antwerp by that time, provided excess roughs to their contractors or served as guarantors for other suppliers. The early Kathiawari entrants took advantage of this opportunity to bring other members of their community into the business, providing connections to rough suppliers in Antwerp and other forms of support, and the number of Kathiawari firms subsequently grew rapidly over time.

The analysis in this paper is based for the most part on a survey of nearly 800 diamond export firms, with offices in the Bombay market, that I conducted in 2004-05. The survey collected information on the senior partner's personal and family background, the firm's history, and its business relationships. Based on this information, the business background of entrants into the industry can be plotted across communities and over time. Not surprisingly, the Kathiawaris are less likely to report that their father was a businessman than their more established rivals. Closer inspection of the data reveals, in addition, a substantial widening in this community-gap over time. Most of the Marwari and Palanpuri entrepreneurs are the sons of businessmen, irrespective of when their firm was established. In contrast, while most of the early Kathiawari entrants also had family backgrounds in business, there is a substantial decline in inherited business experience across entering cohorts. Around 10% of the Kathiawari entrepreneurs who established their businesses in the late 1970s report that their father was a farmer, but this statistic increases steadily over time and by 1990 over 60% of the Kathiawari entrants were the sons of farmers.

How do entrepreneurs with such different backgrounds co-exist in this industry and how can we explain the divergence across communities over time? The explanation put forward in this paper is that while business networks may be active in all three communities, the Kathiawari network strengthened most rapidly once it had crystallized, compensating for the increasingly weak background of its entering members. Although the Palanpuris and particularly the Marwaris have many business opportunities outside the diamond industry, the next best option for a Kathiawari entrepreneur is farming or managing a diamond workshop in Surat, neither of which is particularly remunerative. We would thus expect the Kathiawaris to have invested most heavily in their industry-specific network once it was established. Analysis of firm performance across communities and over time provides independent support for the compensatory role of the Kathiawari network, while inspection of intra-industry marriage patterns suggests a mechanism through which the Kathiawari network grew so strong. Previous analysis of networks by economists has treated these institutions independently of the markets that

they supplement (Kranton 1996 is a notable exception). The theoretical framework developed in this paper generates predictions for changes in the organization of firms, across communities and over time, as the underlying networks develop, which we will successfully verify, providing an additional dimension along which networks shape economic activity in this industry.

This paper documents the role played by a new business network in supporting occupational mobility in an industry with substantial barriers to entry. Although no external interventions were necessary in the diamond industry, the concluding section of the paper considers the role that policy instruments could play in promoting entrepreneurship in other circumstances. I will argue that although standard solutions, such as the infusion of bank credit, can sometimes be very effective, recent developments in the diamond industry demonstrate that they can have unexpected negative consequences in industries where networks and markets co-exist.

2 The Institutional Setting

2.1 Entrepreneurship in India

“The history of the rise and growth of a modern business class in India is largely the history of the activities of members of certain groups” (Gadgil 1959: 16). One broad caste group, the Vaishyas, traditionally controlled money-lending and trade in India, with sub-castes or *jatis* drawn from this group active in different regions of the country. Mercantile opportunities expanded considerably with the arrival of the British in the eighteenth century and, not surprisingly, these opportunities were captured by the traditional business *jatis* and by a few non-Hindu communities such as the Jains and the Parsis.

Commercial activity under the British was concentrated around the ports of Calcutta and Bombay. Parsis and Gujarati Baniyas dominated Bombay’s textile manufacturing, finance, and foreign trade from the middle of the nineteenth century (Nafziger 1971). Commercial activity in Calcutta was already controlled by Marwari traders and bankers, originally from Rajasthan, by this time. Although the Marwaris made the transition to industry relatively late – around 1914 – they subsequently rapidly expanded their industrial and trading activities throughout the country (Lamb 1955).

The Marwaris, Parsis, and Gujarati trading *jatis* continue to dominate modern industry and banking, especially in major cities such as Bombay and Calcutta. For example, Timberg (1978) reports that 23 of the 37 largest North Indian owned industrial houses listed in the *Monopolies Inquiry Com-*

mission Report of 1964 were Marwaris and Gujaratis. Timberg also cites a *Time Magazine* article (March 1, 1963, p. 77) in which it is estimated that the Marwaris controlled 60% of the assets in Indian industry at that time. More recently, a *Times of India* article (October 20, 2006) estimates that Gujarati promoted companies account for 17% of the market capitalization of the BSE-500 index, followed by Marwari promoted companies with 11% and Parsi promoted companies with 8%. Public sector units, including banks and oil companies, account for 25% and all other companies, including multinationals, just 39% of the market capitalization.³ A recent survey of garment export firms in South India, reported in Banerjee and Munshi (2004), suggests that these traditional communities play an important role in industries characterized by a smaller scale of production and in regions where they have historically been less active as well.

The fact that traditional business communities continue to dominate mercantile activity in India does not imply that outsiders will not step forward in the future. There are some notable examples of non-mercantile communities making the transition to business when new opportunities became available, such as the entry of the Parsis into trade and industry under the British (Medhora 1965) and more recently the expansion of the Gounder community in Tamil Nadu from agriculture to textile manufacturing and exports in Tirupur (Cawthorne 1995). We know very little about the preconditions or the process through which such occupational mobility occurs and so it seems especially relevant to study the expansion from agriculture to business among the Kathiawaris.

2.2 A Brief History of the Indian Diamond Industry

The history of the modern Indian diamond industry begins in the 1880s when two diamond merchants from the town of Palanpur in Northern Gujarat, Surajmal Lallubhai and Amulakh Khubhchand Parikh, expanded their business to Bombay, Calcutta, and Rangoon.⁴ Over the next two decades, many Palanpuri Jains followed these pioneers into the diamond business, and later the pearl trade, and the Palanpuri network reached as far as Antwerp, where 20-25 families were settled by 1937. The overseas Palanpuris were forced to return to India during World War II and the industry suffered a further blow after independence in 1947 when the import of rough diamonds was banned to preserve scarce foreign exchange. The diamond business was restricted to domestic trade in polished stones,

³The market capitalization of the BSE-500 index is 92% of the total BSE (Bombay Stock Exchange) market capitalization.

⁴The discussion on the Palanpuris in this section is based on Chhotalal (1990) and an unpublished interview with the (former) Nawab of Palanpur conducted by Mark Boston and Sharada Dwivedi. The discussion on the Kathiawaris that follows is drawn from Engelshoven (2002).

for the most part, until the mid-1960s, when the Multi-Rate Import Replenishment Scheme allowed rough diamonds to be imported once again, against the export of rough diamonds.

Workshops were quickly set up in Surat, Navsari, and other inland centers to cut and polish diamonds and the industry grew extremely rapidly thereafter. Marwari businessmen also entered the diamond industry at this time. The Marwari network is more diversified, both spatially and by business activity, than any other community network in the country. Some of the new Marwari entrants had experience in the colored-stone business, which was traditionally centered around the city of Jaipur in Rajasthan, but other merchants were attracted by the high rate of return on investment in the diamond industry.

In these early years, the Palanpuris and Marwaris handled the trading end of the diamond business, while Kathiawaris cut and polished the diamonds. The Kathiawaris are a caste of cultivators who worked historically as sharecroppers and laborers in Saurashtra, an arid region in Gujarat that is prone to drought and famine. The first Kathiawari migrants came to Surat in the 1960s, just as the diamond industry was starting to grow. Initially the Kathiawaris worked in factories owned by Palanpuris and local Surtis. However, many of the early migrants were able to set up their own workshops and factories by the early 1970s, doing contract work for Palanpuri and Marwari exporters. As discussed earlier, some of these contractors were encouraged to enter the import-export business in the late-1970s by Palanpuris with whom they had established close personal ties, and we will see that the Kathiawari network grew at least as fast as the Palanpuri and Marwari networks in the decades that followed.⁵ What is most remarkable about this rapid growth is that the Kathiawari network had to draw from a pool of potential entrepreneurs with little family experience in business to expand, whereas the Palanpuris and the Marwaris belong to communities with many generations of business experience.

⁵Exporters maintain long-term relationships with their manufacturing contractors to avoid commitment problems at the cutting and polishing stage of the production process. This allows a high level of trust to be sustained across community lines between the exporters and their contractors. The fact that the early Kathiawari entrants were supported by Palanpuris is not disputed in the diamond industry, although individual firms are reluctant to admit that they were assisted in this way. Statements such as the following are often heard: “Kathiawadis are here because of the Palanpuris’ admits a Kathiawadi diamond merchant. The Palanpuris, who were the market leaders brought the Kathiawadis into the trade. Help came not only in the form of finance but as initiation into the import-export sector.” *Diamond World* (November-December 1999: p.52-53).

2.3 The Survey

Although aggregate diamond statistics are available over many years, detailed firm-level information could only be obtained by conducting a survey of the industry. Diamond firms are very secretive and so every effort was made to establish connections within the industry before the survey commenced. Assisted by a few close personal connections within the industry, I gradually built up a small network of influential diamond exporters over a two-year period, which in turn later helped the survey team penetrate each of the community networks. Despite this strong support, it was a challenge to gain access to the firms, and the implementation of the survey itself provides useful insights into the workings of this industry.

The population of firms is based on a computerized database maintained by the Gem and Jewelry Export Promotion Council (GJEPC) of all its members. This database includes the name of the firm, its address and telephone numbers, the name of a contact individual (typically the senior partner), and the firm's export figures, each year from 1995 onwards. Under the Multi-Rate Import Replenishment Scheme, a firm's foreign exchange quota, which allowed it to (legally) import roughs, was based on its previous exports. The GJEPC verified the export figures for its members and then forwarded them to the Government of India. Most exporters availed of this useful service, and so the GJEPC database provides us with a comprehensive list of firms that exported polished diamonds, each year, over the past decade. I was able to gain access to this database, covering the 1995-2003 period, at the beginning of 2004.

For security reasons, diamond markets tend to be spatially concentrated world-wide. In Bombay, the polished diamond market covers approximately 0.25 square miles in the Opera House area of the city. Hundreds of the larger firms have offices in two buildings – Panchratna and Prasad Chambers – and the smaller firms are crowded into buildings in the adjacent lanes and by-lanes. Somewhat surprisingly, however, a preliminary inspection of the GJEPC database revealed a significant fraction of firms with addresses outside the Opera House area. Diamond firms often operate under multiple names to exploit income tax loopholes and many of these “shell” firms are listed in residential areas where the diamond merchants live. In an economy where foreign exchange was until recently tightly regulated, the import-export nature of the diamond business also attracted firms, known in the industry as *choprawallas* (book-keepers), that were engaged in money laundering rather than legitimate diamond business. Many of these firms would also be listed outside the Opera House area. My industry contacts

assured me that firms with legitimate activity in the diamond industry would have at least one office in the Opera House area and so the relevant population of firms for the survey was restricted to the 1,854 firms with addresses in that area, listed in the GJEPC database as exporting in any year over the 2001-03 period.

To test its ability to gain access to these firms, the survey team sent letters of introduction from the chairman of the GJEPC and the principal investigator to 40 firms drawn randomly from the list of 1,854 firms operating in the Opera House area. These firms were subsequently contacted by telephone to arrange an appointment, but only three agreed to be interviewed. It was clear from the outset that the only way to achieve a reasonable response rate in such a heavily networked industry was to use our own social connections. A computerized referral system was set up, and each firm in my personal network provided a list of firms that it was tied closely with. These firms, in turn, provided additional referrals, and the process continued until all the names on our list had been covered. Progress was slow to begin with, and only 63 interviews were completed in December 2004, the first month of the survey. However, the pace increased thereafter, to six interviews per day, and the survey was ultimately completed in five months.

Of the 1,854 firms on our list, we were able to ascertain that 480 were multiple-name listings, 288 were *choprawallas*, 102 could not be contacted by phone, 53 had shut down, and 9 had no partners in town during the survey period, leaving us with 922 eligible firms. We ultimately interviewed 777 firms, giving us an overall response rate of 84.3%.⁶ Among the firms that we interviewed, 96.3% belonged to the three major communities and of these firms, 29% were Kathiawari, 17% were Marwari, and 54% were Palanpuri. When providing referrals, our contacts were simply asked to list firms that they were closely tied with, without any prompting from our side. It is worth noting that not a single referral led us to a firm without at least one office in the Opera House area, justifying the spatial restriction placed on the population of relevant firms. Moreover, only 5.7% of the sampled firms did not appear in the GJEPC database, supporting the assumption that this database effectively covers the entire population of active exporters.⁷

⁶The firms that could not be contacted using the phone number provided by the GJEPC or traced through the directory enquiry system had either changed their name or shut down. Firms without a partner in town over a five month period are also unlikely to be active in the export market. The response rate across communities was 85.7% for the Kathiawaris, 89.3% for the Marwaris, and 81.9% for the Palanpuris.

⁷Towards the end of the survey, respondents were provided with a list of firms from our list that were still to be contacted. The survey team also made 36 appointments in the final month of the survey by telephoning exporters directly. While these few deviations from the usual procedure would naturally reduce the number of referrals made outside the list, they are unlikely to undermine the basic claim that the GJEPC database effectively covers all active

The sampled firms are all currently active. Much of the analysis in this paper is concerned with changes in the industry and so we would, in principle, need information on exit as well. Fortunately, exit rates in the diamond industry are extremely low, consistent with the theoretical framework in Section 4, which predicts that firms should not exit once they enter this industry. The GJEPC database lists all exporters, each year, over the 1995-2003 period. I assume that a firm exits in a given year if it was exporting in that year but fails to show up thereafter. It seems reasonable to assume that a firm which fails to show up continuously for three years or longer has permanently exited, allowing me to compute exit rates each year from 1995 to 2000. Restricting attention to firms in the Opera House area, exit rates are low each year – just around 1.5% – and there is no discernable time trend in these statistics. Moreover, exit rates do not vary by community.⁸

The computerized system that we had set up to schedule interviews included data fields to record the identity of up to five individuals who had provided referrals for each firm. We would speak on behalf of these individuals when arranging interviews with the firms; in many cases this was sufficient for the firm to agree to be interviewed, but in other cases the firms did contact the individual who had provided the referral to verify its authenticity. Although it is well known that community networks play an important role in this industry, the survey respondents were generally reluctant to report the support that they received from members of their community or from other close connections in the diamond industry. The pattern of referrals that was received evidently had research value since it could be used to provide direct evidence on the importance of community ties and so the survey team was instructed to continue to fill those data fields even after a firm had been interviewed.

Table 1 lists the major sources of referrals, the number of referrals that they provided, and the community-wise breakdown of firms that received these referrals. We started with the largest firms in the industry and gradually moved down the firm-size distribution as we received referrals to smaller and smaller firms. Because of this non-random sequence of interviews and because the number of referrals is restricted to five per firm, we clearly do not have a representative sample of referrals. The statistics in Table 1 should be treated with caution, but the cross-community referral patterns reported

exporters and that it is appropriate to restrict attention to firms located in the Opera House area.

⁸The contact names included in the GJEPC database, together with a detailed knowledge of firms in the industry, allowed my contacts and their employees to assign a community affiliation to each firm in the database that was located in the Opera House area. Names are a good indicator of community affiliation, and comparing this assignment to the actual affiliation, obtained from the survey, just 6.3% of the sampled firms were miscoded. Based on the assigned community affiliation, annual exit rates over the 1995-2000 period are 1.8% for the Kathiawaris, 1.1% for the Marwaris, and 1.5% for the Palanpuris.

below are nevertheless indicative of the important role that social ties play in this industry. A total of 295 individuals provided referrals; 72% were exporters belonging to the three main communities, 16% were brokers, and the remaining 12% were exporters from other communities and individuals outside the industry who had social connections with particular exporters. A total of 1,473 referrals were provided by these sources; 76% from the exporters, 16% from the brokers, and 8% from other sources. Although the three communities are represented roughly in proportion to their share in the population of export firms in Column 1, Marwaris are over-represented, while Kathiawaris are under-represented in terms of their share of the total referrals provided in Column 2.

Looking across Columns 3-5 it is apparent that exporters from each community disproportionately provide referrals to members of their own group. Given that Kathiawaris make up just 29% of all firms, it is quite striking that 74% of the referrals from Kathiawari exporters are to members of their community. This pattern of within-community referrals matches well with the rapidly strengthening network ties that we later document for this community. Marwaris and Palanpuris also favor members of their own community, but not as conspicuously as the Kathiawaris. The Marwaris in particular make a substantial number of cross-community referrals. We will see that the Marwaris concentrate on the polished side of the market where community affiliation is less important, which explains why the Marwari exporters appear to maintain connections across all communities. In contrast with the pattern of referrals made by the exporters, the distribution of referrals made by brokers – who belong to different communities and must interact with firms of all communities – generally matches the composition of firms, by community, in the industry.

3 The Diamond Industry Today

3.1 Organization of Production

Most diamond exporters visit Antwerp once every month or every other month for a few days to acquire rough diamonds, have these diamonds cut and polished in workshops located in Surat, and then sell the polished diamonds on the Bombay market or directly to foreign buyers. “Much of the diamond industry revolves around the issue of getting a regular supply of good quality [rough] diamonds” (Engelshoven 1999: 371). Rough suppliers in Antwerp and the largest exporters receive parcels directly from the Diamond Trading Corporation (DTC), the trading arm of DeBeers, or from other primary suppliers of rough diamonds. These parcels will typically comprise stones of various

grades and sizes. Individual exporters, however, will tend to specialize in stones of a particular size, which implies that they must approach different suppliers in Antwerp from one trip to the next.⁹ The rough stones are received on credit without a written contract. Without the ability to establish a long-term relationship with a single supplier, the commitment problems that could consequently arise are substantial.

I argue that this is where the community network comes in: Firms that have established close ties with particular suppliers provide referrals for other members of their community. The set of firms providing referrals varies from one period to the next depending on the mix of stones received by the suppliers in Antwerp. Firms providing referrals have supplier-specific reputations, and presumably the rents that go with them, at stake and so they will ensure that firms receiving the rough stones do not renege on their obligations. Firms will typically draw upon different members of their community to provide referrals from one trip to the next, and so a multilateral punishment strategy of the sort described by Greif (1993), in which no firm provides referrals to an entrepreneur who has deviated in the past in equilibrium, must presumably be in place to maintain cooperative behavior.¹⁰

Table 2, Panel A describes transactions on the rough side of the market. Firms have 10-12 suppliers per year and 70% of the firms have a dominant supplier who provides more than 30% of their roughs. Different firms will have different dominant suppliers, allowing for cross-referrals across firms as described above. Much of the rough supply (around 70%) comes from Antwerp. The other major alternative source of roughs is the Bombay secondary market, where the price is substantially higher but the commitment problems less severe since the firms have a permanent presence in the city. Notice that the Kathiawaris receive a significantly greater fraction of their roughs from Antwerp than

⁹Diamonds are classified by size and shape. In the questionnaire we defined eight categories – seven sizes and a separate category for “fancy shapes” – and asked the entrepreneurs to report the proportion of their output (by value) in each category. Despite this fine classification of stones, a substantial fraction of the firm’s output is devoted to a single – most popular – category: 52% for the Kathiawaris, 42% for the Marwaris, and 48% for the Palanpuris. The Marwaris are significantly less specialized, in large part because their business is centered on the polished side of the market, where flexibility is less costly.

¹⁰Suppose that a limited number of exporters are in a position to provide a fixed number of referrals in each period. If one of those exporters deviates from the equilibrium and provides a referral to someone who has reneged on his obligations in the past, the previous cheater’s only incentive to be honest is to maintain ties with his benefactor. In contrast, someone who has been honest in the past has an additional incentive to be honest; to receive referrals from other exporters in the future. As long as there is some probability that the deviating exporter will be unable to provide a referral in the next period, irrespective of current-period behavior, previously honest individuals will have a strictly greater incentive to honor their commitments and so will be preferred, ruling out such deviations from the cooperative equilibrium. The Antwerp suppliers could, in principle, have organized a similar arrangement to punish exporters who reneged on their obligations. However, they would have less information and enforcement power than a coalition of exporters drawn from the same community for this purpose.

the other two communities, consistent with the view that they have access to a stronger network.¹¹ Despite the high value of the rough diamonds and the potential for default, much of the rough supply is obtained on credit and rarely involves a written contract, across all three communities, emphasizing the important role played by the networks.

In contrast with rough diamond transactions, where referrals are critical and firms tend to do business with a limited number of suppliers, the polished side of the industry operates very much like a spot-market. Firms have as many as 30-50 buyers per year in Panel B, which describes transactions on the polished side of the market, and relatively few (around 60%) of the firms have a single dominant buyer, despite the fact that a dominant buyer is now defined to account for just 20% of the firm's product. A substantial fraction of the polished diamonds are also sold on the Bombay market, typically through brokers, either to merchant exporters or visiting foreign buyers. Notice that the Marwaris perform particularly well on the polished side of the market; they have more buyers per year, yet are more likely to report a dominant buyer (indicative of a balanced client portfolio) and to sell their polished directly abroad. This observation is consistent with the subsequent analysis, which indicates that the Marwari rough-diamond network is relatively weak and that diamond firms from this community tend to concentrate on the polished side of the market.

Polished diamonds are largely sold on credit and these transactions rarely involve a written contract, so commitment problems could potentially arise on this side of the market as well, with buyers renegeing on their obligations. Although referrals play an important role on the rough side of the market, firms do not share polished buyers with each other according to my industry informants. Because firms tend to specialize in particular stone sizes, they can build long-term relationships with a few foreign buyers instead, channelling the rest of their output abroad through numerous *merchant exporters*. Merchant exporters restrict their activity to buying polished diamonds on the Bombay market and selling these diamonds to established foreign clients. All export firms, including the merchant exporters, have a permanent presence in Bombay and so commitment problems between local firms naturally tend to be less severe on the polished side of the market. Along the same lines, we do not expect community networks to play an active role at the cutting and polishing stage of the production process either. Entrepreneurs can always establish long-term bilateral relationships with their manufacturing contractors to avoid the commitment problems, associated with the swapping of

¹¹The very largest firms, known as *sightholders*, receive roughs directly from the DTC. A relatively small number of firms also buy roughs from Israel. Allowing for all of these possibilities, the Kathiawaris continue to receive a greater share of their roughs from outside the Bombay market than the other communities.

roughs, that arise at this stage. Consistent with this view, the respondents in the survey reported an average relationship of 16 years with their manufacturing contractors.

Information on the firm's transactions was also collected when it first started exporting. Although not reported, the patterns in Table 2 are by and large the same when the transactions statistics are computed at this earlier point in time. The number of suppliers and buyers is smaller, less than half of what we see in Table 2, but most other aspects of these transactions do not change with the firm's age or over time. The only exceptions are the proportion of roughs bought directly from Antwerp, which has declined for the Marwaris and Palanpuris relative to the Kathiawaris, and the repayment period on the polished side of the market, which was about 90 days when the firms first started exporting and has now increased to about 110 days. These two observations are consistent with a strengthening of the Kathiawari rough-network and a decline in profit margins with the entry of new firms over time. Many Marwari and Palanpuri firms have chosen to exit the rough side of the business in recent years, restricting their activity to merchant exporting. These firms are not included when computing the rough statistics in Table 2, Panel A and these changes in the organization of the firm, across communities, will also show up in subsequent sections where we theoretically and empirically explore changes in the industry over time.

3.2 Characteristics of Entrepreneurs

The history of the industry described earlier would suggest that exporters from the three communities should come from very different backgrounds. The descriptive statistics in Table 3, based on data collected from the senior partner in each firm, indicate that this is indeed the case.

The entrepreneur's age is (mechanically) negatively correlated with the year that the firm was established. Not surprisingly, the Kathiawari respondents are younger than the Marwari respondents, who in turn are younger than the Palanpuri respondents in our sample. The Kathiawaris also have significantly lower educational attainment, measured by years of schooling, than the entrepreneurs from the more established business communities. One important schooling decision that parents must make in India is whether to send the children to secondary school in English or the local language (university education is almost always in English, at least in the major metropolitan areas). Munshi and Rosenzweig (2006) describe how this choice has important implications for the children's future; in the diamond industry, fluency in English and the westernization that goes with English schooling allow entrepreneurs to make contact and establish personal relationships more easily with foreign buyers

and suppliers. The Kathiawaris are less likely to have been schooled in English than the Marwaris and Palanpuris, and they are further disadvantaged by being less likely to have grown up in Bombay (as compared with the Palanpuris). This lack of urban experience is potentially a liability when it comes to establishing branches abroad and interacting with foreign buyers and suppliers. Notice that a relatively low proportion of Marwaris also report having grown up in Bombay, but this simply reflects the wide scope of their business activities; although not reported, many of them grew up in urban centers elsewhere in the country and this will become apparent in a moment when we describe the occupations of their fathers.

Table 3, Panel B describes the entrepreneur's father's occupation, which is aggregated into seven categories: farming, white-collar professional, other business, other jewelry business, diamond cutting and polishing, diamond broker or trader, and diamond exporting. The most striking observation from these statistics is that 53% of the Kathiawaris, but just over 2% of the Marwaris and Palanpuris, report that their fathers were farmers. Looking down the other occupational categories, the Kathiawaris are significantly less likely to belong to a business family than the other two communities: 35% of the Kathiawaris versus 82% of the Marwaris and 76% of the Palanpuris report that their father was engaged in any type of business.

Table 4 subjects the community differences uncovered in Table 3 to greater scrutiny by studying how this community-gap changed over time. I estimate regressions of the form:

$$\omega_i^j = \alpha EY_i^j + \beta EY_i^j \cdot \delta^j + \delta^j + \epsilon_i^j \quad (1)$$

where ω_i^j measures the family background or the education of entrepreneur i belonging to community j , EY_i^j is the year in which his firm was established, δ^j is a vector of community dummies, and ϵ_i^j is a mean-zero disturbance term. Treating the Palanpuris as the reference category, the coefficient on the Kathiawari-establishment year interaction term will be negative (positive) if the gap between the Kathiawaris and the more established communities in Table 3 is widening (narrowing) across entering cohorts.

The dependent variable takes the value one if the entrepreneur's father was not a farmer, zero if he was in Table 4, Column 1. Non-business activities are expanded to include white-collar professional occupations and diamond cutting and polishing in Column 2. Finally, we measure ω_i^j by the entrepreneur's years of schooling in Column 3. The coefficient on the establishment year variable is

negative in all three columns but only significant in Column 3. More importantly, the coefficient on the interaction of this variable with the Kathiawari dummy is negative and significant (except with schooling as the dependent variable). The Marwari-establishment year coefficient, in contrast, is small in magnitude and imprecisely estimated.¹²

The explanation put forward in this paper for the widening gap between the Kathiawaris and the more established communities is that a rapidly strengthening Kathiawari network was able to support increasingly weak entrants from that community at the margin. An alternative explanation is based on changing characteristics in the population that the entrepreneurs are drawn from. Suppose that entrepreneurs are selected randomly from this population. The pattern of coefficients in Columns 1-3 could also be obtained if father's occupation and the entrepreneur's educational attainment diverge across communities over time. To disentangle differential selection into the industry due to changes in the underlying networks from exogenous variation in population characteristics, we take advantage of the fact that entrepreneurs establish their firms at different ages. The father's occupation is inherited at birth (or relatively early in life if there were career changes in the previous generation). The entrepreneur's own educational attainment is strongly correlated with his father's occupation and, more generally, these population characteristics will vary across age cohorts in each community. The specifications in Columns 4-6 consequently include the entrepreneur's age and age-community interaction terms as additional regressors. Conditional on the age variables, the establishment year effect can then be attributed to differential selection into the industry in response to contemporaneous changes in the underlying community networks. The Kathiawari-establishment year coefficient becomes even more negative once the age terms are included and is now significant even with schooling as the dependent variable.¹³

To demonstrate the economic importance of the community differences reported in Table 4, I present nonparametric estimates of the relationship between business background, measured by whether the entrepreneur's father was a farmer, and the firm's establishment year (net age effects) in

¹²For firms that were formed following a separation by partners, the establishment year is measured by the year of separation. The results in Table 4 are unaffected when the establishment year is measured instead by the year in which the original firm was established or the year in which the firm started exporting.

¹³Although the age coefficients are not reported in Table 4, it is worth mentioning that the coefficient on the Kathiawari-age interaction term is negative and significant in all columns. This indicates that schooling levels and business backgrounds in the population are converging across these communities, which is not surprising since the Kathiawaris started at such a low level. Some of the entrepreneurs in the oldest firms inherited the business from their fathers and it follows that the age-establishment year correlation will be naturally weaker in such firms. Dropping those firms has no effect on the establishment year coefficients.

Figure 1.¹⁴ Almost all entrants, regardless of their community, came from non-farming backgrounds in 1970. While this pattern remains constant over time for the Marwaris and the Palanpuris, starting from the late 1970s the Kathiawari entrants are increasingly likely to have fathers who were farmers and by 1990 over 60% of the Kathiawari entrants have farming backgrounds. With the less inclusive business classification corresponding to Table 4, Column 5, 90% of the Marwaris and 80% of the Palanpuris that started their firms in 1975 had fathers in business. This statistic drops to 70% for both communities by 1990. However, this decline is dwarfed by the corresponding decline for the entering Kathiawaris; from 70% in 1975 to 30% in 1990.¹⁵

4 Networks and Entrepreneurship

This section presents a simple model of the diamond industry that clarifies the role played by community networks in supporting entrants with weaker business backgrounds at the margin over time. The model generates simple tests, based on firm performance across communities and over time, that allow us to rule out alternative non-network explanations for the entry patterns observed in Figure 1 and Table 4.

4.1 A Simple Model of the Diamond Industry

4.1.1 Production and Network Technology

Each firm in this industry consists of a single entrepreneur who buys rough diamonds from Antwerp on credit at the beginning of each period, has the rough diamonds cut and polished in Surat, and then sells the polished diamonds on the competitive Bombay market. His profits at the end of the period are determined by his sales net of the loan that he must repay to the rough supplier. The unit price of rough and polished diamonds is constant over time. Diamond cutting and polishing is a labor intensive activity that does not require great skill. Firms in the industry employ the same production technology, with a single worker assigned to a single machine, and so must increase their

¹⁴The nonparametric kernel estimates are constructed in two steps: Estimate the regression corresponding to Table 4, Column 4, separately by community, with *EY*-squared as an additional regressor. This allows for additional flexibility in the relationship between father's occupation and the firm's establishment year. Compute mean age by community and subtract this from each entrepreneur's age. Subtract this differenced variable, multiplied by the estimated age coefficient from the regression just described, from the dependent variable. This generates a measure of father's occupation net age effects. Then nonparametrically regress this measure on the firm's establishment year, separately by community, using the Epanechnikov kernel function.

¹⁵Schooling levels match these trends in occupational background: The Marwari entrepreneurs maintain roughly 14 years of schooling, and the Palanpuris roughly 13 years of schooling, over the 1975-1990 period. The Kathiawaris start with 13 years of schooling in 1975 and fall below 11 years by 1990.

production by hiring new workers. With constant returns to scale in production, the firm's profit is a linear function of the amount of rough diamonds that it can procure, which varies across firms and over time.

Each entrepreneur is characterized by an ability endowment that reflects his family background. More able entrepreneurs are better positioned to independently establish connections with suppliers in Antwerp and so the amount of roughs procured is increasing in ability. The entrepreneur will also receive referrals from members of his network to rough suppliers. A stronger network provides more referrals or can support a higher level of credit per referral in the cooperative equilibrium, increasing the amount of roughs made available to its members.

4.1.2 Selection into the Industry

Payoffs inside the diamond industry are increasing in the entrepreneur's ability and the strength of his network, as described above. The infinitely lived individual must choose whether or not to enter the industry at a fixed age. He will receive referrals from the cohort of entrants that preceded him and so the per-period payoff for individual i belonging to community j who enters the industry in period t is denoted by $G_{t-1}^j + r_I \omega_i^j$, where G_{t-1}^j measures the strength of the network that he inherits, ω_i^j is the individual's ability, and r_I measures the returns to ability inside the industry. We will see in a moment that these payoffs remain constant over the individual's lifetime in equilibrium. The assumption that the individual receives referrals from the cohort that preceded him is clearly quite special. However, it rules out strategic entry behavior and simplifies the network dynamics derived in the next section, while retaining the main intuition for our results.

Individuals belong to two communities, the H -community and the L -community, which are distinguished only by the quality of the options available to their members outside the diamond industry. In practice, the L -community refers to the Kathiawaris while the H -community includes the more established Marwaris and Palanpuris. The payoff outside the diamond industry for individual i from community j in any period is described by the expression $u^j + r_O \omega_i^j$, where u^j measures outside options that are common across all members of the community, $u^L < u^H$, and r_O measures the returns to individual ability outside the industry. The diamond industry is an industry in which an individual with initiative and resourcefulness can do exceptionally well and so it seems reasonable to assume that $r_I > r_O$.

Without individual experience effects, the individual will enter the industry in period t as long as

his payoffs inside the industry exceed the payoffs outside in that period. In general, there exists a threshold ability ω_t^j in each period t satisfying the condition:

$$w^j + r_O \omega_t^j = G_{t-1}^j + r_I \omega_t^j. \quad (2)$$

Suppose that ability is uniformly distributed on the unit interval for all cohorts in both communities. This assumption will later allow us to conveniently evaluate the effect of changes in the underlying ability distribution on the pattern of entry and the strength of the networks. It then follows that individuals with $\omega_i \in [\omega_t^j, 1]$ will enter the industry and entrepreneurs with $\omega_i \in [0, \omega_t^j]$ will stay outside. Individuals receive referrals from their network in perpetuity, so it is easy to verify that a strategy in which no firm exits once it has entered the industry can be sustained in equilibrium.

From equation (2), and given our distributional assumption, the average ability of entrants from community j in period t is given by the expression:

$$W_t^j = \frac{1}{2} \left[1 + \frac{w^j - G_{t-1}^j}{r_I - r_O} \right]. \quad (3)$$

We will later describe alternative mechanisms, based on differences in outside options $u^L < u^H$, through which the L -community network would have strengthened more rapidly than the H -community network. For the time being suppose that this is the case: $\frac{dG_{t-1}^L}{dt} > \frac{dG_{t-1}^H}{dt}$, $\forall t$. It follows immediately, from equation (3), that the average entrant's ability will decline more steeply in the L -community over time, matching the entry patterns in Figure 1 and Table 4.

4.2 Alternative Explanations

The alternative explanations for the patterns in Figure 1 and Table 4 that we consider next do not require networks to be active. They will be derived by allowing communities to differ along other dimensions, specifically by relaxing some of the assumptions that we made to get to equation (3). One of these alternative explanations will be ruled out immediately using the results in Table 4. The other explanations will be ruled out in the next section, using variation in firm performance across communities and over time.

1. The ability distribution varies across cohorts and communities: Suppose we relax the assumption that the ability distribution is fixed and allow ability over successive cohorts to decline and to diverge across communities. With our distributional assumption, this is conveniently implemented

by allowing the right support of the ability distribution to decline across all cohorts, but more steeply in the L -community. Then it is easy to verify from equation (3) that W_t^j will decline more steeply in the L -community even when network effects, measured by G_{t-1}^j , are absent.

As discussed, the fact that entrepreneurs establish their firms at different ages allows us to control for differential changes in population characteristics across communities. Recall from Table 4, Columns 4-6 that the Kathiawari-establishment year coefficient grows larger in absolute magnitude when the age terms are included, indicating that differences in family background and educational attainment between the Kathiawaris and the more established communities may actually have been narrowing over time. The age variables control for *average* changes in population characteristics across cohorts and it is possible, at least in principle, for the right support of the ability distribution to diverge even as average ability was converging across communities. Tests described below, based on firm performance across communities and over time, will be used to rule out this unlikely possibility.

2. Outside options vary across communities and over time: Returning to equation (3), suppose now that u^j is declining over time, more steeply in the L -community. Once again, W_t^j will decline more steeply in the L -community, without requiring networks to be active. This alternative explanation is more difficult to rule out because changes in outside options occur contemporaneously with entry decisions.

One approach to rule out this alternative explanation, as well as the possibility that the age controls do not fully account for differential changes in population characteristics, is to study firm performance across communities and over time. With constant returns to scale in production, the firm's payoff or profit is a linear function of its exports. In our framework, the firm's performance, measured by its exports, can then be described by the expression: $\theta[G_{t-1} + r_I \omega_i^j]$, where θ is a positive constant mapping profits into exports. Firm-level export data over the 1994-2004 period were made available by the GJEPC. If networks are absent and the relatively steep ability decline in the L -community is caused by changing outside options or population characteristics, then exports should decline more steeply in the L -community. More generally, once we allow for secular shifts in exports over time, the prediction is that exports in the L -community should increasingly lag behind exports in the H -community. In contrast, if an underlying network is supporting the entry of entrepreneurs with weaker backgrounds, then a comparison of unconditional exports across communities yields ambiguous results.¹⁶ Once we

¹⁶It can be verified from equation (2), after some manipulation, that the marginal entrant's exports will lag behind over time in the L -community when networks are active. However, the comparison of entrepreneurs with average ability in their community is not as straightforward.

control for compositional change with firm fixed effects, the assumption that $\frac{dG_{t-1}^L}{dt} > \frac{dG_{t-1}^H}{dt}$ implies that the export trajectory must certainly be *steeper* in the L -community when networks are active. Under the alternative hypotheses, exports in the L -community and the H -community should, instead, track together when fixed effects are included.

3. Ability is mis-measured: The model and the regressions in Table 4 assume that entrepreneurial ability is measured by family background alone. However, the intrinsic capability that the entrepreneur is endowed with could also contribute to his success. Once we relax the assumption that each firm consists of a single entrepreneur, the senior partner could also compensate for any personal weakness by matching with capable partners or hiring well qualified employees. Finally, entrepreneurs could compensate for their weak business backgrounds by preparing themselves prior to establishing their firms. The survey collected information on the entrepreneur’s employment activity prior to entering the diamond industry as well as his activities within the industry prior to entering the current firm. In general, there is no evidence that the Kathiawaris make a special effort to prepare themselves prior to entry.¹⁷ Nevertheless, we leave open the possibility that entrepreneurs could compensate for their weak personal backgrounds along other unobserved dimensions, differentially across communities and over time, in which case the observed patterns in Figure 1 could be entirely spurious.

To demonstrate that effective ability among the entering Kathiawari entrepreneurs did indeed decline over time relative to their rivals, we once again take advantage of the fact that firm-level export data are available over multiple years. If the pool of Kathiawari entrepreneurs is indeed worsening over time, then the export trajectory for that community should grow steeper once fixed effects that control for this compositional change are included. Moreover, if the ability decline is steeper for the Kathiawaris than for the Marwaris and Palanpuris, then the *impact* of the fixed effects on the export trajectory should be larger in that community.

4. Returns inside the industry vary across communities and over time: Since we are concerned with cross-community variation in family background and firm exports, we could easily relax the assumption that prices and the returns to ability in the diamond industry are constant. However,

¹⁷The activities prior to entry into the industry include: did nothing, farming, white-collar professional job, jewelry business, colored stone or pearl business, and other business. Combining the last three categories, 6% of the Kathiawaris versus 19% of the Marwaris and 9% of the Palanpuris reported that they were engaged in any type of business activity before entering the industry. The list of activities within the industry but prior to entering the current firm included: did nothing, cut and polished diamonds, worked as a manufacturing contractor, served as an employee/apprentice, worked as a broker, was involved in rough or polished trading, and was a partner in another firm. Combining the last four categories, 52% of the Kathiawaris versus 71% of the Marwaris and 65% of the Palanpuris reported prior activity that would have prepared them directly for the diamond export business.

if Kathiawaris occupy a particular niche in the diamond industry and returns in that niche have grown disproportionately fast over time, then this could explain the weakening family background of entering Kathiawaris without an accompanying decline in their relative performance, even if networks are absent.

Kathiawari firms tend to specialize in small stones; these stones account for 57% of their output by value, versus 44% and 49% for the Marwaris and the Palanpuris, respectively.¹⁸ Small stones make up the most dynamic and competitive segment of the market and, if anything, we would expect the availability of these stones (per firm) to have declined over time, relative to other sizes. We will nevertheless include the proportion of small stones in the firm's output interacted with time as an additional variable in the export regression (the uninteracted proportion will also be included in the specification without fixed effects), with the expectation that this should only strengthen the results.

4.3 Firm Performance Across Communities and Over Time

Citing confidentiality concerns, the GJEPC did not release firm-level export figures when it provided its database to be used to design the survey in 2004. However, it reversed its decision in 2005 once the survey had been completed and I had established more credibility in the industry. I was provided with export data over the 1994-2004 period, which can be matched to the 95% of firms in the sample that appear in the database. To mask firm-specific figures, the firms in the database were sorted by export level and then divided into 100 groups in each year by the GJEPC. The average export level in a group was then assigned to all firms in that group. While this procedure generates some noise in the export data, it does not bias the estimated community coefficients in the export regressions that I describe below.

Table 5, Column 1 regresses exports on a time trend, the interaction of the time trend with Kathiawari and Marwari dummies, and a full set of community dummies.¹⁹ We see that the coefficient on the Kathiawari-year interaction term is positive but insignificant; Kathiawari exports do not lag behind Palanpuri exports despite the fact that entrepreneurs from this community with relatively weak backgrounds were entering the industry over time. The community-year effects in Column 1

¹⁸We classified stones into seven sizes in the survey: -2, stars, mele, +11, pointers, stones, and larger stones. Small stones are defined to include -2, stars, and mele.

¹⁹For firms with multiple names, we took care to discard the "shell firm," which typically reports negligible exports in each year. An additional complication when computing the export figures is that polished diamonds sold to merchant exporters will not appear under the supplying firm's name. Based on changes in the organization of firms that we report below, this would increasingly underestimate export levels for the Kathiawaris over time and so provide a conservative estimate of the role of their network in supporting entrepreneurship.

reflect changes in the strength of the network as well as changes in the composition of firms over time. Controlling for compositional change with firm fixed effects in Column 2, the Kathiawari-year interaction coefficient increases in size and is now significant at the 5 percent level. The increase in the steepness of the export trajectory from Column 1 to Column 2 is substantially larger for the Kathiawaris than for the Marwaris or Palanpuris, indicating that the relatively steep decline in the background of entering entrepreneurs from that community did indeed have consequences for firm performance. As discussed above, the fact that the Kathiawaris do not lag behind in Column 1, together with their significantly steeper trajectory in Column 2 with fixed effects, also rules out differential changes in outside options or population characteristics as alternative explanations for our results.

Another explanation for the selective entry, which is also consistent with changes in performance across communities and over time, is based on rapidly improving conditions in the Kathiawari segment of the industry. Table 5, Columns 3-4 include the proportion of rough stones in the firm's output interacted with time as an additional regressor (the uninteracted variable is also included in Column 3 without fixed effects). The coefficient on this interaction term is negative and significant (in Column 4), indicating that the small-stone segment has become relatively *less* profitable over time, while the Kathiawari-year coefficient continues to be positive and significant once fixed effects are included.

When a firm is involved in all stages of the production process, typically three partners, who are invariably close relatives, are required; one to buy roughs, the second to supervise the cutting and polishing, and the third to market the polished. In contrast, a merchant exporter could get by with no additional partners. Many Marwari and Palanpuri firms have restricted their activities to merchant exporting in recent years, often leading to the termination of existing partnerships. This explains, in part, why over 17% of Marwari and Palanpuri firms were formed following a separation by partners, as opposed to only 8% of the Kathiawari firms.²⁰ When two relatives who were partners separate, one individual will keep the original name while the other starts a new firm under a different name. Since rough suppliers and polished buyers will be divided among the partners, both firms will be smaller than the original firm, at least to begin with. To rule out the possibility that the positive Kathiawari-year coefficient is a consequence of greater separation among Marwari and Palanpuri firms,

²⁰The Kathiawari firms have significantly more partners than firms from the other communities: The average number of partners, with standard errors in parentheses, is 2.81(0.12), 2.07(0.12), 2.22(0.07) for the Kathiawaris, Marwaris, and Palanpuris, respectively. Moreover, around 40% of the Marwari and Palanpuri firms are proprietary concerns versus 25% of the Kathiawari firms.

Table 5, Columns 5-6 exclude firms that have separated or were formed following a separation from the sample. The Kathiawari-year coefficient remains stable and continues to be precisely estimated with this reduced sample of firms.²¹

Notice, in contrast with the positive Kathiawari-year coefficient, that the coefficient on the Marwari-year term is negative across all specifications in Table 5, consistent with the view that superior outside options in that community are associated with a weakening industry-specific network. The estimated coefficients in the fixed effects regressions indicate that the Kathiawari network increased average sales for its members by approximately 240 thousand dollars per year over and above the Palanpuri benchmark, which reflects growth in that network as well as secular changes in the industry, effectively compensating for their increasingly weak business backgrounds. To get a sense of the importance of this differential network effect, average annual sales for Kathiawari firms were roughly 4.7 million dollars per year over the 1994-2004 period.²²

5 Network Strengthening Mechanisms

In this section we consider two mechanisms through which networks could have strengthened over time: (i) growth at the *extensive* margin through an increase in the number of firms, and (ii) growth at the *intensive* margin through network-strengthening investments by members of the network. We will see that the Kathiawari network should have grown stronger, under reasonable conditions, in each case. However, only the latter mechanism turns out to be empirically relevant in this industry.

5.1 Growth at the Extensive Margin

As discussed, the set of entrepreneurs providing referrals varies from one period to the next depending on the mix of stones received by suppliers in Antwerp. If a fixed proportion of entrepreneurs in the network provide referrals in each period and each entrepreneur provides a fixed number of referrals

²¹Although we ruled out individual experience effects when modelling entry decisions and firm performance, the cross-community patterns in Table 5 could also be obtained if firms with weaker backgrounds, who are disproportionately Kathiawari, benefit more from their experience in the industry. It is well known that individual experience effects and time effects (the network effects in this context) cannot be separately identified with panel data once fixed effects are included. However, if experience effects were indeed substantially larger for entrepreneurs with weaker backgrounds, then we would expect such entrepreneurs to enter the industry at a younger age. Instead, we see precisely the opposite pattern (not reported), both in the full sample and within each community.

²²Exports are measured in millions of 1994 Rupees in Table 5 and the exchange rate was 31 Rupees to the dollar in that year. While the Kathiawaris grow at least as fast as the Marwaris and Palanpuris in Table 5, they do not lag behind in the *level* of exports either. Average exports over the 1994-2004 period (in millions of dollars per year) are 3.8 for the Marwaris and 5.0 for the Palanpuris.

then it is evident that the probability of receiving a referral is independent of network size. However, the amount of referrals received on credit with each referral will be positively correlated with network size if larger networks can sustain higher levels of cooperation. Apart from the loss in network services (referrals), an individual who has reneged on his obligations could also lose access to the suppliers that his network is connected with and this loss would be increasing in network size under the reasonable assumption that larger networks interact with more suppliers. A larger network might also be better positioned to punish the deviator by adversely affecting his reputation outside the industry; for example, by reducing his marriage prospects in the wider community. With larger sanctions, inside and outside the industry, higher levels of credit can be sustained without default, increasing the level of production and hence the profits of firms in larger networks.

As before, assume that the individual receives referrals from the cohort that preceded him. When ability is uniformly distributed on the unit interval, the size of the network that is available to an individual who enters the industry in period t is $1 - \omega_{t-1}^j$, where ω_{t-1}^j is the threshold ability in period $t - 1$. The network's strength, when it is determined by its size alone, can then be described by the expression $G_{t-1}^j \equiv g(1 - \omega_{t-1}^j)$, with the g parameter mapping network size into the individual's profit or payoffs.

With this characterization of the network, equation (2) can be rewritten as

$$\omega_t^j = \frac{w^j - g(1 - \omega_{t-1}^j)}{r_I - r_O} \equiv \alpha^j + \beta \omega_{t-1}^j. \quad (4)$$

To initiate the network dynamics, assume that all individuals with ability above ω_0 are exogenously moved into the industry, in both the H -community and the L -community, in period 0. Starting with the first period and moving forward in time we solve recursively to obtain

$$\omega_t^j = \frac{\alpha^j}{1 - \beta} + \left(\omega_0 - \frac{\alpha^j}{1 - \beta} \right) \beta^t. \quad (5)$$

Treating time as a continuous variable, $\beta \in (0, 1)$ and $\omega_0 - \frac{\alpha^j}{1 - \beta} > 0$ ensure that ω_t^j converges to $\alpha^j / (1 - \beta)$ and that ω_0 is greater than the steady-state ability threshold, which implies that:

$$\frac{d\omega_t^j}{dt} = \left(\omega_0 - \frac{\alpha^j}{1 - \beta} \right) \beta^t \ln \beta < 0$$

$$\frac{d^2\omega_t^j}{d\alpha^j dt} = \frac{-\beta^t}{1 - \beta} \ln \beta > 0.$$

Noting that α^j is increasing in u^j , the threshold ability level declines over time in both communities, with a steeper decline in the L -community. Based on our characterization of network strength, it follows immediately that the L -network strengthens more rapidly than the H -network over time. In addition, since $W_t^j = (1 + \omega_t^j)/2$, it is easy to verify that the average entrant's ability declines more steeply over time in the L -community as well.²³ These results are generated entirely by differences in outside options between communities; $u^L < u^H$.

Variation in network size across communities and over time can, in principle, explain the observed patterns in Table 4 and Table 5. The question is whether growth at the extensive margin is empirically relevant in this industry. To address this question, Figure 2 plots the number of firms by community over the 1965-2004 period, based on the establishment year of the firms in the sample. The Palanpuris are always the dominant group, growing at a fairly constant rate over the entire 40-year period. The Marwaris and the Kathiawaris track together at a slower rate up till the early 1980s, but while the Marwaris continue to grow at that rate, the Kathiawaris grow as fast as the Palanpuris thereafter. Contrary to the popular perception in the industry that the Kathiawaris suddenly entered business in the late 1970s, we see that a few Kathiawari firms were active as far back as the 1960s. Nevertheless, there is a trend-break in the early 1980s, which is just after the time that the first supply shocks hit the industry. If we were to divide the 1965-2004 period into two equal halves, the Kathiawaris would actually grow significantly faster than the Palanpuris in the latter period (not reported). The relatively small difference in these trajectories, however, does not seem sufficient to explain the rapidly expanding gap in the ability of entering firms across communities and over time described in Table 4 and Figure 1.

Why didn't the number of Kathiawari firms grow faster over time? Communities are distinguished by their outside options alone in our framework, whereas we would expect the underlying ability distribution in the Kathiawari population to be dominated by the corresponding distributions among the Marwaris and Palanpuris as well. In our framework, differences in ability across communities can be conveniently generated by allowing the right support of the distribution to vary. Let this support be denoted by S^j , with $S^L < S^H$. From equation (4), $\alpha^j \equiv \frac{w^j - gS^j}{r_I - r_O}$, making clear the opposing effects of outside options and ability. We could control for differences in underlying ability in Table 4 to

²³A previous version of the paper showed that this result would be obtained as long as the technology mapping network size to individual profits was not too concave and the density was non-decreasing moving down the ability distribution. These conditions ensured that the L -network would grow more rapidly at each point in time, even when it had far outstripped the H -network in size.

isolate the effect of the network on selection into the industry. However, when measuring changes in network strength, it is the unconditional growth in the number of firms that matters, and in this industry these opposing forces appear on net to have generated little additional entry and, hence, little extra growth in network size for the Kathiawaris.

5.2 Growth at the Intensive Margin

Up to this point we have assumed that all entrepreneurs benefit from the community network and contribute to it. The implicit condition underlying this assumption is that the threat of punishment by members of the network is sufficient to deter deviations from cooperative behavior. In practice, we might expect individuals to make investments in the industry-specific network that increase the level of cooperation that can be sustained in equilibrium. One example of such an investment is marriage within the industry. The basic marriage rule in Hindu society is that no individual can match outside the sub-caste or *jati*. The dense web of marriage ties that consequently forms over the course of many generations improves information flows and reduces commitment problems, and not surprisingly networks serving different functions have historically been organized, and continue to be organized, at the level of the *jati*. Among business communities, marriage alliances within specific industries are, in addition, commonly observed (Hazlehurst 1966). Such marriages strengthen industry-specific community networks when monitoring and enforcement at the wider *jati* level is imperfect, and in our sample, 35% of the entrepreneurs and 57% of their children married within the diamond industry.

In our simple framework, the individual chooses whether or not to enter the industry at a fixed age, at which time he makes his marriage decision as well. Individuals receive referrals from the cohort that preceded them. Although individuals can choose the level of participation in the network that is optimal for them in practice, we assume that only those individuals who marry within the industry contribute to the network and benefit from it. We will see that there exists an ability threshold above which individuals enter the diamond industry, as before. In addition, there will exist an ability threshold above which individuals select out of the network, conditional on having entered the industry. Payoffs inside the diamond industry can now be described by the expression:

$$X_i^j \cdot h \left[\bar{\omega}_{t-1}^j - \underline{\omega}_{t-1}^j \right] + r_I \omega_i^j - X_i^j \Delta r_I \omega_i^j,$$

where X_i^j equals one if individual i from community j who has chosen to enter the industry also invests

in the network, X_i^j equals zero if he does not. $\underline{\omega}_{t-1}^j$ is the ability threshold above which individuals entered the industry in the preceding cohort and $\bar{\omega}_{t-1}^j$ is the threshold above which they selected out of the network. Assuming that ability is uniformly distributed on the unit interval, the measure of firms that invest in the network in period t is $\Delta\omega_{t-1}^j \equiv \bar{\omega}_{t-1}^j - \underline{\omega}_{t-1}^j$. The linear mapping from this measure to individual payoffs is characterized by the h term, which is presumably larger than the g parameter defined earlier. Finally, the return to individual ability (conditional on having entered the industry) is assumed to be greater outside than inside the network; Δr_I measures this gap in returns. The motivation for this assumption, as in Munshi and Rosenzweig (2005, 2006), is that networks, and collective institutions more generally, equalize returns for their members, whereas the performance of independent entrepreneurs is much more responsive to ability. This implies that relatively high ability entrepreneurs will select out of the network in each community.

Using the preceding expression for payoffs inside the diamond industry, individual i in community j will invest in the network (conditional on having entered the industry) if:

$$h\Delta\omega_{t-1}^j - \Delta r_I \omega_i^j \geq 0.$$

Using the same expression for payoffs outside the industry as in equation (2) and noting that the marginal individual who enters the industry also invests in the network, individual i in community j will enter the industry (and invest in the network) if:

$$h\Delta\omega_{t-1}^j + (r_I - \Delta r_I)\omega_i^j \geq u^j + r_O\omega_i^j.$$

Based on the entry conditions derived above, the thresholds for selection out of the network and selection into the industry can be expressed as:

$$\bar{\omega}_t^j = \frac{h\Delta\omega_{t-1}^j}{\Delta r_I} \tag{6}$$

$$\underline{\omega}_t^j = \frac{u^j - h\Delta\omega_{t-1}^j}{r_I - r_O - \Delta r_I}. \tag{7}$$

Entrepreneurs with $\omega_i \in [0, \underline{\omega}_t^j)$ stay out of the industry, entrepreneurs with $\omega_i \in [\underline{\omega}_t^j, \bar{\omega}_t^j]$ enter the industry and select into the network, and entrepreneurs with $\omega_i \in (\bar{\omega}_t^j, 1]$ enter the industry but select out of the network. Subtracting the expression for $\underline{\omega}_t^j$ in equation (7) from the expression for $\bar{\omega}_t^j$ in equation (6),

$$\Delta\omega_t^j = \frac{-\Delta r_I u^j + (r_I - r_O)h\Delta\omega_{t-1}^j}{p(r_I - r_O - \Delta r_I)} \equiv -\tilde{\alpha}^j + \tilde{\beta}\Delta\omega_{t-1}^j.$$

Assume that a measure $\Delta\omega_0$ of firms exogenously invest in the network in both communities in period 0. Moving forward in time and solving recursively, we obtain an expression analogous to equation (5),

$$\Delta\omega_t^j = \frac{\tilde{\alpha}^j}{\tilde{\beta} - 1} + \left(\Delta\omega_0 - \frac{\tilde{\alpha}^j}{\tilde{\beta} - 1} \right) \tilde{\beta}^t. \quad (8)$$

Imposing parametric restrictions, $\Delta\omega_0 - \frac{\tilde{\alpha}^j}{\tilde{\beta} - 1} > 0$, $\tilde{\beta} > 1$ that ensure that $\Delta\omega_t^j > 0$, the change in network strength – the measure of firms that invest in the network – across communities and over time can be described by the following expressions:

$$\begin{aligned} \frac{d\Delta\omega_t^j}{dt} &= \left(\Delta\omega_0 - \frac{\tilde{\alpha}^j}{\tilde{\beta} - 1} \right) \tilde{\beta}^t \ln \tilde{\beta} > 0 \\ \frac{d^2\Delta\omega_t^j}{d\tilde{\alpha}^j dt} &= \frac{-\tilde{\beta}^t}{\tilde{\beta} - 1} \ln \tilde{\beta} < 0. \end{aligned}$$

The measure of firms that invest in the network grows over time. This growth is steeper in the L -community, which implies that the gap in network strength across communities should widen over time, as observed in Table 5.²⁴ These differential changes in network strength have implications for the average ability of entrants into the industry across communities and over time. In this simple framework, the average entrant's ability, $W_t^j = (1 + \underline{\omega}_t^j)/2$. Substituting from equation (8) in equation (7), it is easy to verify that the average entrant's ability will decline over time, more steeply in the L -community, matching the patterns in Table 4.

By allowing firms to select into or out of the network, conditional on having entered the industry, we can also characterize the relationship between the evolution of networks and the organization of firms in the market. Most firms periodically make short trips to Antwerp and so must rely on their networks for much of their rough supply. Other firms have vertically integrated by establishing branches in Antwerp. This permanent presence in the Antwerp market allows them to source roughs directly, without relying on their networks. The ability of the network to punish these firms is consequently

²⁴ $\tilde{\beta} > 1$ implies that $r_I - r_O - \Delta r_I > 0$. It then follows that u^j and $\tilde{\alpha}^j$ have the same sign. Because $\tilde{\beta} > 1$, these comparative statics and the results derived below only apply to periods before the time that the entire entering cohort in the L -community invests in the network.

limited and they would have restricted access to the network in any case. Finally, merchant exporters restrict their activity to buying and selling polished diamonds and so would have little use for the network's services. Placing vertically integrated firms and merchant exporters outside the network, we can derive changes in the organization of firms across communities and over time by studying changes in $\bar{\omega}_t^j$. Substituting from equation (8) in equation (6), it is straightforward to verify that $d\bar{\omega}_t^j/dt > 0$, $d^2\bar{\omega}_t^j/d\tilde{\alpha}^j dt < 0$. The measure of non-network firms entering in each cohort is $(1 - \bar{\omega}_t^j)$. With infinitely-lived entrepreneurs, $d\bar{\omega}_t^j/dt > 0$ implies that the measure of non-network firms is increasing, but at a declining rate over time. The marginal decline is smaller in the H -community since $d^2\bar{\omega}_t^j/d\tilde{\alpha}^j dt < 0$. These results indicate that non-network firms are more likely to be drawn from the H -community and that the community-gap should be widening over time.²⁵ In our framework, firms belonging to the H -community are more likely to select out of the network for two reasons: First, they have higher ability on average than firms from the L -community and this ability gap is widening over time. Second, their network is weakening relative to the L -community network over time and so they have less to lose by selecting out of it.

Figure 3 plots the growth in the number of merchant exporters across communities and over time. These firms emerged in the mid-1970s, allowing the Kathiawaris, without contacts on the polished side of the market, to later enter the export business. As predicted, the merchant exporters are drawn predominantly from the Marwari and Palanpuri communities and it is apparent from the figure that the gap between the number of merchant exporters belonging to these established business communities and the Kathiawari community has grown over time. I define a merchant exporter to be a firm that has only been active on the polished side of the market, both when it started exporting and currently. A number of Palanpuris who were previously involved in all stages of the import-export process have recently reduced their activities to merchant exporting. If we accounted for the shift of such firms into merchant exporting in Figure 3, then the gap between the Kathiawaris and the other communities would widen even further over time.

A firm is defined to be vertically integrated when it establishes a branch in Antwerp and we see in Figure 4 that the number of vertically integrated Palanpuri firms increases dramatically from the late 1970s onwards. There is a fixed cost to setting up a branch abroad – apart from the monetary

²⁵This result does not follow mechanically because the measure of H -community firms in the industry is increasing more rapidly over time. Substituting from equation (8) in equation (7), we could go through a similar exercise for $\underline{\omega}_t^j$ to demonstrate that $d\underline{\omega}_t^j/dt < 0$, $d^2\underline{\omega}_t^j/d\tilde{\alpha}^j dt > 0$. The measure of new firms entering the industry in each cohort is given by $(1 - \underline{\omega}_t^j)$ and so these results imply that the total number of new firms entering the industry will be increasing at the margin, more rapidly in the L -community.

expense, a close relative must also typically reside there – and so the firm will weigh the returns from procuring roughs through the community network with the returns from this substantial investment when choosing between these options. The returns to vertical integration will depend to a large extent on how easy it is for the firm to access roughs on its own, once it is established in Antwerp. The exogenous increase in the world supply of rough diamonds, described earlier, presumably provided the impetus for Palanpuri firms to set up branches in Antwerp. And, as discussed, these firms played an important role in the subsequent growth of the Kathiawari network. Notice that the timing of the increase in vertical integration among the Palanpuris in Figure 4 matches perfectly with the onset of the ability decline among entering Kathiawari entrepreneurs in Figure 1.

While the gap in the number of vertically integrated Kathiawari and Palanpuri firms widens over time, as predicted, notice from Figure 4 that very few Marwari firms vertically integrate. Marwari business activities are well diversified across space and industries. Fixed investments in the industry, such as setting up a branch in Antwerp, are consequently particularly costly for the Marwaris and this might explain why they concentrate on the polished side of the market.²⁶

The number of Marwari and Palanpuri firms operating outside the network increased relatively rapidly over time in Figures 3-4, despite the fact that the total number of Kathiawari firms kept pace with the number of Palanpuri firms, and outstripped the Marwari firms, in Figure 2. These differential trajectories are consistent with the theoretical framework developed above. What remains is to verify that our measure of network strengthening investment, intra-industry marriage, increased more rapidly across entering cohorts in the *L*-community.

The dependent variable in Table 6, Column 1 takes the value one if the spouse’s family was in the diamond industry prior to their marriage, zero otherwise. The regressors include the firm’s establishment year, a full set of community dummies, and the interaction of the establishment year with the community dummies. The establishment year coefficient is negative but insignificant. Although the model predicts that intra-industry marriage should be increasing over time for all communities, this coefficient cannot be interpreted once we allow for secular changes inside or outside the industry. More importantly, the Kathiawari - establishment year coefficient is positive and significant, in line

²⁶Although the theoretical framework provides one explanation for why the Kathiawaris may be less likely to vertically integrate, an alternative explanation is that their rural, less Westernized background makes it difficult for them to live abroad. However, the Kathiawaris are nearly as likely as the Marwaris and Palanpuris to set up branches in the United States, Asia and Europe to market polished diamonds, and the increase in the number of these branches among the Kathiawaris matches the corresponding increase for the Palanpuris during the 1990s. Recall that networks are less important and that firms effectively operate independently on the polished side of the market.

with the network strengthening mechanism that has been proposed.²⁷

Intra-industry marriage will mechanically respond to growth in the number of firms in the industry, which expands the pool of prospective partners from within the industry and the community. We saw in Figure 2 that the number of Kathiawari firms did not grow especially fast, at least relative to the Palanpuris. Nevertheless, we include the number of firms from the entrepreneur's own community that were already active when his firm was established, and the squared value of this variable, as additional regressors in Table 6, Column 2. Not surprisingly, the results reported in Column 1 are unchanged, with the Kathiawari-establishment year coefficient, in particular, continuing to be positive and significant.

Apart from his own marriage decision, the entrepreneur could also invest in the network through the marriage choices he makes for his children. Although the Kathiawari children continue to lag behind the established communities in educational attainment and the likelihood of being schooled in English, the community-gap has narrowed substantially across the generations (not reported). The sons of the respondents who have completed school are almost without exception absorbed into the diamond industry, whereas almost none of the daughters work outside the home. The corresponding statistics for the spouses of the (married) children broadly match these occupational patterns, except that a significant proportion of the daughters marry white-collar professionals or businessmen in other industries. One-third of the Marwari daughters are married to businessmen operating outside the diamond industry, consistent with the idea that many outside opportunities are available for members of that community. Along the same lines, just 16% of the daughter-in-laws and 37% of the son-in-laws of the Marwari respondents come from families that were already in the diamond business prior to marriage. These numbers are significantly lower than the corresponding statistics for the Kathiawaris and Palanpuris. However, 90% of the children from all three communities continue to marry within their *jatis*, highlighting their continued ties to the broader community networks.

Table 6, Column 3 repeats the regression that we ran for the entrepreneur in Column 1, with

²⁷Marriage within the community or sub-caste would seem to be a pre-condition for marriage within the industry, based on our characterization of the industry-specific community network. As expected, while 92% of the entrepreneurs in the sample married within their community, the corresponding statistic for entrepreneurs who married within the industry is as high as 98%. Although caste networks have been historically very stable, recent evidence from urban India indicates that some of these traditional networks may be starting to decay, with an accompanying decline in intra-community marriage (Munshi and Rosenzweig 2006). An alternative explanation for the cross-community variation in Table 6, Column 1 would then be that intra-community marriage has declined more rapidly over time among the urbanized and Westernized Marwaris and Palanpuris. However, regressions (not reported) with our sample of entrepreneurs indicate that intra-community marriage actually *increased* over time among the Palanpuris (the reference category), while remaining roughly constant for the other two communities.

intra-industry marriage for the children as the dependent variable. The child's gender is now included as an additional regressor but the specification from Column 1 is otherwise unchanged. Once again, the Kathiawari-establishment year coefficient is positive and statistically significant. Table 6, Column 4 includes the number of firms from the entrepreneur's community that were already active in the industry when his firm was established (linear and quadratic terms) as additional regressors, without changing any of the results once again.

To provide a sense of the economic importance of these cross-community differences in marriage patterns, Figure 5 presents nonparametric estimates of the relationship between the entrepreneur's marriage choice and the firm's establishment year, corresponding to the specification in Column 1. The nonparametric estimates for the Marwaris and Palanpuris are noisy in the tails (pre-1975 and post-2000), but no time trend is discernable in either community, consistent with the estimates in Table 6, Column 1. Sample averages indicate that 16% of the Marwaris and 45% of the Palanpuris married within the industry. The corresponding statistic for the Kathiawaris is 28%, but as in Table 6, Column 1 notice the substantial increase in such network strengthening marriages over time, starting just above zero in 1970 and reaching 45% by 2004. Munshi and Rosenzweig (2005, 2006) describe how individuals at the top of the ability or wealth distribution in their sub-caste start to exit, with an accompanying increase in out-marriage, as their traditional networks start to decay. In this paper we observe the opposite pattern, with a decline in the marginal entrant's ability and an increase in intra-industry marriage as the new Kathiawari business network develops.

Previously we attributed the relatively slow increase in the number of Kathiawari firms, despite their poor outside options, to the effect of a weaker ability distribution in that community. When it comes to growth at the intensive margin, however, the effect of weaker ability is no longer unambiguously negative. Lower ability will continue to dampen entry into the industry, mechanically reducing the size of the network. But lower ability individuals are also more likely to invest in the network, conditional on having entered the industry. The net effect of worse outside options and lower ability in this industry appears to have been to strengthen the Kathiawari network, relative to its rivals, at the intensive margin.

The preceding argument relies, in part, on the assumption that firms with relatively low ability in their entering cohort are more likely to invest in the network. We complete the analysis by verifying this assumption. Let non-network firms include merchant exporters and vertically integrated firms and let network firms include all other exporters. Including the firm's establishment year, a full set of

community dummies, and the interaction of the establishment year with these dummies, as controls we see in Table 7, Columns 1-3 that network firms have lower observed ability as assumed, although the network coefficient is only significant at the 10 percent level. Further, entrepreneurs and their children from network firms are significantly more likely to marry within the industry in Columns 4-5, consistent with the equilibrium correlation between network membership and marriage implied by the model.

6 Conclusion

This paper documents the role played by a new business network in supporting occupational mobility in an industry with substantial barriers to entry. Based on the preceding analysis, there are three reasons why such mobility could fail to be observed in other industries: First, if the tradeoff between ability and outside options is less favorable than it was in the diamond industry, then new networks might fail to grow, even at the intensive margin, dampening entry by new entrepreneurs. Second, although we do not model network dynamics in this fashion, it is possible that there exists a minimum scale below which networks cannot function. In the diamond industry, a supply shock fortuitously generated simultaneous entry by a number of new entrepreneurs. Non-convexities in the network technology could, however, serve as a barrier to entry in other industries. Third, in industries where networks are absent, there is no force that will emerge endogenously to compensate potential entrepreneurs for their weak family backgrounds.

The provision of (subsidized) bank credit will promote new entrepreneurship in each of the scenarios described above. In the second scenario, a temporary infusion of credit is sufficient to set the new network on a positive growth trajectory. In the other scenarios, however, disadvantaged individuals or groups would need to be supported for much longer periods of time – as long as a generation in the framework of our model – with ambiguous efficiency and welfare consequences. In an industry such as the diamond industry where the network and supplier credit have effectively substituted for bank credit, the infusion of this new source of capital could actually have substantial negative consequences, as discussed below.

Diamond firms have few fixed assets and banks must use their rough inventory as security when providing them with credit. The value of rough diamonds is uncertain and easily manipulated, and so it is no surprise that banks have historically kept away from this industry. However, this policy

has changed dramatically with financial liberalization in India. Ten years ago, three banks provided credit to the industry. Today, nearly 60 banks provide credit (*Solitaire International*, January 2007) and the current outstandings, based on Reserve Bank of India statistics, are estimated to be close to four billion dollars.

This surge in bank credit allowed firms to compete vigorously for roughs in Antwerp, pushing up the price and encouraging DeBeers and other primary suppliers to unload their rough stocks on the market from 2000 onwards. The increase in the polished diamond supply that followed quickly outstripped the demand and as noted in Section 3 the delay in payment on the polished side of the market had lengthened substantially by 2004-05. This delay made it difficult for firms to repay their rough suppliers in a timely fashion and starting from 2005, the rough suppliers in Antwerp cut back drastically on their credit to diamond firms. Without supplier credit, which continues to be the main source of capital in the industry, the rough diamonds cannot move and the industry is now in a downturn. The past few months have witnessed the unprecedented phenomenon of sightholders refusing to accept their boxes of roughs, which were once a prized commodity, from the DTC and industry observers predict that the downturn in the industry is unlikely to be rectified in the immediate future (*IDEXmagazine*, Issue no. 198, October 10, 2006).²⁸

There are two reasons why the rough suppliers might have cut back on credit. First, the availability of bank credit without sufficient monitoring allowed firms to buy roughs recklessly, pushing up the price and increasing delays in payment and default rates. Second, firms that now had access to bank credit had less to lose by renegeing on their obligations to the network, providing another channel through which defaults would have increased. Networks that took many decades to mature have now been undermined and it is not clear that they will be in a position to provide their former levels of support when the industry corrects itself and recovers from the current downturn. The banks could, in principle, have exploited the monitoring and enforcement capability of the networks to judiciously increase the supply of capital and stimulate entry, as well as growth in the industry. Instead, the indiscriminate provision of bank credit may have undermined an institution based on trust that took many decades to develop, leaving the industry less stable in the future.

²⁸Reserve Bank of India statistics indicate that the ratio of bank credit outstanding to imports in the Gem and Jewelry sector was just under 0.25 from 1997 to 2004, then increased unexpectedly to 0.37 in 2005 and to 0.41 in 2006. Rough diamonds account for approximately 90% of Gem and Jewelry imports, by value, and so these changes in the credit-import ratio are almost certainly associated with the downturn in the diamond industry and the associated decline in supplier credit. The banks are currently dangerously over-exposed in this industry and recent statements by bankers indicate that they are now aware of the problem (*Solitaire International*, January 2007).

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Table 1: Referral Pattern

Source of referrals:	number of individuals that provided referrals (1)	total number of referrals provided (2)	percent of referrals for Kathiawaris (3)	percent of referrals for Marwaris (4)	percent of referrals for Palanpuris (5)
Kathiawari exporters	60	212	74.06	2.83	20.28
Marwari exporters	24	206	12.62	42.72	37.86
Palanpuri exporters	128	707	9.19	9.05	78.64
Brokers	47	239	31.38	14.23	51.05
Other	36	109	18.35	21.10	49.54

Note: Other sources of referrals include personal connections of the survey team and firms belonging to other communities.

A total of 295 individuals provided referrals in Column 1.

These individuals provided a total of 1,473 referrals in Column 2.

Columns 3-5 sum to approximately 95% because some referrals are also made to exporters from other communities.

Table 2: Organization of Production

Community:	Kathiawari	Marwari	Palanpuri
	(1)	(2)	(3)
Panel A: Rough transactions			
Number of suppliers per year	9.98 (1.17)	11.68 (2.71)	10.76 (1.13)
Percent of firms with a single dominant supplier	70.78 (3.68)	70.83 (6.63)	71.48 (2.83)
Percent of roughs sourced directly from Antwerp	76.31 (2.37)	63.18 (4.99)	67.98 (2.15)
Percent of roughs received on credit	80.78 (2.27)	73.48 (4.99)	75.39 (2.03)
Average repayment period (days)	102.39 (1.88)	98.29 (4.78)	101.44 (1.79)
Percent of transactions involving a written agreement	3.95 (1.58)	9.76 (4.69)	6.28 (1.57)
Panel B: Polished transactions			
Number of buyers per year	33.23 (4.39)	49.57 (14.11)	30.11 (2.40)
Percent of firms with a single dominant buyer	52.91 (3.49)	69.03 (4.37)	58.65 (2.56)
Percent of polished sold directly to buyers abroad	59.10 (2.71)	69.42 (3.42)	63.35 (1.89)
Percent of polished sold on credit	77.20 (1.95)	82.95 (2.38)	84.37 (1.25)
Average repayment period (days)	102.11 (2.55)	114.24 (3.89)	113.49 (1.83)
Percent of transactions involving a written agreement	2.99 (1.20)	5.98 (2.20)	5.57 (1.18)

Note: standard errors in parentheses.

Dominant supplier is defined as a supplier who provides more than 30% of the firm's roughs.

Dominant buyer is defined as a buyer who accounts for more than 20% of the firm's polished.

Merchant exporters, who restrict their activity to the polished side of the market, are excluded from Panel A.

Table 3: Characteristics of Entrepreneurs

Community:	Kathiawari	Marwari	Palanpuri
	(1)	(2)	(3)
Panel A: Individual characteristics			
Age	42.46 (0.77)	46.13 (0.92)	49.05 (0.52)
Years of schooling	10.84 (0.26)	14.41 (0.19)	12.87 (0.12)
Percent schooled in English	11.47 (2.16)	47.20 (4.48)	37.28 (2.41)
Percent that grew up in Mumbai	22.02 (2.81)	26.40 (3.96)	49.38 (2.49)
Panel B: Family background			
<u>Father's occupation (%)</u>			
Farming	53.02	2.46	2.54
White-collar professional	5.58	13.93	15.52
Other business/store-owner/sales	11.16	27.05	27.23
Other jewelry business	5.12	29.51	11.96
Diamond cutting & polishing	7.44	1.64	6.62
Diamond broker/trader	2.79	3.28	9.92
Diamond exporter	14.88	22.13	26.21
Any business	34.56 (3.24)	82.40 (3.42)	75.81 (2.14)
Number of firms	218	125	405

Note: standard errors in parentheses.

Any business includes other business/store-owner/sales, other jewelry business, diamond broker/trader, and diamond exporter.

Table 4: Selection into the Industry

Dependent variable:	father not farmer	father business	schooling	father not farmer	father business	schooling
	(1)	(2)	(3)	(4)	(5)	(6)
Establishment year	-0.001 (0.001)	-0.002 (0.002)	-0.022 (0.007)	-0.001 (0.001)	-0.002 (0.002)	-0.030 (0.007)
Establishment year - Kathiawari	-0.008 (0.004)	-0.011 (0.004)	-0.017 (0.024)	-0.016 (0.004)	-0.016 (0.004)	-0.065 (0.025)
Establishment year - Marwari	-0.00004 (0.001)	-0.003 (0.002)	0.025 (0.017)	0.0001 (0.001)	-0.003 (0.003)	0.031 (0.018)
Age terms	No	No	No	Yes	Yes	Yes
Number of observations	737	737	737	737	737	737

Note: Standard errors in parentheses clustered by establishment year.

All regressions include community dummies.

Entrepreneur's age is included, uninteracted and interacted with Kathiawari and Marwari dummies, in Columns 4-6.

Business occupations include other business/store-owner/sales, other jewelry business, diamond broker/trader, and diamond exporter.

Schooling is measured as years of educational attainment.

Table 5: Firm Performance

Dependent variable: Sample:	exports					
	all firms				excluding separated firms	
	(1)	(2)	(3)	(4)	(5)	(6)
Year	12.940 (2.093)	14.272 (1.906)	17.593 (4.440)	20.585 (3.287)	14.114 (2.241)	15.293 (1.954)
Year-Kathiawari	1.874 (3.938)	7.419 (2.223)	2.744 (3.803)	8.266 (2.362)	3.453 (4.054)	8.892 (2.411)
Year-Marwari	-7.514 (2.332)	-6.626 (2.153)	-8.214 (2.520)	-7.583 (2.408)	-7.113 (2.553)	-6.504 (2.298)
Year-proportion small stones	--	--	-0.100 (0.056)	-0.123 (0.031)	--	--
Firm fixed effects	No	Yes	No	Yes	No	Yes
Number of observations	6,114	6,114	5,965	5,965	5,233	5,233

Note: Standard errors in parentheses clustered by year.

Exports are measured in millions of 1994 Rupees.

Proportion small stones measures the proportion of the firm's output that is accounted for by -2, stars, and mele.

Separated firms are formed following a split among original partners.

All regressions without firm fixed effects include community dummies.

Table 6: Marriage Choices

Dependent variable: Generation:	married within the industry			
	firm owners		children	
	(1)	(2)	(3)	(4)
Establishment year	-0.001 (0.002)	0.007 (0.004)	0.001 (0.002)	0.002 (0.004)
Establishment year - Kathiawari	0.009 (0.004)	0.011 (0.005)	0.014 (0.004)	0.017 (0.005)
Establishment year - Marwari	0.003 (0.003)	-0.0002 (0.001)	0.008 (0.008)	0.009 (0.008)
Number of active firms in the community	No	Yes	No	Yes
Number of observations	742	742	588	588

Note: Standard errors in parentheses clustered by establishment year.

All regressions include community dummies. Columns 3-4 also include a gender dummy.

Number of active firms in the community is computed in the year that the firm was established (linear and quadratic terms are included as regressors).

Table 7: Selection into the Network

Dependent variable:	entrepreneur's characteristics			married within the industry	
	father not farmer	father business	schooling	entrepreneur	children
	(1)	(2)	(3)	(4)	(5)
Network firm	-0.031 (0.024)	-0.062 (0.037)	-0.396 (0.234)	0.079 (0.032)	0.081 (0.045)
Number of observations	737	737	737	742	588

Note: Standard errors in parentheses clustered by establishment year.

All regressions include community dummies and establishment year, uninteracted and interacted with Kathiawari and Marwari dummies.

Column 5 also includes a gender dummy.

Network firms exclude merchant exporters and vertically integrated firms.

Figure 1: Family Background of Entering Entrepreneurs

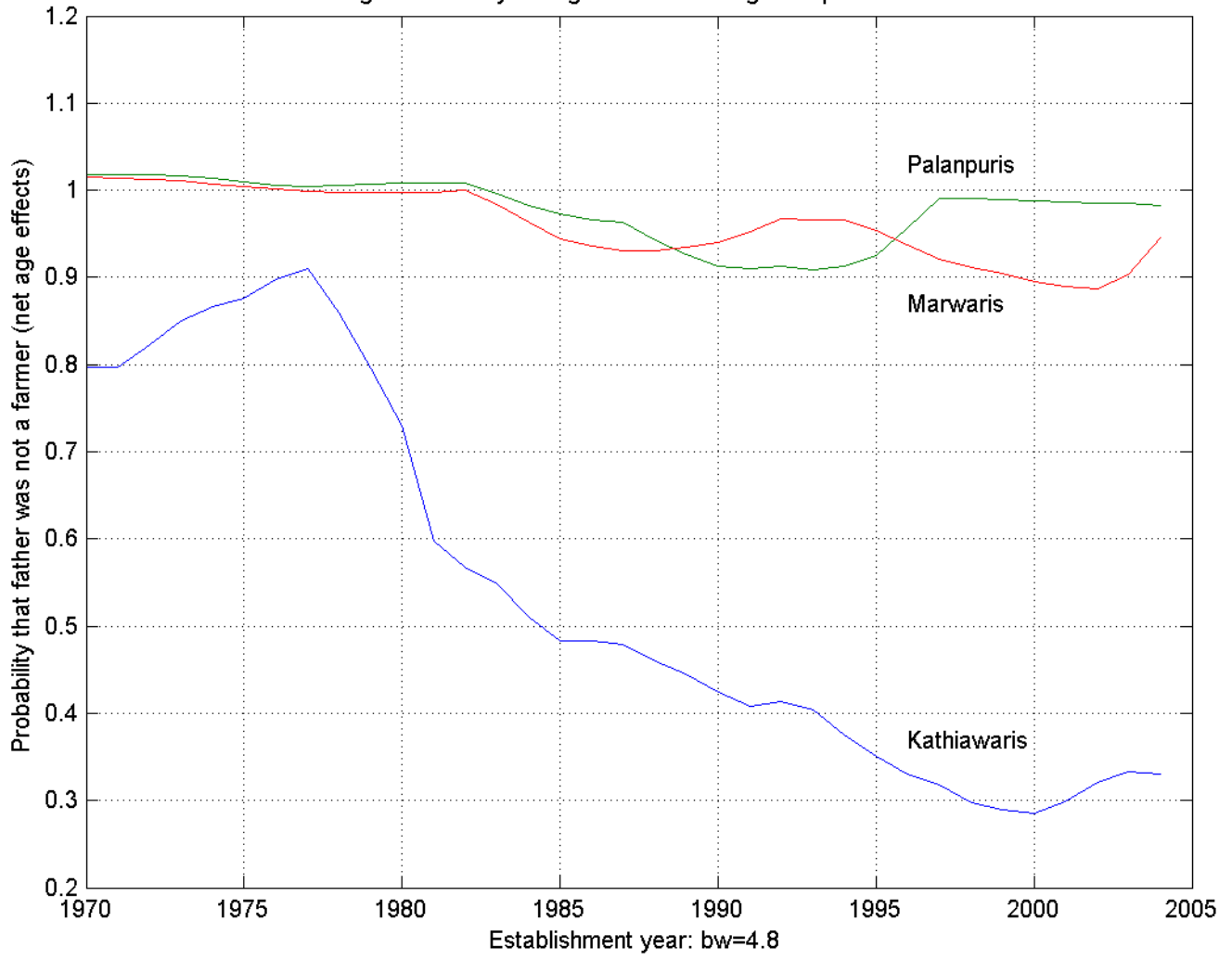


Figure 2: Number of Firms

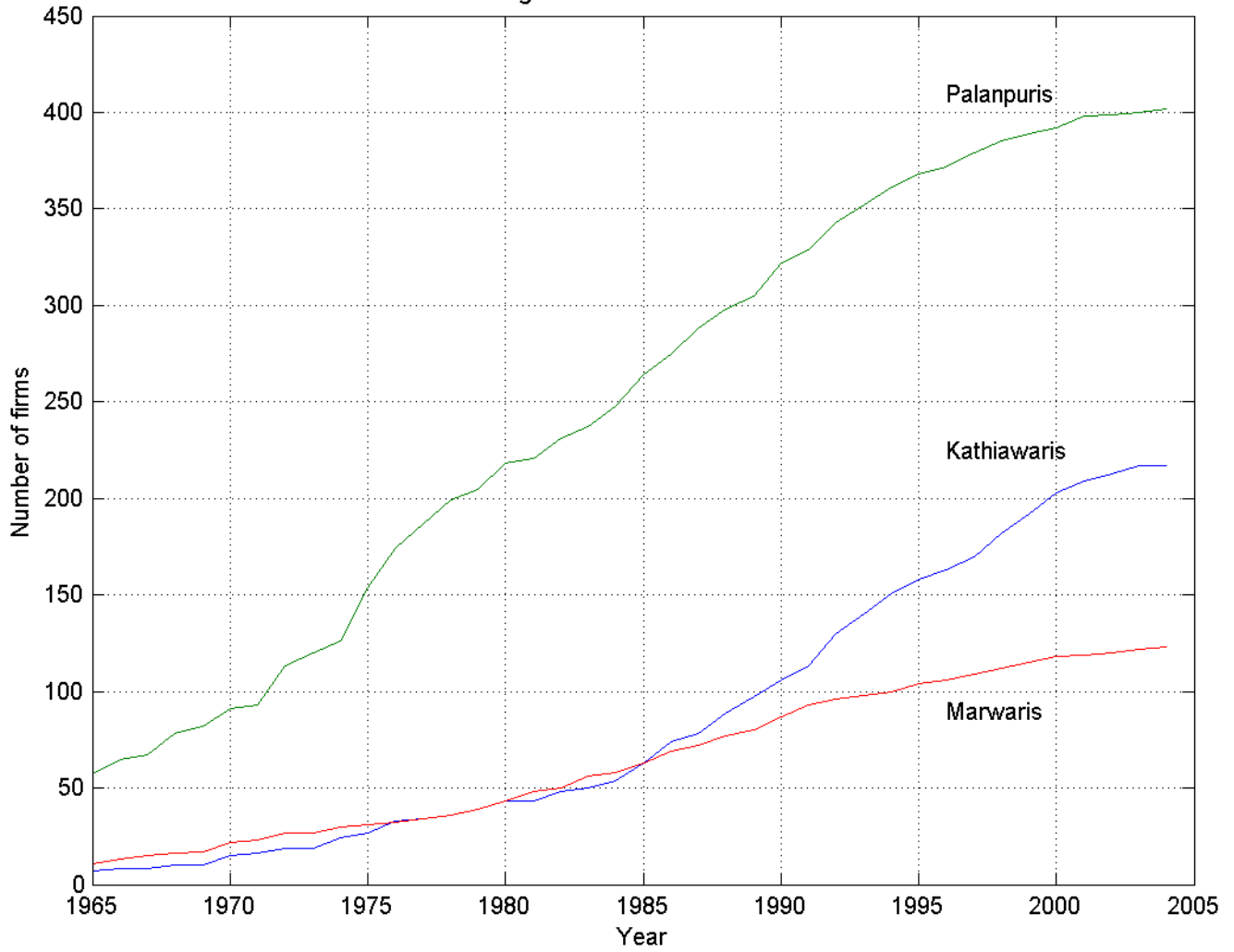


Figure 3: Number of Merchant Exporters

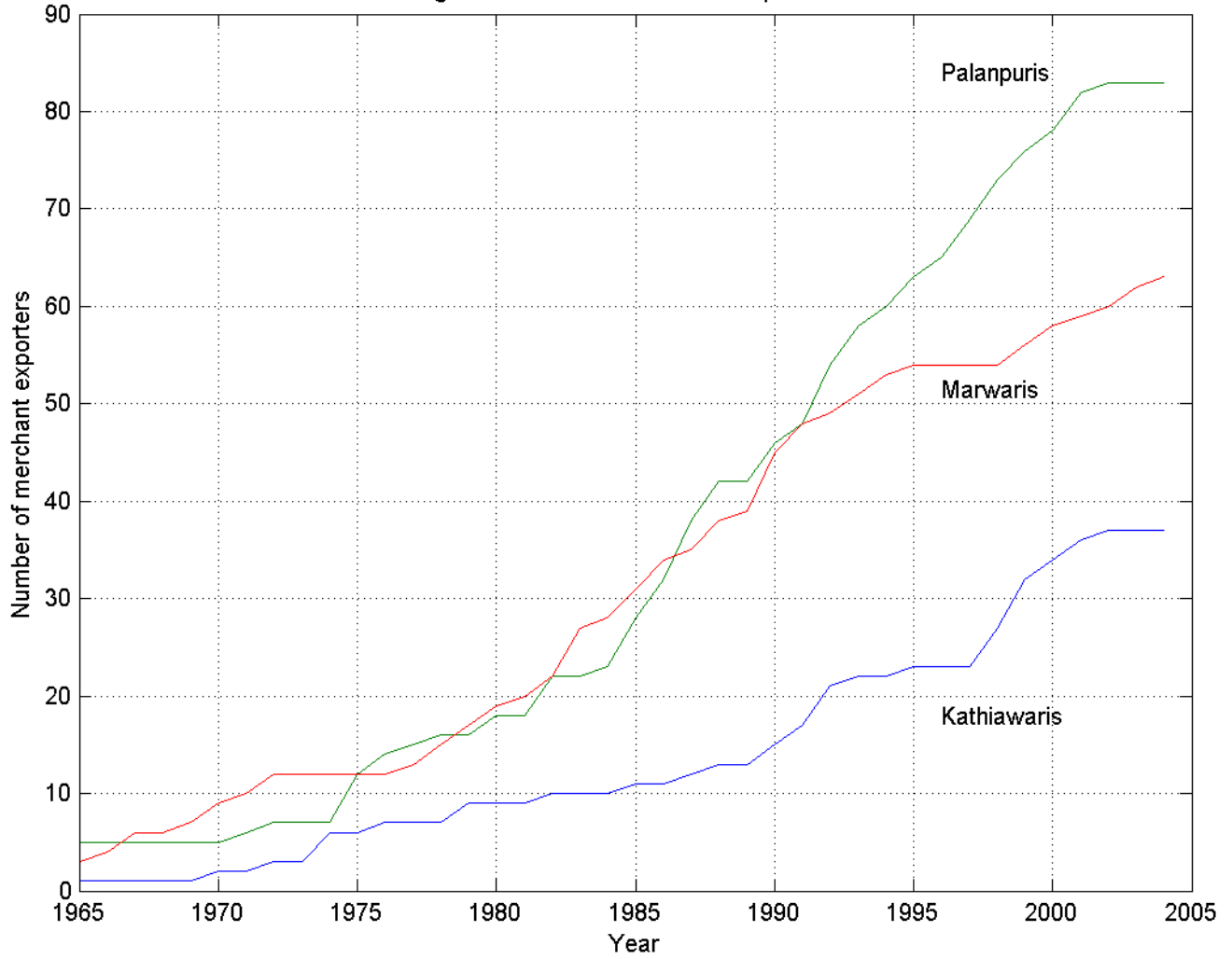


Figure 4: Number of Vertically Integrated Firms

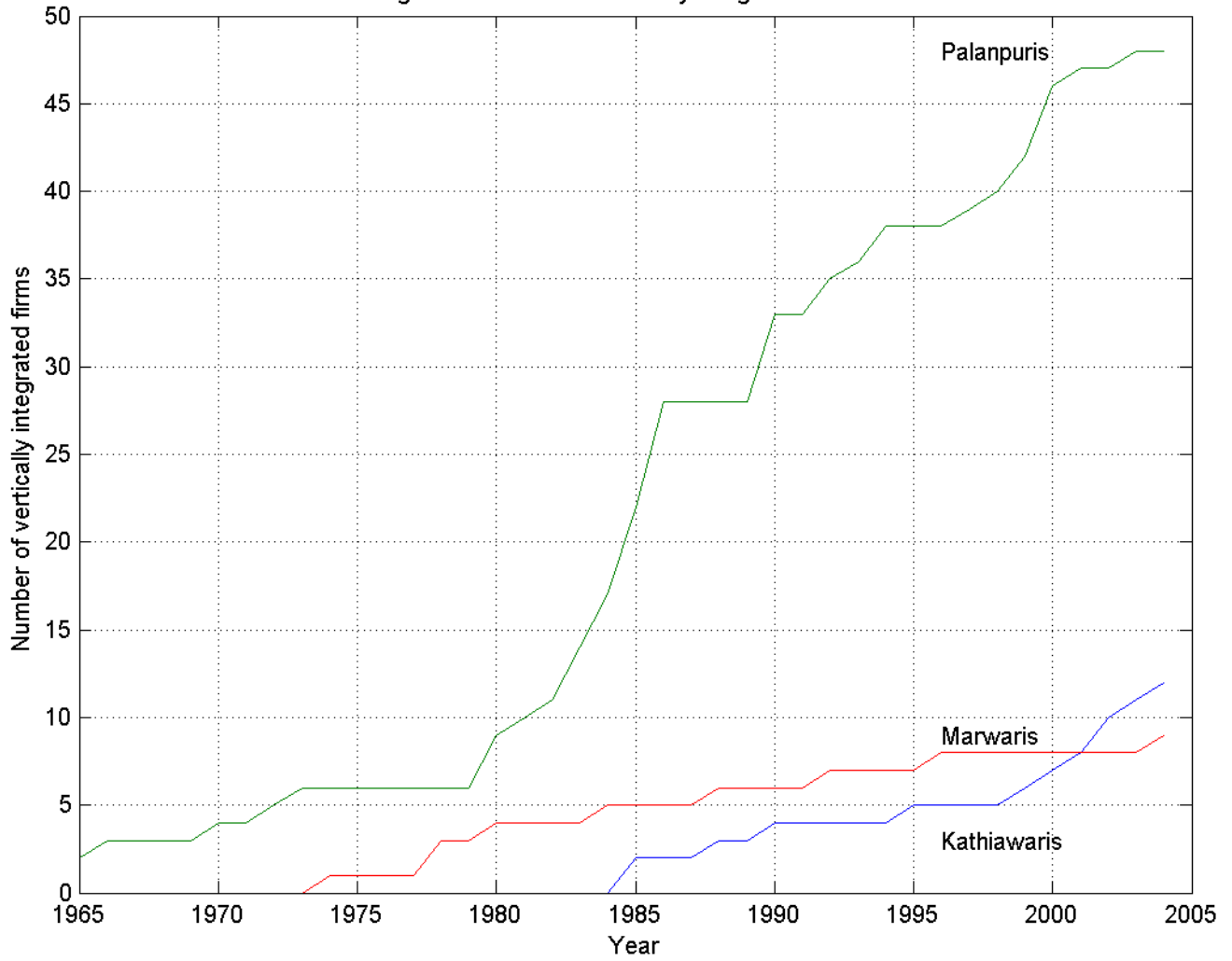


Figure 5: Marriage within the Industry

