Can Networks Reduce Persistent Inequality? *

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Abstract

The persistence of inequality across multiple generations, with its accompanying mismatch between individual ability and occupational choice, has been the subject of much attention in the growth literature. Complementing the "new classical" theory, a parallel literature has emerged showing that community effects can reinforce the persistence of inequality across individuals or families. This paper departs from the existing literature by providing theoretical and empirical support for the hypothesis that community-based networks can *reduce* persistent inequality by actively supporting inter-generational mobility among their members when new opportunities become available and the context is appropriate. The key insight from the dynamic model developed in the paper is that once they form, new networks will strengthen most rapidly in historically disadvantaged communities, allowing these communities to bootstrap their way out of poverty traps. These predictions for changes in network strength and inter-generational occupational mobility across communities are successfully tested using new data from the Indian diamond industry that were collected specifically for this purpose. Extensions to the analysis identify policies that could be implemented to replicate the mobility-enhancing and inequality-reducing experience of the industry under study in other settings.

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1 Introduction

The relationship between inequality and growth has received much attention in recent years. The starting point for the "new classical" theory are the assumptions that credit markets are imperfect and that there are fixed costs to investing in human capital. Under these assumptions, it can be shown that poor families with low levels of human capital stay poor, while rich families with correspondingly high levels of human capital stay wealthy, from one generation to the next (Galor and Zeira 1993, Banerjee and Newman 1993, Mookherjee and Ray 2003). This persistence of inequality, with its accompanying mismatch between individual ability and occupational choice, evidently has negative consequences for growth.

Complementing the new classical theory, there have been a number of attempts to enrich the model of educational (and occupational) choice described above by introducing community effects. The general insight from this parallel literature is that if there are complementarities in human capital investments, due to peer effects or wealth effects, or alternatively if there are complementarities in labor market outcomes, due to networks or discrimination, then families will stratify into homogeneous communities. This stratification will only serve to accentuate the family-level persistence in inequality implied by new classical models (Loury 1977, Bénabou 1996, Fernandez and Rogerson 1996, Durlauf 1996, Bowles, Loury, and Sethi 2009).

This paper departs from the existing literature by providing theoretical and empirical support for the hypothesis that community-based networks can *reduce* persistent inequality by actively supporting inter-generational mobility among their members when new opportunities become available and the context is appropriate. The model of occupational choice developed in Section 2 of the paper is set up to initially deliver the familiar result that families or dynasties get locked into specific occupations, even though intrinsic individual ability and, hence, the match with other occupations might vary across generations. Introducing a new relatively remunerative occupation does little to reduce inequality by itself since only dynasties that were traditionally engaged in related occupations will have the resources to shift into it. Prospects for convergence increase, however, once we allow community-based networks to form in the new occupation. These networks effectively substitute for inherited occupation-specific human capital or wealth, allowing individuals without an advantageous family background to move into the new occupation. The key insight from the dynamic model is that new networks will strengthen most rapidly in historically disadvantaged communities, allowing these communities to bootstrap their

way out of poverty traps.

The main predictions of the model are that once they form, new networks should strengthen most rapidly in communities with the *weakest* outside options, and that inter-generational occupational mobility should be correspondingly greater in those communities. The empirical analysis tests these predictions with unique data from the Indian diamond industry that were collected specifically for this purpose. India does not produce rough diamonds. The rough diamonds are imported, for the most part from Antwerp, then cut and polished in domestic factories, before being sold on the Mumbai (formerly Bombay) market to foreign buyers or shipped directly abroad.[1] Two distinct supply shocks serve as the point of departure for the empirical analysis: The first shock, in the mid-1960s, allowed Indian firms to use scarce foreign exchange to import rough diamonds. As described in Section 3, two traditional business communities – the *Marwaris* and the *Palanpuris* – dominated the business end of the industry from that point onward, leaving the cutting and polishing to a community of lower caste agricultural laborers known as the *Kathiawaris*. The second shock, in the late 1970s, coincided with a huge increase in the world supply of rough diamonds with the opening of Australia's Argyle mines. This allowed Kathiawari firms to enter the business and today all three communities account for a substantial share of the industry.

The episodes that triggered the entry of different communities into the industry are distant enough to trace the growth of their underlying networks together with changes in the family background of entering firms over a thirty-year period, yet are recent enough to provide data that are amenable to statistical analysis. The empirical analysis in this paper uses two unique and independent sources of data: (i) a survey of nearly 800 diamond export firms, with offices in the Mumbai market, conducted in 2004-05, and (ii) a comprehensive database covering all active firms over the 1995-2004 period, with their export performance in each year, maintained by an administrative agency, the Gem and Jewelry Export Promotion Council (GJEPC). The survey collected information on the senior partner's personal and family background, the firm's history, and changes in the organization of its business over time.

Because of the difficulty in enforcing legal contracts, the diamond industry is associated with a high degree of community networking throughout the world. Ultra-orthodox Jews historically dominated

[1]The diamond industry accounts for roughly 14 percent of India's total merchandize exports today, and has competed with textiles, and more recently with computer software, as the country's top export industry over 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 percent (65 percent by value) of the rough diamonds cut and polished worldwide (GJEPC 1998, Purani 2000).

the Antwerp market and continue to dominate the New York market (Coleman 1988, Richman 2006). Over 96 percent of the firms in our survey are drawn from just three communities, suggesting that community networks must be active here as well. Taking advantage of the coexistence of communities with very different histories in the diamond industry, our objective is to compare the growth of these networks, with accompanying change in the composition of entrants. Based on information from the survey we see in Section 4 that while there is a mild weakening in the inherited business background of the Marwaris and Palanpuris over time, there is a particularly steep decline in the background of the entering Kathiawaris from the late 1970s onward. Although 70 percent of the Kathiawaris who entered the industry in 1970, before the second supply shock, reported that their father was a businessman, this statistic declines steadily and drops below 20 percent by 2000.

The explanation provided by the model for the relatively high inter-generational mobility observed in the Kathiawari community is that its rapidly strengthening industry-specific network was able to support increasingly disadvantaged entrants over time. The marriage institution is key to the formation of a strong network. The basic marriage rule in Hindu society is that no individual can match outside the sub-caste or *jati*, which typically has a population of a few hundred thousand. 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 at the level of the sub-caste. Given the particularly severe commitment problems associated with (risky) business activity, marriage alliances within specific industries are, in addition, commonly observed in business communities (Hazlehurst 1966). In our sample communities, 35 percent of the entrepreneurs and 57 percent of their children married within their caste and within the diamond industry.

Providing direct support for the hypothesis that the Kathiawari network strengthened relatively rapidly, the frequency of intra-industry marriages increases steeply in that community over time. Almost none of the early Kathiawari entrants who established their firms before 1975 married within the industry. By 2004, however, 50 percent of the entrants were marrying within the industry, surpassing the corresponding marriage rates for the Marwaris and Palanpuris, which remained roughly constant over time.[2] Firm-level export data, available over a ten-year period, indicate that these investments in the network translated into superior firm performance. The Kathiawaris keep pace

[2]We will also see that Kathiawari firms are more likely to organize production in ways that leave them more reliant on their network and that these community differences in organizational structure have widened over time.

with their more established rivals despite the decline in the inherited business background of entrants from this community. Indeed, once this compositional change is accounted for with firm fixed effects, the Kathiawari export trajectory is significantly steeper than the corresponding trajectory for the Marwaris and Palanpuris, precisely as predicted by the model.

The important role played by community networks in the migration process and in supporting mobility has been extensively documented. In India, the setting for this paper, community networks supported urban migration and the movement of entire sub-castes into the new occupations that became available under colonial rule in the nineteenth and early twentieth century (Chandravarkar 1985, Rudner 1994). More recently, a new business class has emerged in post-colonial India, drawn from a select group of agricultural sub-castes and from sub-castes that had historically dominated the bureaucracy and various white-collar professions (Damodaran 2008). The Indian experience is in many respects similar to the historical and contemporary U.S. experience. For example, Gordon, Edwards, and Reich (1982) describe how migrant European communities clustered in particular occupations and locations in the nineteenth century. While British coal miners may have been imported to work in American coal mines, and while German bakers and confectioners may have maintained their traditional occupations, their analysis indicates that the arriving migrants typically found niches in new occupations. These patterns of spatial and occupational mobility, supported by underlying networks, continue to this day, as evidenced by the rapidly growing literature connecting community networks and international migration to the United States (see, for instance, Fairlie and Meyer 1996, Munshi 2003, Patel and Vella 2007, and McKenzie and Rapoport, forthcoming). This paper contributes to the migration literature, and links it to the inequality literature, by theoretically and empirically establishing the negative relationship between outside options in the origin location and the trajectory of new networks at the destination, with accompanying implications for inter-generational occupational mobility and inequality across social groups.

Previous theoretical work on networks has taken the position that these traditional institutions can restrict mobility during the process of development (Greif 1994, Kranton 1996, Rauch 2001). Consistent with this view, Munshi and Rosenzweig (2006, 2009) show that sub-caste networks restrict the occupational and spatial mobility of their members, in contrast with the role played by the same institution in this paper. Whether transitions of the type that are documented in this paper occur or not will depend on whether specific pre-conditions (derived in our analysis) are satisfied. Section 5 concludes by identifying policies that could be implemented to replicate the mobility-enhancing and

inequality-reducing experience of the industry under study in other settings.

2 The Model

The model of occupational choice developed in this section is set up to deliver the familiar result that inequality persists across generations when networks are absent. Community networks open up the possibility of inter-generational mobility and the main result of the model is that these networks will strengthen most rapidly in communities with the weakest outside options. The model makes a number of simplifying assumptions for analytical convenience. Graphical analysis and simulations reported at the end of this section verify that the results are robust to some of these assumptions. Other assumptions will be dealt with in Section 4.

2.1 Individual Endowments

Each individual i belonging to community j is endowed with ability ω_i^j. There are two types of occupations in this economy: business (B) and non-business (NB). The returns to ability vary by the type of occupation. Let the return to ability in the NB occupation be r_{NB} and let the corresponding return in the B occupation be $r_B > r_{NB}$.

In addition to his intrinsic ability, each individual inherits an occupation-specific human capital endowment from his father, as in Galor and Tsiddon (1997) or Hassler and Rodríguez Mora (2000). The son of a businessman receives a utility payoff U_B, in addition to the returns to his ability, if he chooses the same occupation as his father, and no inheritance if he chooses any other occupation. Similarly, a father in the NB occupation passes on U_{NB}^j if his sons remains in the same occupation, and nothing otherwise. The human capital endowment U_{NB}^j reflects the historical opportunities that were available to communities and is the only dimension along which communities differ in the basic version of the model.

The assumption that the human capital endowment is occupation-specific is standard in the inequality literature and is based on the idea that success in any occupation is associated with a specific set of actions or skills. For example, the son of a businessman in a developing economy will learn how to make connections to buyers and sellers, how to bribe government officials, and more generally to exploit arbitrage opportunities from his father. Such complex and multidimensional knowledge is non-tradeable and can only imbibed over a long period of time in the parental household (Hassler and Rodríguez Mora make an argument along the same lines).

2.2 Occupational Choice without Networks

Individual i belonging to community j will choose a career on the basis of the utility he receives from the alternative occupations available to him. If his father was in the B occupation, his utility from the B and NB occupations can be expressed as

$$U_B + r_B \omega_i^j$$

$$r_{NB} \omega_i^j$$

and so he will certainly choose the B occupation since $r_B > r_{NB}$. If the individual's father was in the NB occupation instead, his utility from the B and NB occupations will be expressed as

$$r_B \omega_i^j$$

$$U_{NB}^j + r_{NB} \omega_i^j.$$

As in Galor and Tsiddon, we make the distributional assumption $\omega_i^j \sim U[0,1]$, regardless of the occupation of the father (B, NB) or the community that the individual is born into. Moreover, ability is uncorrelated across generations. It is nevertheless easy to verify from the expressions above that the children of fathers in the NB occupation will always choose that occupation, regardless of their ability if

Condition 1: $U_{NB}^j \geq r_B - r_{NB}$.

The occupational persistence derived above would continue to be obtained even if human capital were not occupation-specific as long as (the now generalized) human capital requirements vary across a discrete set of occupations. With missing or incomplete credit markets, individuals would be unable to invest in the higher levels of human capital needed to move out of the parental occupation into more remunerative activities (Galor and Zeira 1993, Mookherjee and Ray 2003). Introducing a new D occupation, that is perfectly substitutable with the B occupation and provides a higher utility payoff for the children of businessmen $U_D > U_B$ will have little impact on inequality in this case. All the children of businessmen would switch to the D occupation, but inequality within and between communities would remain qualitatively unchanged.

2.3 Occupational Choice with Networks

Prospects for inter-generational mobility out of the NB occupation and a corresponding reduction in inequality improve once we allow networks to form in the new D occupation. In general, these networks

will substitute for the parental endowment U_D that the children of businessmen receive. For example, in a business-related occupation, the network will provide connections to buyers and sellers, as well as credit, all of which would be provided by a businessman to his son. In other occupations, the network provides information and strategies for success that would otherwise be provided by the father. The parental endowment is effectively redundant when an individual chooses to rely on the network and we assume that the net benefit from operating independently in the D occupation is greater than the net benefit from participation in the network for the children of businessmen. Empirical support for this assumption will be provided in Section 4. The children of individuals in the NB occupation, in contrast, must participate in the network if they are to choose the D occupation. We will focus on the choice between the NB and the D occupation for these children in the first generation that has access to the new occupation.

Let each individual work for M periods and allow for $N < M$ cohorts in each generation. A fresh cohort enters the workforce in each period and each member of that cohort must make an irreversible career decision at that point in time. For the child of an individual in the NB occupation this choice will depend on the utility from the NB occupation, as described above, and the utility from the D occupation, which will change across cohorts as the community network strengthens over time. The utility from occupation D for individual i from community j who must make his career choice in period t can be described by the expression

$$h(1-\lambda)\sum_{\tau=0}^{t-1}\Delta\omega_{\tau}^{j}+r_{B}\omega_{i}^{j},$$

where $(1-\lambda)\sum_{\tau=0}^{t-1}\Delta\omega_{\tau}^{j}$ measures the size of the network, h maps network size into the utility that the individual derives from the network over his working life, and r_B is the return to ability in the D occupation (and the B occupation).[3] Let the measure of individuals in each community-cohort be equal to one and let a fraction λ of each cohort consist of children of businessmen. We will see momentarily that $(1-\lambda)\Delta\omega_{\tau}^{j}$ is the measure of individuals from community j who entered the workforce in period τ and chose to participate in the network. The relevant measure of network size for an individual entering in period t is thus the entire stock of participants up to the preceding period. This assumption and the assumption that network size maps linearly into the individual's utility are made for analytical convenience. These assumptions will be relaxed at the end of this section without qualitatively changing the key result of the model.

[3] We could introduce a cost c to participating in the network without changing any of the results that follow.

Given the utility derived from different occupations, the son of an individual in the NB occupation who enters the workforce in period t will choose the D occupation if

$$h(1-\lambda)\sum_{\tau=0}^{t-1}\Delta\omega_{\tau}^{j}+r_{B}\omega_{i}^{j}\geq U_{NB}^{j}+r_{NB}\omega_{i}^{j}.$$

Since $r_B > r_{NB}$, there exists an ability threshold $\underline{\omega}_t^j$ above which all members of community j without a business background who enter the workforce in period t enter the D occupation, where

$$\underline{\omega}_{j}^{t}=\frac{U_{NB}^{j}-h(1-\lambda)\sum_{\tau=0}^{t-1}\Delta\omega_{\tau}^{j}}{r_{B}-r_{NB}}.$$

Individuals with $\omega_i^j \in [0, \underline{\omega}_t^j)$ remain in the traditional NB occupation, while individuals with $\omega_i^j \in [\underline{\omega}_t^j, 1]$ move into the D occupation.

2.4 Network Dynamics

Given that ability is distributed uniformally over the unit interval, the range of ability over which individuals enter the network in period t is $\Delta\omega_t^j \equiv 1 - \underline{\omega}_t^j$. Substituting the expression for $\underline{\omega}_t^j$ derived above,

$$\Delta\omega_{t}^{j}=\frac{(1-\lambda)h}{r_{B}-r_{NB}}\Sigma_{\tau=0}^{t-1}\Delta\omega_{\tau}^{j}-\left(\frac{U_{NB}^{j}}{r_{B}-r_{NB}}-1\right)\equiv\beta\Sigma_{\tau=0}^{t-1}\Delta\omega_{\tau}^{j}-\alpha^{j}. \tag{1}$$

Note that $\alpha^j \geq 0$ from Condition 1. Since $r_B > r_{NB}$ it follows that $\beta > 0$ and $d\alpha^j/dU_{NB}^j > 0$. We will use α^j interchangeably with U_{NB}^j in the discussion that follows.

To initiate the network dynamics, a measure $(1-\lambda)\Delta\omega_0$ of individuals without a business background are moved exogenously into the D occupation in period 0. Starting with period 1 and moving forward in time, equation (1) can be solved recursively to derive a simple expression relating $\Delta\omega_t$ to $\Delta\omega_0$:

$$\Delta\omega_{t}^{j}=(\beta\Delta\omega_{0}-\alpha^{j})(1+\beta)^{t-1}. \tag{2}$$

Notice that the network will only set off on a positive trajectory if there is a sufficiently large influx of initial entrants:

Condition 2: $\Delta\omega_0 \geq \alpha^j/\beta$.

This requirement is a standard feature of "tipping" models and if it is satisfied, the main result of the model follows directly from equation (2).

Proposition 1. *If Condition 2 is satisfied then (a) The strength of the network increases over time, more steeply in communities with weak outside options (low U^j_{NB}). (b) The share of entrants without a family background in business increases over time, more steeply in communities with weak outside options if the measure of entrants with a business background exceeds the measure of entrants without such a background.*

From equation (1), the strength of the network in period t,

$$W^j_t \equiv (1-\lambda)\sum_{\tau=0}^{t-1}\Delta\omega^j_\tau = \frac{(1-\lambda)}{\beta}\left[\Delta\omega^j_t + \alpha^j\right].$$

$$\frac{dW^j_t}{dt} = \frac{(1-\lambda)}{\beta}\frac{d\Delta\omega^j_t}{dt}, \quad \frac{d^2W^j_t}{d\alpha^j dt} = \frac{(1-\lambda)}{\beta}\frac{d^2\Delta\omega^j_t}{d\alpha^j dt}.$$

It follows that changes in network strength over time and across communities are driven entirely (up to a positive constant) by changes in $\Delta\omega^j_t$. The first part of the proposition then follows directly from equation (2):

$$\frac{d\Delta\omega_t}{dt} = (\beta\omega_0 - \alpha^j)(1+\beta)^{t-1}ln(1+\beta) \tag{3}$$

$$\frac{d^2\Delta\omega_t}{d\alpha^j dt} = -(1+\beta)^{t-1}ln(1+\beta). \tag{4}$$

If Condition 2 is satisfied, $d\Delta\omega_t/dt > 0$, $d^2\Delta\omega_t/d\alpha^j dt < 0$. The strength of the network is thus increasing over time, more steeply in communities with weak outside options (low U^j_{NB}). Although the negative relationship between conditions in the origin and the propensity to migrate is well understood, our model of endogenous network formation at the destination generates the stronger prediction that the gap in network strength between communities with different outside options will widen over time. This result is obtained with a linear network technology and we will see below that it holds up when individuals are assumed to benefit from a single cohort and the network technology is concave.

To prove the second part of the proposition, the share of entrants in period t with a business background can be expressed as

$$S^j_t = \frac{\lambda}{\lambda + (1-\lambda)\Delta\omega^j_t}.$$

$$\frac{dS^j_t}{dt} = \frac{-\lambda(1-\lambda)}{[\lambda + (1-\lambda)\Delta\omega^j_t]^2}\frac{d\Delta\omega^j_t}{dt}$$

$$\frac{d^2S_t^j}{d\alpha^j dt} = \frac{2\lambda(1-\lambda)^2}{[\lambda+(1-\lambda)\Delta\omega_t^j]^3}\frac{d\Delta\omega_t^j}{dt}\frac{d\Delta\omega_t^j}{d\alpha^j} - \frac{\lambda(1-\lambda)}{[\lambda+(1-\lambda)\Delta\omega_t^j]^2}\frac{d^2\Delta\omega_t^j}{d\alpha^j dt}.$$

Substituting from equations (2), (3), (4), and noting that $d\Delta\omega_t^j/d\alpha^j = -(1+\beta)^{t-1}$ from equation (2),

$$\frac{d^2S_t^j}{d\alpha^j dt} = \frac{\lambda(1-\lambda)(1+\beta)^{t-1}ln(1+\beta)[\lambda-(1-\lambda)\Delta\omega_t^j]}{[\lambda+(1-\lambda)\Delta\omega_t^j]^3}.$$

Although the share of entrants with a business background is unambiguously declining over time, $dS_t^j/dt < 0$ from equation (3), this decline will only be steeper in communities with weak outside options, $d^2S_t^j/d\alpha^j dt > 0$, if the measure of entrants with a business background is greater than the measure of entrants without such a background, $\lambda > (1-\lambda)\Delta\omega_t^j$. This last condition will be satisfied, at least in the early stages of the transition, if the initial share of entrants in period 0 with a business background exceeds 0.5 ($\lambda > (1-\lambda)\omega_0$). We will verify empirically that the initial entrants are overwhelmingly from business backgrounds in all communities in Section 4.

2.5 Extensions to the Model

The advantage of assuming that ability is uniformally distributed, that the network technology is linear, and that individuals only benefit from the cohorts that have preceded them is that $\Delta\omega_t^j$ can be expressed as a linear function of past investments in the network $\sum_{\tau=0}^{t-1}\Delta\omega_\tau$. This expression can then be solved recursively to derive a simple relationship between $\Delta\omega_t^j$ and the exogenous initial condition $\Delta\omega_0$, which delivers the main result of the model. The analysis that follows relaxes each of these assumptions in turn, using graphs and simulations to verify the robustness of the main analytical result that the new network strengthens more rapidly in communities with weak outside options (low U_{NB}^j). As an additional check, we will verify that the main result holds up when communities are allowed to vary on a second dimension: the share of individuals with a business background (λ). Recall that changes in network strength W_t^j over time and across communities are driven entirely (up to a positive constant) by changes in $\Delta\omega_t^j$. It will thus be convenient to derive all the results that follow in terms of $\Delta\omega_t^j$.

1. λ varies across communities: We might expect historically disadvantaged communities to have access to less favorable NB occupations (low U_{NB}^j) as well as a smaller share of businessmen (lower λ). Adding a j superscript to the λ parameter, without loss of generality suppose that U_{NB}^j and λ^j are increasing in j. Let a constant measure $\Delta\mu_0 \equiv (1-\lambda^j)\Delta\omega_0^j$ of individuals without a business

background enter the network in period 0 across all communities. Moving forward in time, we arrive at an expression analogous to equation (1),

$$\Delta\omega_t^j = \frac{(1-\lambda^j)h}{r_B - r_{NB}}\Sigma_{\tau=0}^{t-1}\Delta\omega_\tau^j - \left(\frac{U_{NB}^j}{r_B - r_{NB}} - 1\right) \equiv \beta^j \Sigma_{\tau=0}^{t-1}\Delta\omega_\tau^j - \alpha^j,$$

which can be solved recursively to obtain an expression analogous to equation (2),

$$\Delta\omega_t^j = (\beta\Delta\mu_0 - \alpha^j)(1+\beta^j)^{t-1},$$

where $\beta \equiv h/(r_B - r_{NB})$. Assuming $\Delta\mu_0 > \alpha^j/\beta$ and noting that $d\alpha^j/dj > 0$, $d\beta^j/dj < 0$,

$$\frac{d\Delta\omega_t}{dt} = (\beta\Delta\mu_0 - \alpha^j)(1+\beta^j)^{t-1} ln(1+\beta^j) > 0$$

$$\frac{d^2\Delta\omega_t}{djdt} = -(1+\beta^j)^{t-1} ln(1+\beta^j)\frac{d\alpha^j}{dj} + (\beta\Delta\mu_0 - \alpha^j)\left((1+\beta^j)^{t-1}[ln(1+\beta^j)]^2 + (1+\beta^j)^{t-2}\right)\frac{d\beta^j}{dj} < 0.$$

Notice that the second term on the right hand side of the preceding expression only reinforces the divergence in network strength across communities derived in equation (4) (with constant λ across communities).

2. The network technology is concave: One consequence of the linear network technology, together with the assumption that the length of the individual's work life exceeds the number of cohorts, $M > N$, is that the strength of the network will be increasing at the margin over time. Once the transition is initiated, it will continue until all children without a business background start to enter the network in later cohorts, irrespective of their community, if N is sufficiently large. To allow for the possibility that not everyone shifts into the D occupation in steady state, suppose instead that the network technology is concave and that individuals only benefit from the cohort that precedes them. The expression analogous to equation (1) is then

$$\Delta\omega_t^j = \beta\phi(\Delta\omega_{t-1}^j) - \alpha^j,$$

with $\phi'(\Delta\omega_{t-1}^j) > 0$, $\phi''(\Delta\omega_{t-1}^j) < 0$. While we can no longer derive the network dynamics analytically, Figure 1 describes the evolution of $\Delta\omega_t^j$ over time in two communities H and L with $\alpha^H > \alpha^L$. Starting with an initial influx of individuals $\Delta\omega_0$ that ensures that the network takes off, it is evident from the phase diagram that the network converges to a higher (interior) steady state in a fewer number of steps (or, equivalently, in a shorter period of time) in the L community, broadly matching the prediction from Proposition 1.

3. Individuals benefit from their own cohort and subsequent cohorts: Figure 2 plots simulated changes in the measure of entrants from the H and L communities, allowing individuals to (i) receive support from their own cohort in addition to all preceding cohorts, and (ii) to receive support from the cohort that followed them as well.[4] Network strength will increase as the set of cohorts providing referrals expands, increasing the measure of entrants and, in turn, steepening the network's trajectory in equilibrium. The divergence in network strength between the H and L communities, however, continues to be obtained. Given the patterns in Figure 2, we would expect this divergence to be maintained as we allowed additional cohorts to provide support, ultimately including all cohorts that were active in the industry at a given point in time. What is essentially a statement about changes in network strength across cohorts in Proposition 1 could then be reformulated as a statement about changes in network strength over time.

In the basic version of the model, firms are locked into a cohort-specific network over their lifetimes and so their profits remain constant over time. In contrast, each firm's profit will be increasing over time if it benefits from subsequent cohorts as well. This distinction will be important in the analysis of firm performance that follows, where we exploit variation in profits within firms over time to identify underlying changes in the strength of community networks.

4. Ability is normally distributed: Figure 3 plots changes in the measure of entrants from the two communities allowing for both a uniform and a normal ability distribution. We use the same parameter values as in Figure 2 and the normal distribution has the same mean (0.5) and the same standard deviation (0.29) as the uniform distribution. It is apparent from the figure that network strength diverges for the H and L communities with the normal distribution as well, although not as dramatically as with the uniform distribution.

3 Institutional Setting

3.1 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. The population of firms upon which

[4]The parameter values are $h = 0.1$, $\Delta\omega_0 = 0.2$, $r_B - r_{NB} = 0.6$, $\lambda = 0.07$, $u^L = 0.61$, $u^H = 0.615$. Ability is distributed uniformally on the unit interval. In these simulations, I solve iteratively for a fixed point. In the first iteration, the firm is assumed to only receive referrals from the cohorts that preceded it, generating a sequence of $\Delta\omega_\tau^j$. In the next iteration, these $\Delta\omega_\tau^j$'s are used to compute a new set of entry thresholds, assuming now that individuals also benefit from their own cohort and, in the second case, from the cohort that followed as well. This process is repeated until the sequence of $\Delta\omega_\tau^j$'s converges across successive iterations. Convergence is achieved in seven iterations.

the survey is based is obtained from a computerized database maintained by the Gem and Jewelry Export Promotion Council (GJEPC) of all its members. The import of rough diamonds was banned after independence in 1947 to preserve scarce foreign exchange. This policy was reversed in the mid-1960s with the introduction of the Multi-Rate Import Replenishment Scheme, which allowed firms to import rough diamonds against their previous exports of polished diamonds. The GJEPC verified the export figures for its members under this scheme and then forwarded them to the Government of India. Almost all active 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. I was able to gain access to this database, covering the 1995-2003 period, at the beginning of 2004. The GJEPC 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.[5] The population of firms for the survey was restricted to firms with offices in the Mumbai market, listed in the GJEPC database as exporting in any year over the 2001-03 period. 777 firms were ultimately interviewed, with an overall response rate of 84.3 percent.[6]

Diamond firms are notoriously secretive and so every effort was made to establish connections within the industry before the survey commenced. Assisted by a few close personal contacts, I gradually built up a small network of influential diamond exporters over a two-year period, which in turn helped the survey team penetrate each of the communities in the industry. A computerized referral system was set up, and each individual in my personal network provided a list of exporters that he was tied closely with. 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. These firms, in turn, provided additional referrals, and the process continued until *all* the names on our list had been covered. While the order of interviews may not have been random, the referral-based approach that we took did not result in a non-representative sample since all firms were ultimately contacted. When providing referrals, our respondents were simply asked to list firms that they were closely tied with, without any prompting from our side. It is worth noting that only 5.7 percent of the sampled firms do not appear in the GJEPC database, consistent with the assumption that this

[5]The export figures were provided in 2005 after the survey was completed and so the export data cover a ten year period from 1995 to 2004.

[6]The response rate across communities was 85.7 percent for the Kathiawaris, 89.3 percent for the Marwaris, and 81.9 percent for the Palanpuris. See Munshi (2007) for further details of the survey.

database effectively covers the population of active exporters.

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 they received from members of their community or from other close connections. 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 the data fields, which recorded the identity of up to five individuals who had provided referrals, 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. A total of 295 individuals provided 1,473 referrals. Looking across Columns 3-5 it is apparent that exporters from each community disproportionately provide referrals to members of their own group. The Kathiawaris make up just 29 percent of the firms in the sample, yet 74 percent of the referrals from Kathiawari exporters are to members of their community. The Marwaris who make up 17 percent of the sample and the Palanpuris who account for another 54 percent 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 and we will later see that the Marwaris concentrate on the polished side of the market where community affiliation is less important.[7]

3.2 Exit from the Industry

The surveyed firms are all currently active. Much of the analysis will use the establishment year of these firms to describe historical changes in the industry across communities. However, firms that exited the industry will be missing, which could bias our interpretation of these changes if exit rates varied by community. A particularly useful feature of the administrative data made available by the GJEPC is that they cover all active firms 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 in the database thereafter. It seems reasonable to assume that a firm which fails to show up continuously for three years or longer has permanently exited, allowing exit rates to be computed each year from 1995 to 2000. Restricting attention to firms with offices in the Mumbai market, we see in Table 2 that annual exit rates over

[7] 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 may not have a representative sample of referrals. The cross-community referral patterns are nevertheless indicative of the important role that social ties play in this industry.

this period are extremely low – just around 1.5 percent – and do not vary by community.[8] Although not reported, there is no discernable time trend in these statistics.

Diamonds are bought and sold on credit. Faced with unexpected delays in receiving payment from their polished buyers, it is often a challenge for exporters to turn their working capital around on schedule. Based on my conversations with diamond exporters, it appears that firms are most likely to exit the industry when they face a large demand or supply shock and subsequently fall behind on their payments. Although there is evidently a random aspect to these shocks, we might expect firms that have recently begun to export, with smaller cash reserves, to be especially vulnerable. Exit rates by the age of the firm are thus presented next in Table 2. I assume that a firm enters the industry in a given year if it first appears in the database in that year, allowing me to compute exit rates for one to four year old firms over the 1996-2000 period.[9] Exit rates remain extremely low even for these young firms and, and while the small number of observations in each age-community cell generates some noise in these statistics, oneway analysis of variance tests do not reject the hypothesis that exit rates are equal across communities in each age category.

3.3 The Communities

The history of the industry described earlier would suggest that entrepreneurs from the three communities should come from very different backgrounds. The Palanpuri Jains entered the diamond business in the 1880s and later expanded into the pearl trade, with their business activity extending as far as Antwerp by the 1930s (Chhotalal 1990). The Marwaris are a community of traders and moneylenders who made the transition into industry around 1914 and subsequently expanded their trading and industrial activity throughout the country (Lamb 1955). The Marwari network is more diversified, both spatially and by business activity, than any other community network in the country (Timberg 1978). The Kathiawaris, in contrast, are a lower caste of agricultural laborers and sharecroppers who made the transition to industrial labor in the 1960s when the Indian diamond industry started to grow with the introduction of the Multi-Rate Import Replenishment Scheme (Engelshoven 2002). The cutting and polishing of the small stones that the Indian diamond industry specializes in

[8]The contact names included in the GJEPC database, together with a detailed knowledge of firms in the industry, allowed the exporters that I knew and their employees to assign a community affiliation to each firm in the database with an office in the Mumbai market. Names are a good indicator of community affiliation, and comparing this assignment to the actual affiliation, obtained from the survey, just 6.3 percent of the sampled firms were miscoded. We would expect similarly low rates of miscoding for firms out of sample as well.

[9]Exit rates can be computed for one-year olds over the 1996-2000 period, for two-year olds over the 1996-1999 period, for three-year olds over the 1996-1998 period, and for four-year olds over the 1996-1997 period.

does not require great skill or ability, and this historically disadvantaged community only moved into business in the late 1970s when a supply shock hit the world diamond industry.

The descriptive statistics in Table 3, Panel A, based on data collected from the senior partner in each firm, are broadly consistent with these historical differences across communities. The entrepreneur's age is (mechanically) negatively correlated with the year that the firm was established. Given the long history of the Palanpuris in the diamond business and the late entry of the Kathiawaris into this occupation, it is not surprising that 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 historically advantaged communities. They are also less likely to have grown up in Mumbai (as compared with the Palanpuris). Notice that a relatively low proportion of Marwaris also report having grown up in Mumbai, but this simply reflects the wide scope of their commercial 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.

The differences in education and childhood location described above most likely arise because of differences in parental occupations. 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. Not surprisingly, the Kathiawaris are significantly less likely to belong to a business family than the other two communities: 35 percent of the Kathiawaris versus 82 percent of the Marwaris and 76 percent of the Palanpuris report that their father was engaged in any type of business. The most striking feature of these statistics, however, is the differential access to occupations outside business with 53 percent of the Kathiawaris, but just over 2 percent of the Marwaris and Palanpuris, reporting that their fathers were farmers. Although the Palanpuris, and especially the Marwaris, have many opportunities outside the diamond business, the next best option for a Kathiawari entrepreneur is farming or working as a labor contractor, neither of which is particularly remunerative. In terms of the model, the historical background and the descriptive statistics in Table 3 indicate that the Kathiawaris have the worst options outside business among the three communities. Although the differences between the Palanpuris and the Marwaris are not as large, non-business (and business) activity in the Palanpuri community is largely restricted to the diamond industry whereas the Marwaris are well diversified and can choose from a wider range of non-business (and business) activities.

3.4 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 domestic factories, and then sell the polished diamonds on the Mumbai 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.[10] This implies that they would like to buy from suppliers in Antwerp who happen to be well stocked with the type of stones they specialize in on any given trip, with the set of preferred suppliers changing from one trip to the next. The rough stones are received on credit, without a written contract stipulating the principal, interest rate, and time of repayment, giving rise to a potentially substantial commitment problem.

Three solutions are available to avoid this commitment problem. First, an exporter could establish long-term bilateral relations with a small number of suppliers in Antwerp. Given the variation in the types of stones received by suppliers from one month to the next, this strategy is relatively inefficient in the diamond industry. A second solution takes advantage of the community network, with exporters that have established long-term relations with particular suppliers providing referrals for other members of their community. The set of exporters providing referrals will vary from one period to the next depending on the mix of stones received by the suppliers in Antwerp. Exporters thus draw upon different members of their community to provide referrals over time, expanding the set of suppliers that is available to them. Exporters providing referrals have long-term relationships at stake and so will ensure that members of their community receiving the rough stones do not renege on their credit obligations. Exporters receiving referrals will not cheat, even if they do not expect to be helped by the same exporter in the future, if the threat of community-based sanctions is sufficiently severe. Numerous accounts (as described below) of the serious economic and social punishments faced

[10] Diamonds 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 percent for the Kathiawaris, 42 percent for the Marwaris, and 48 percent 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.

by exporters who reneged on their obligations, on the few occasions when such transgressions did occur, would tend to support this characterization of the cooperative equilibrium.[11]

Most exporters follow both approaches described above, building long-term relationships with a few suppliers in Antwerp, while using the community network to expand their access to rough diamonds. Other exporters have avoided the cost associated with participating in the network by setting up branches in Antwerp. Exporters who are based permanently in Antwerp also function as rough suppliers and so will interact frequently with other suppliers in the Antwerp market. These interactions and their permanent presence in Antwerp allow them to establish a reputation in the market, which serves as a commitment device and gives them access to rough diamonds from numerous suppliers without the support of a community network. Based on the model in Section 2 we would expect the sons of businessmen, who have the connections and the skills needed to operate independently, to be most likely to establish branches in Antwerp.

Table 4, Column 1 describes transactions on the rough side of the market. Firms have 11 suppliers per year on average and 71 percent of the firms have a dominant supplier who provides more than 30 percent of their rough diamonds. Different firms will have different dominant suppliers, allowing for the cross-referrals across firms that are needed for the network to function effectively. Much of the rough supply (70 percent) comes from Antwerp. The other major alternative source of roughs is the Mumbai secondary market, where the price is substantially higher but the commitment problem less severe since all firms have a permanent presence in the city.[12] 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. Although not reported, these patterns of business activity do not vary by community.

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, described in Column 2, appears to operate very much like a spot-market. Firms have as many as 34 buyers per year on average, and fewer (less than 60 percent) of the firms have a single dominant buyer, despite the

[11] Greif's (1993) classic description of the Maghribi traders' coalition is very similar to this characterization of the diamond exporters' network. Although deviations from cooperative behavior are associated with severe sanctions in the diamond industry, increasing the level of commitment that can be sustained, Greif shows formally that the termination of future network services can be sufficient to support a cooperative equilibrium.

[12] The very largest firms, known as *sightholders*, receive rough diamonds directly from the DTC. A relatively small number of firms also buy rough diamonds from Israel. However, Antwerp is the dominant source of rough diamonds from abroad.

fact that a dominant buyer is now defined to account for just 20 percent of the firm's product. A substantial fraction of the polished diamonds are also sold on the Mumbai market, either to *merchant exporters*, who restrict their activity to buying and selling polished diamonds and brokerage, or to visiting foreign buyers.

Polished diamonds are largely sold on credit and these transactions rarely involve a written contract in Column 2, so commitment problems could potentially arise on this side of the market as well, with buyers reneging on their obligations. Because firms specialize in particular stone sizes, they tend to build long-term relationships with a few foreign buyers, channeling the rest of their output abroad through numerous merchant exporters, who buy the product directly or serve as commission agents for foreign buyers with whom they have established long-term relationships. All export firms, including the merchant exporters, have a permanent presence in Mumbai and so can build a personal reputation in the polished market. As with the exporters with branches in Antwerp, this market reputation serves as a commitment device, expanding business relations across community lines. The analysis that follows will consequently assume that the primary role of the community network is to increase the amount of rough diamonds that its members can procure, with larger networks providing more referrals.[13]

4 Empirical Analysis

We are particularly interested in the transition into business in the historically disadvantaged Kathiawari community. The empirical analysis thus begins by describing the formation of a new business network in this community in the late 1970s. Subsequently, we test the predictions of the model as described in Proposition 1. Although the analysis focusses on the comparison between the Kathiawaris and the more established communities, we will also take account of the difference in outside options between the Marwaris and Palanpuris at the end of this section to provide additional support for the predictions of the model.

[13]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 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.

4.1 Network Formation

Recall from Condition 2 in Section 2 that a sufficiently large influx of initial entrants is needed to set the network on a positive trajectory. The entry of the Kathiawaris as a group into business can be traced to the discovery of massive diamond deposits in Australia's Argyle mines in 1979. Although the Argyle mines account for as much as one third of the global production of natural diamonds, these diamonds tend to be small and low quality. The Indian industry with its low labor costs was particularly suited for the cutting and polishing of these diamonds, resulting in the entry of new firms at this time and substantial expansion in the decades that followed.

Figure 4 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 constant rate over the entire 40-year period. The Marwaris and the Kathiawaris track together at a slower rate initially, but while the Marwaris continue to grow at that rate, the Kathiawaris shift to a steeper trajectory around 1980. Although this is not visually discernable, if we were to divide the 1965-2004 period into two equal halves, the Kathiawaris would grow significantly faster than the Palanpuris in the latter period.

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. Our theoretical framework assumes that individuals with a family background in business can always move into a new business-related activity. For hundreds of Kathiwaris to enter as in Figure 4, however, the support of a network is needed since the bulk of that community lacks a business background. The supply shock in 1979 may have jump-started the Kathiawari network, but how did the *first* members of the network succeed in business? The story told in the industry is that the Palanpuris supported the early Kathiawaris.[14] Such support could only have been provided if the Palanpuris had started to establish branches in Antwerp by that time. An entrepreneur with a branch in Antwerp functions simultaneously as an exporter and a rough diamond supplier. He could thus use his market reputation to provide referrals to many other suppliers (as opposed to just a few if he was part of the network) and independently support the new entrant. At the same time, he would have an incentive to bring his

[14]The fact that the early Kathiawari entrants were supported by Palanpuris is not disputed in the diamond industry, although individual entrepreneurs are reluctant to admit that they were personally 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).

trusted labor contractor into business, as a way of unloading his stock of rough diamonds. The survey collected information on the year in which each firm established each of its foreign branches (where relevant) and Figure 5 uses this information to plot the number of firms with branches in Antwerp. As expected, we see a sharp increase in the number of Palanpuri firms with branches in Antwerp just around 1979.

There is a fixed cost to setting up a branch abroad – apart from the monetary expense, a close relative must also typically reside there – and so the firm will weigh the returns from procuring rough diamonds through the community network with the returns from this substantial investment when choosing between these options. The returns to setting up a branch will depend to a large extent on how easy it is for the firm to access rough diamonds on its own, once it is established in Antwerp, and the additional benefit of being a rough supplier. The discovery of the Australian deposits and the anticipation of large increases in the supply of rough diamonds many years into the future presumably provided the impetus for Palanpuri firms to set up branches in Antwerp. It was this change in the organizational structure of firms belonging to a community that was already established in the industry that allowed the Kathiawaris to enter, emphasizing the fortuitous confluence of circumstances that was needed to initiate the large-scale occupational migration that followed.

While the Palanpuris may have been able and willing to support the entering Kathiawaris in Antwerp, how did they sell their polished diamonds in the Mumbai market? Figure 6 plots the growth in the number of merchant exporters across communities and over time. We see that these firms, drawn predominantly from the Marwari and Palanpuri communities, emerged as early as the mid-1970s, allowing the initial Kathiawari entrants to sell their polished diamonds without established foreign buyers. The model assumes that children of businessmen prefer operating independently to participating in the network in the new D occupation. Figures 5-6 are broadly consistent with this assumption since firms with branches in Antwerp and merchant exporters operate independently of their networks and the Marwaris and Palanpuris are much more likely to be children of businessmen than Kathiawaris. Formal statistical support for the assumption that children of businessmen are less likely to participate in the network, with its corollary that Marwaris and Palanpuris are more likely to operate independently will be provided below.[15]

[15] Although few Marwari firms establish branches in Antwerp in Figure 5, entrepreneurs from this community are disproportionately represented among the merchant exporters who also operate independently of their networks.

4.2 Composition of Entrants

Proposition 1(b) predicts that the share of entrants with a business background should be declining over time, more steeply in communities with weak outside options. We test this prediction at the individual level by estimating the equation

$$Pr(f_i^j = 1) = \sum_j \left[\gamma_j EY_i^j \cdot \delta^j + \lambda_j \delta^j\right], \tag{5}$$

where $f_i^j = 1$ if the entrepreneur's father was a businessman, $f_i^j = 0$ if he was not, EY_i^j is the year in which his firm was established, and δ^j is a vector of community dummies. We subtract 1965 from the establishment year in these regressions, so the estimated community dummies can be interpreted as the mean share of entrants with a business background around the time of the first shock to the industry. Treating the Palanpuris as the reference category, the model predicts that the coefficient on the uninteracted establishment year variable should be negative. Once we allow for changing conditions in the new industry, this coefficient cannot be interpreted. However, as long as these changes independently affect all three communities, we continue to expect the coefficient on the interaction of the establishment year variable with the Kathiawari dummy to be negative.

The dependent variable in Table 5, Column 1 takes the value one if the entrepreneur's father was a businessman, and zero if he was engaged in farming, a white-collar professional occupation, or diamond cutting and polishing. Column 2 expands the set of occupations that are assumed to be substitutable with the diamond business, setting the dependent variable to one if the entrepreneur's father was engaged in any non-agricultural occupation and zero if he was a farmer. Column 3 replaces the father's occupation with the entrepreneur's years of schooling as the dependent variable. The children of (wealthy) businessmen will tend to have higher education and so we would expect the predictions of the model to follow through with education as well. Education is also generally assumed to be positively correlated with ability. The fact that new entrants without a business background from historically disadvantaged communities are increasingly (and disproportionately) drawn from lower down the ability distribution would only reinforce this prediction.

The coefficient on the establishment year variable is negative in the first three columns of Table 5 but only significant in Column 3. As noted, this coefficient cannot be interpreted once we allow for changing conditions within the new industry. However, the coefficient on the interaction of this variable with the Kathiawari dummy continues to be interpretable and, as predicted by the model 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.[16]

The explanation put forward in this paper for the widening gap in the business background of the Kathiawaris and the more established communities is that a rapidly strengthening Kathiawari network was able to support an increasing share of disadvantaged entrants. 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 inherited business background and educational attainment in the pool of potential entrepreneurs diverged across communities over time. In the context of the model, this would effectively relax the assumptions that λ and the distribution of ability, $\omega_i^j \sim U[0,1]$ were constant across cohorts.

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 parental occupations and educational attainment will vary across age cohorts but are constant over an individual's working life. Entrepreneurs establish their firms at different ages. The specifications in Columns 4-6 consequently include the entrepreneur's age and age-community interactions 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.[17]

To illustrate the magnitude of the community differences reported in Table 5, nonparametric estimates of the relationship between business background and the firm's establishment year are presented in Figure 7. Subsequently, this relationship is estimated net age affects in Figure 8.[18] 90 percent of the

[16]The results in Table 5 are unaffected when the establishment year is replaced by the year in which the firm started exporting.

[17]Although the age coefficients are not reported in Table 5, the coefficient on the Kathiawari-age interaction term is negative and significant in all columns. This indicates that schooling levels and business background in the population are converging across these communities, which is not surprising since the Kathiawaris started at such a low level.

[18]The nonparametric kernel estimates in Figure 8 are constructed in two steps: (1) Separately regress father's occupation and the entrepreneur's age nonparametrically on the establishment year. Regress the residual from the first regression on the residual from the second regression to obtain a consistent estimate of the age coefficient. (2) Compute mean age by community and subtract this from each entrepreneur's age. This allows the intercepts in the second stage to reflect differences in average age across communities. Subtract the differenced variable, multiplied by the estimated age coefficient, from the father's occupation. 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. The Epanechnikov kernel function is used in Figures 7-9.

Marwaris and Palanpuris that started their firms in 1970 had fathers in business. This statistic drops to 70 percent for both communities by 2000. However, this decline is dwarfed by the corresponding decline for the entering Kathiawaris; from 70 percent in 1970 to 20 percent in 2000.[19] Figure 9 repeats this exercise, measuring business background by whether the entrepreneur's father was a farmer or not. Almost all entrants, regardless of their community, came from non-agricultural backgrounds in 1970. This pattern remains constant over time for the Marwaris and the Palanpuris, since there are almost no farmers in those communities. Starting from the late 1970s, the Kathiawari entrants, however, are increasingly likely to have fathers who were farmers and by 2000 over 70 percent of the Kathiawari entrants have farming backgrounds.[20] It is evident that most of the change in the business background of entering Kathiawari entrepreneurs in Figure 8 was driven by the dramatic shift out of agriculture in this community over a single generation.

4.3 Participation in the Network

The model assumes that children of businessmen select immediately into the new (substitutable) occupation but choose to operate independently of their community network in that occupation. Based on the discussion in Section 3, merchant exporters and firms with branches in Antwerp operate independently, while all other exporters rely on their community networks. Classifying this last group of firms as "network" firms, we see in Table 6, Column 1, *within* community and establishment year (with a full set of community-year dummies) that the children of businessmen are indeed significantly less likely to be dependent on the network. Expanding the set of parental occupations that are assumed to be substitutable with the diamond business, we see in Table 6, Column 2 that the children of fathers in non-agricultural occupations are significantly less dependent on the network. Since the children of (wealthy) businessmen will have higher educational attainment, more educated entrepreneurs should be less dependent on the network, and this is what we see in Column 3 (although the association is not statistically significant at conventional levels).

The model implicitly assumes that participants in the network can credibly commit to cooperative

[19] Schooling 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 1970-2000 period. The Kathiawaris start with 13 years of schooling in 1970 and fall below 11 years by 2000.

[20] The apparent trend-break for the Kathiawaris around 1977 in Figure 9 is caused by the paucity of data in those early years and is misleading. To statistically identify a trend-break, I estimated parametric regressions for the Kathiawaris as in Table 5 that allowed for a different trend beyond a pre-specified threshold establishment year. The F-statistic for this regression remained roughly constant as the threshold was shifted sequentially from 1975 to 1980 and then spiked in 1981 and 1982 before declining sharply and then becoming stable once again.

behavior. Previous research has identified the important role that the marriage institution plays in maintaining the integrity of caste-based networks (Munshi and Rosenzweig 2006, 2009) and the following episode exemplifies the role played by this institution in supporting cooperation and building strong networks in the diamond industry: In September 2003, a series of articles appeared in local Mumbai newspapers, including *The Times of India*, describing the high profile murder in Mumbai of a Palanpuri polished buyer who was based in Belgium. This individual owed an enormous sum of money to export firms in India, but since diamond transactions are not in writing, his creditors had no recourse to the legal system. Because he was based abroad, there was little they could do to punish him directly either. However, he had married a woman from a diamond family and at the insistence of his in-laws it appears that he agreed to return to Mumbai to face his creditors. The situation subsequently took an unfortunate turn (off the equilibrium path), but what this episode makes clear is that punishments are severe in this industry and that intra-industry marriage can serve as a very powerful commitment device.

Given the importance of intra-marriage as described above, suppose that such marriages are a prerequisite for participation in the network. Apart from his own marriage decision, the entrepreneur could also make credible commitments to the network through the marriage choices he makes for his children. Completing the analysis within community and establishment year, we see in Table 6, Columns 4-5 that entrepreneurs and their children from firms that are organized to rely on the network are significantly more likely to marry within the industry.

Having established the association between parental occupation, the organization of production, and marriage decisions, *within* community and establishment year, an additional test of Proposition 1 (b) that is specific to the diamond industry exploits variation *across* communities and over time to estimate regressions analogous to equation (5),

$$Pr(y_i^j = 1) = \sum_j \left[\tilde{\gamma}_j EY_i^j \cdot \delta^j + \tilde{\lambda}_j \delta^j \right], \tag{6}$$

with parental occupation replaced as the dependent variable by $y_i^j = 1$ if firm i in community j participates in the network, $y_i^j = 0$ if it operates independently. Following the discussion above, we use two measures of participation: The first measure is based on the organization of production, with merchant exporters and firms with branches in Antwerp classified as operating outside the network and all other firms assumed to be participating in the network. The second measure is based on the

assumption that marriage within the industry is a prerequisite for participation in the network.

As with equation (5), the coefficient on the uninteracted establishment year variable cannot be interpreted once we allow for changing conditions in the industry over time. However, as long as these changes affect all three communities, the coefficient on the community-establishment year interaction can still be interpreted. We saw in Table 5 that the Kathiawaris were relatively *less* likely to be drawn from a business background over time. Treating the Palanpuris as the reference category and given the associations estimated in Table 6, we expect the Kathiawari-establishment year coefficient to be *positive* with either measure of network participation as the dependent variable.

Starting with the first measure of participation in Table 7, Column 1 we see that the organization of production of the Kathiawari and Palanpuri firms is statistically indistinguishable in 1965 (the base year) but that the Kathiawaris are significantly more likely to be organized as network firms over time. The Marwaris, in contrast, are much less likely to be dependent on their network than the Palanpuris to begin with, and there is no change in the cross-community gap over time. These estimates broadly match the cross-community differences in the organization of production presented earlier in Figures 5-6.

The dependent variable in Table 7, Column 2 takes the value one if the spouse's family was in the diamond industry prior to their marriage, zero otherwise. Both the Kathiawaris and the Marwaris are less likely to marry within the industry than the Palanpuris (the reference category) to begin with. While the Kathiawari - establishment year coefficient is positive and significant once again, the Marwari - establishment year coefficient is much smaller in magnitude and insignificant.[21]

One explanation for variation in the probability of intra-industry marriage across communities and over time is that these marriages respond to growth in the *stock* of firms in the industry, which expands the pool of prospective partners from within the industry and the community. 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, are consequently included as additional regressors in Table

[21] Marriage 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 percent 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 percent. 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 7, Column 2 would then be that intra-community marriage has declined more rapidly over time among the urbanized 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.

7, Column 3. Reassuringly, the results reported in Column 2 are unchanged, with the Kathiawari-establishment year coefficient, in particular, continuing to be positive and significant.

Table 7, Column 4 repeats the regression that we ran for the entrepreneur in Column 2, with 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 2 is otherwise unchanged. Once again, the Kathiawari-establishment year coefficient is positive and statistically significant. Table 7, Column 5 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 the results once again.

On average, 16 percent of the Marwaris and 45 percent of the Palanpuris married within the industry, with little change in these statistics over time as indicated by the estimated coefficients in Columns 2-3. The corresponding statistic for the Kathiawaris is 28 percent, with a substantial increase in intra-industry marriages over time, matching the positive and significant establishment-year coefficient in Columns 2-3. While a negligible fraction of the Kathiawaris who established their firms in 1970 married within the industry, this fraction increased steadily over time, reaching 50 percent by 2004. The marriage patterns for the children broadly match the patterns reported for their parents but change even more steeply over time, with 65 percent of the Kathiawaris marrying within the industry by 2004.[22]

4.4 Network Strength

Proposition 1(a) predicts that networks will strengthen over time, more steeply in communities with weak outside options. Although network strength cannot be observed directly, firm performance data can be used to infer changes in underlying networks. Let the entrepreneur's utility be determined by his firm's performance or profits. Based on the model, average profits for firms belonging to community j in period t can then be expressed as

$$\pi_t^j = \frac{\lambda t \left[U_D + \frac{r_B}{2}\right] + (1-\lambda)\sum_{\tau=1}^{t} \Delta\omega_\tau^j \left[h(1-\lambda)\sum_{\tau=0}^{t-1} \Delta\omega_\tau^j + r_B \frac{\sum_{\tau=1}^{t} \Delta\omega_\tau^j \left(\frac{1+\omega_t^j}{2}\right)}{\sum_{\tau=1}^{t} \Delta\omega_\tau^j} \right]}{\lambda t + (1-\lambda)\sum_{\tau=1}^{t} \Delta\omega_\tau^j} \tag{7}$$

[22] 90 percent of the children from all three communities married within their sub-caste, highlighting their continued ties to the broader community networks.

The first square bracket in the preceding equation measures the average profit of entrepreneurs with a business background, which remains the same across cohorts (and over time). The first term in the second square bracket measures network strength and the second term measures the effect of ability on profits for entrepreneurs without a business background. Although each entrepreneur's ability is fixed, the average ability of entrepreneurs without a business background declines over time as the ability threshold $\underline{\omega}_t^j$ shifts down over successive cohorts. Notice, however, following the extension to the model in Figure 2, that all individuals without a business background benefit equally from the network regardless of their cohort. The denominator in equation (7) reflects the total measure of firms from community j that are active in the industry in period t, with average profits for firms with and without a business background (the terms in square brackets) weighted by the corresponding measure of firms in each category in the numerator of that equation.

We know from equations (3) and (4) that $\underline{\omega}_t^j = 1 - \Delta\omega_t^j$ is decreasing over time, more steeply in communities with weaker outside options. The weighting of average ability among the entrepreneurs without a business background across cohorts in equation (7) will reinforce this effect and so compositional change in entrepreneurial ability will counteract changes in network strength predicted by Proposition 1(a) in the second square bracket. An unconditional comparison of changes in average firm performance across communities is consequently uninformative about variation in underlying network strength.

Prospects for identifying changes in network strength across communities and over time improve, however, if firm-level panel data are available. Firm fixed effects account for the first square bracket and the second term in the second bracket in equation (7). This last term is essentially the average of a changing set of firm fixed effects and once it is accounted for, changes across communities and over time reflect changes in the strength of underlying networks alone. Because the ability of entrepreneurs without a business background is declining relatively steeply in communities with weak outside options, inclusion of firm fixed effects should have a correspondingly large (positive) effect on the performance trajectory in those communities. Once firm fixed effects are included, we also expect the firm performance trajectory to be unambiguously steeper in communities with weaker outside options as predicted by the model. The fact that the second square bracket is weighted more heavily in those communities in equation (7) will only reinforce these predictions.

Although the preceding analysis generated predictions for conditional profits across communities and over time, the firm-level data provided by the GJEPC consists of annual exports for 95 percent

of the surveyed firms over the 1995-2005 period (or as long as the firm was exporting if it commenced after 1995). There are three stages in the diamond manufacturing process – splitting, cutting, and polishing – with a worker assigned to each stage. Each diamond must go through this process, so firms do not benefit from economies of scale in production. Polished diamonds produced in India are almost exclusively exported and firms are price takers on both the rough and polished side of the market. This implies that there is a linear mapping from exports to profits, with this mapping depending on the polished diamond yield, the labor intensity, and the price of rough and polished diamonds, all of which may vary across size-classes of diamonds but are approximately equal across firms within a size-class.[23]

Ignoring variation across size-classes for a moment, Table 8, 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.[24] We subtract 1995 from the year variable so that the intercept and the community coefficients can be interpreted as average exports in the first year of our panel. The coefficient on the Kathiawari-year interaction term is positive but insignificant in Column 1; Kathiawari exports do not lag behind Palanpuri exports (the reference category) despite the fact that entrepreneurs from this community with relatively weak business backgrounds were entering the industry over time. The community-year effects in Column 1 reflect relative changes in the strength of the network and 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 positive and significant at the 5 percent level as predicted.[25] The increase in the steepness of the export trajectory from Column 1 to Column 2 is also substantially larger for the Kathiawaris than for the Marwaris or Palanpuris, as predicted. Once we relax the assumption that each firm consists of a single entrepreneur, the senior partner could compensate for the absence of a business background by matching with capable partners, hiring well qualified employees, or gaining personal experience prior to establishing the firm. The substantial increase in the export trajectory of the Kathiawaris once fixed effects are included,

[23]Let the price of rough and polished diamonds be P_R, P_P, respectively, let $\theta < 1$ be the yield of polished diamonds per unit of rough diamonds, and let L be the labor requirement (at a wage rate w) per unit of rough diamonds. The firm's profit π can then be expressed as a linear function of exports, X: $\pi = [P_P - (P_R + wL)/\theta]\, X$.

[24]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 noise in the export data, it does not bias the estimated community coefficients in the export regressions.

[25]The intercept and the community coefficients in Column 2, and in the fixed effects regressions that follow, are computed as the average of the estimated firm fixed effects within the relevant groups, with the community coefficients interpreted as deviations from the reference (Palanpuri) category.

however, suggests that the relatively steep decline in the background of entering entrepreneurs from that community in Figures 7-9 did indeed have negative consequences for firm performance.

The export trajectories estimated with firm fixed effects can be interpreted as the average effect of the network on all firms in the community, including firms operating independently that are disproportionately owned by children of businessmen (as assumed theoretically and shown empirically in Table 6). Because the parental occupation is predetermined rather than a choice variable the export regression can be estimated with a restricted sample consisting of entrepreneurs without a business background, thus recovering the effect of the network on those firms that benefit from it. The pattern of coefficients with the reduced sample of firms in Table 8, Columns 3-4 broadly matches what we obtained with the full sample in Columns 1-2. The notable differences are that the Kathiawari-year coefficient is now large and significant even without firm fixed effects and that this coefficient subsequently increases even more with the fixed effects than it did earlier with the full sample. The estimated coefficients in the fixed effects regressions with the full sample indicate that Palanpuri exports, incorporating growth in the network and secular changes in the industry, were increasing by 450 thousand dollars per year on average. The Kathiawari network increased exports for its members by 240 thousand dollars over and above this benchmark. To get a sense of the importance of this differential network effect, average annual exports for Kathiawari firms were roughly 4.7 million dollars per year over the 1995-2004 period.[26] Restricting attention to firms without a business background who directly benefit from the network, the differential network effects are even larger: Palanpuri exports increase by approximately 325 thousand dollars per year while the Kathiawari network increases exports for its members by an additional 550 thousand dollars (over 10 percent of average annual exports).

The model assumes that the returns to ability, inherited human capital, the share of individuals with a business background in the population, and the ability distribution are fixed over time. Changes in the new D (diamond) industry that *equally* affect all communities can easily be incorporated in the empirical analysis. As noted, the uninteracted establishment year coefficient in Tables 5 and 7 and the uninteracted year coefficient in Table 8 can no longer be interpreted. However, the interaction of these variables with the Kathiawari dummy will continue to identify differential changes across communities in the composition of entrants, participation in the network, and network strength. The discussion

[26]Exports are measured in millions of 1994 Rupees in Table 8 and the exchange rate was 31 Rupees to the dollar in that year. Average exports over the 1995-2004 period (in millions of dollars per year) are 3.8 for the Marwaris and 5.0 for the Palanpuris.

that follows goes a step further by allowing for *differential* exogenous changes across communities, in the utility derived from the traditional occupation and profits in the new industry.

Suppose that outside options, U_{NB}^{j} are declining over time, more steeply in historically disadvantaged communities. It is straightforward to verify from the model that the share of entrants without a business background will then increase over time, more steeply in historically disadvantaged communities, without requiring networks to be active. Previously we used the entrepreneur's age to control for differential changes in parental occupations and education in the pool of potential entrants across communities. Changes in U_{NB}^{j} are more difficult to control for empirically because they are not observed and because they occur contemporaneously with entry decisions. These changes, however, cannot explain the differences in firm performance across communities and over time in Table 8. Without a role for underlying community networks, there is no obvious reason why Kathiawari exports should track with Palanpuri exports despite the observed decline in the business background of entrants from that community over time, or why the Kathiawari-year coefficient should be positive and significant once firm fixed effects are included.[27]

Having explored alternative explanations for the observed compositional change across communities, the empirical analysis concludes by considering an alternative explanation for the differential firm performance across communities. While the mapping from exports to profits may be the same for firms specializing in a particular size-class of diamonds, it could potentially vary across size-classes. Kathiawari firms tend to specialize in small stones; these stones account for 57 percent of their output by value, versus 44 percent and 49 percent for the Marwaris and the Palanpuris, respectively.[28] Given the constraints on entry into this industry, Kathiawari exports and profit margins would have grown relatively rapidly if there was an increase in the supply or demand for small stones, matching the patterns in Table 8, Columns 1-4.

If we continue to assume that the children of businessmen shift immediately to the new industry, while individuals without a business background enter selectively as the returns in the new industry grow, then this alternative explanation for the superior performance of the Kathiawari firms would

[27] Although we have shown that exit rates are low and do not vary by community, suppose that the entering Kathiawaris always consisted of a high proportion of first-generation businessmen, but that those individuals had a greater propensity to exit. Such selective exit would also generate the observed compositional change across communities. However, it cannot, once again, explain the observed variation in firm performance across communities, with and without fixed effects.

[28] We 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.

also explain the observed compositional change across communities without requiring networks to be active. To account for this possibility, I 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 is also included in the specification without fixed effects) in Table 8, Columns 5-6. The coefficient on the interaction term is actually *negative* and significant in both columns, while the Kathiawari-year coefficient continues to be positive and significant once fixed effects are included.

Although we have focussed on the comparison between the Kathiawaris and the established communities in the empirical analysis, the distinction between the Marwaris and the Palanpuris is also of some interest. Based on the discussion in Section 3, we expect the Marwaris to have superior outside options than the Palanpuris, although the gap between these communities will be small relative to the gap between them and the historically disadvantaged Kathiawaris. We do not observe a statistically significant difference in the changing background of entering entrepreneurs between these two communities in Table 5, but this may simply reflect the fact that the decline in the business background of the entering Palanpuris was so shallow. Since business background is correlated with network participation, it is not a surprise that changes over time in participation were also statistically indistinguishable between the Marwaris and Palanpuris in Table 7. Recall, however, that intra-industry marriage and the choice of organizational structures that left them reliant on the network were both especially infrequent for the Marwari firms. The export regressions indicate, moreover, that the Marwari network was strengthening significantly more slowly than even the Palanpuri network, providing additional support for the negative relationship between outside options and the growth in new networks.

5 Conclusion

This paper provides theoretical and empirical support for the role played by newly established community networks in facilitating occupational mobility. The key insight from the analysis is that these networks will strengthen most rapidly in communities with the weakest outside options, providing a useful counterpoint to the existing literature in which community effects are seen to reinforce the persistence of inequality across individuals or families.

Why do these occupational transitions not occur more often? The ability to coordinate and form new networks will typically be increasing in the existing level of social capital in the community (Bloch, Genicot, and Ray 2007). One explanation for the relatively infrequent transitions is that historically

disadvantaged communities are unable to coordinate and take advantage of new opportunities. There is, however, no *a priori* reason why economic disadvantage should be associated with low social capital. In the Indian context, for example, caste networks have retained their importance, and high rates of within-caste marriage continue to be observed, across the social hierarchy. A possibly more salient explanation is based on the analysis in this paper, which indicates that a sufficiently large influx of initial entrants is needed to set the network on a positive trajectory. In the diamond industry, a large supply shock, together with a change in the organizational structure of established firms in the industry, allowed the Kathiawaris to enter business. Such a confluence of favorable circumstances may be a rare event.

Given the benefits of these inequality reducing and growth enhancing transitions, could interventions be designed to move individuals out of their traditional occupations? If occupation-specific skills are needed for mobility, then the prospects for such interventions are limited. However, if the constraint on mobility is inherited wealth, then credit infusions could substitute for an advantageous family background. In the diamond industry, most firms rely on supplier credit to procure rough diamonds, which effectively excludes individuals without prior connections. If an outsider received a permanent supply of bank credit, however, he could enter the industry by paying cash for the rough diamonds. If his credit line was sufficiently generous, he could even set up a branch in Antwerp. The drawback of these solutions is that they do not bring other individuals, who do not have access to bank credit, into the business. A more effective intervention would, instead, provide a limited amount of credit on a short-term basis to a sufficiently large number of individuals from the same social group, facilitating the formation and subsequent expansion of a new network. Interventions that exploit network externalities in this way may be especially cost effective in settings where these institutions are active.

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Figure 1: Network Dynamics with Concave Technology

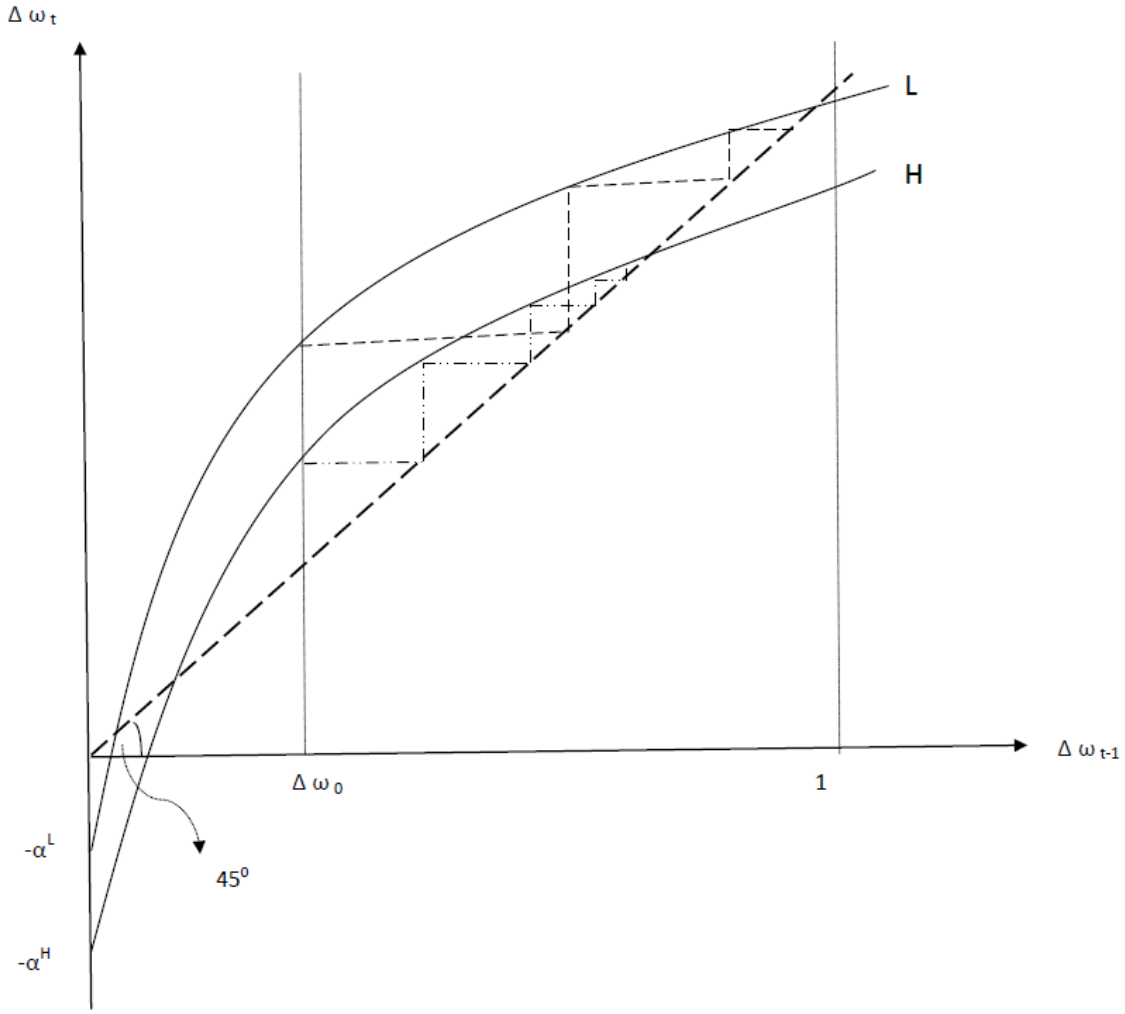

Figure 2: Network Dynamics with Additional Cohorts

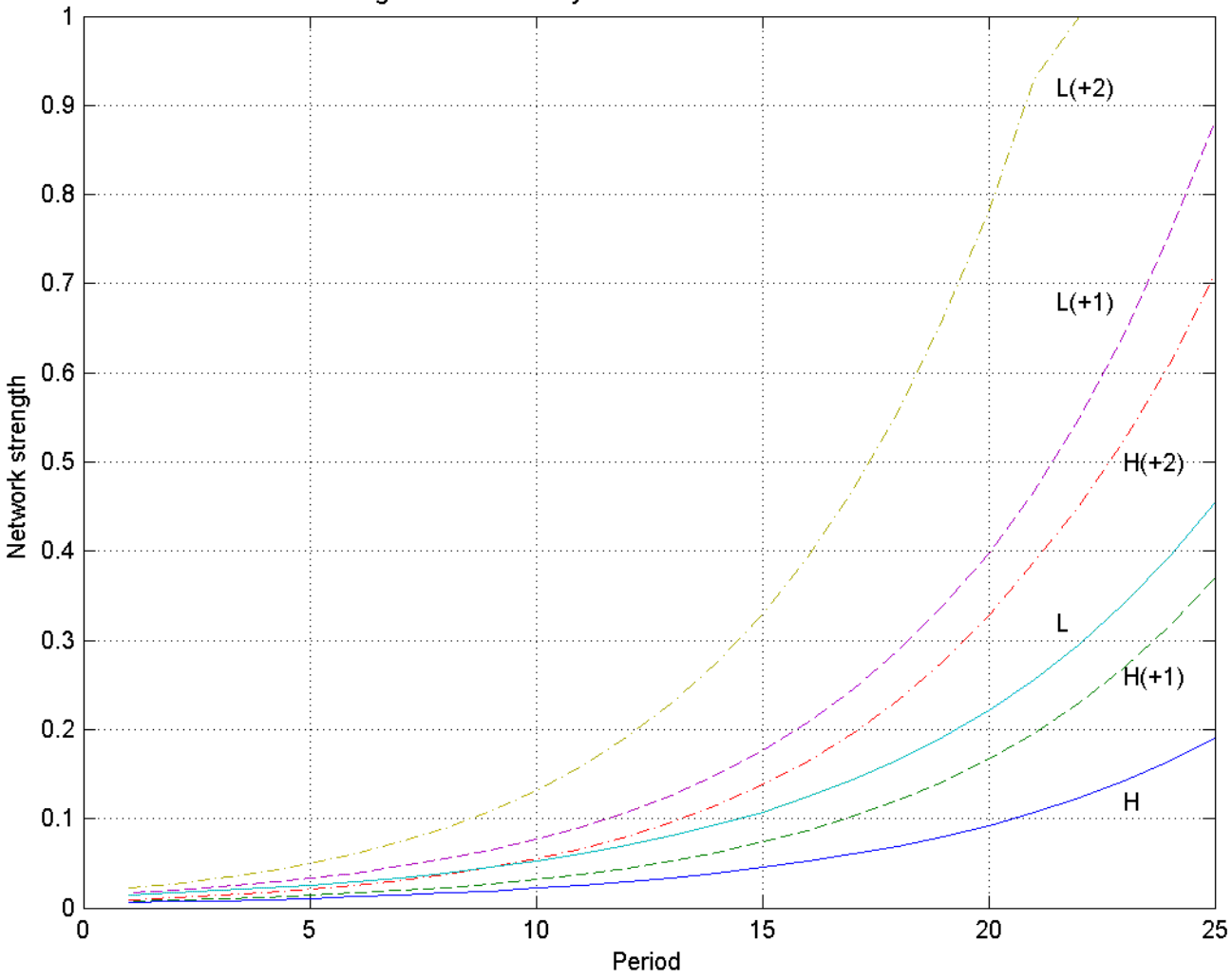

Figure 3: Network Dynamics with Alternative Distributions

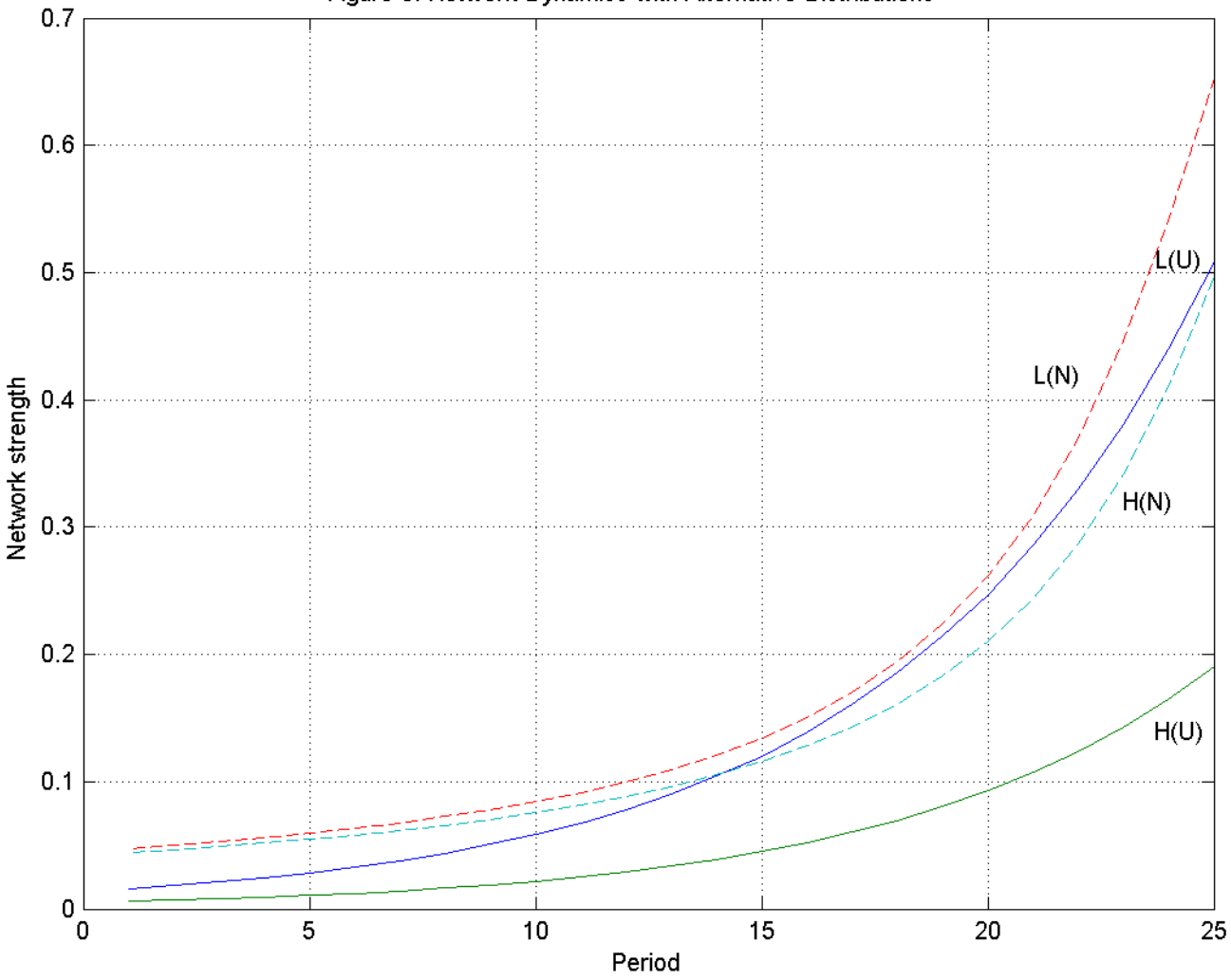

Figure 4: Number of Firms

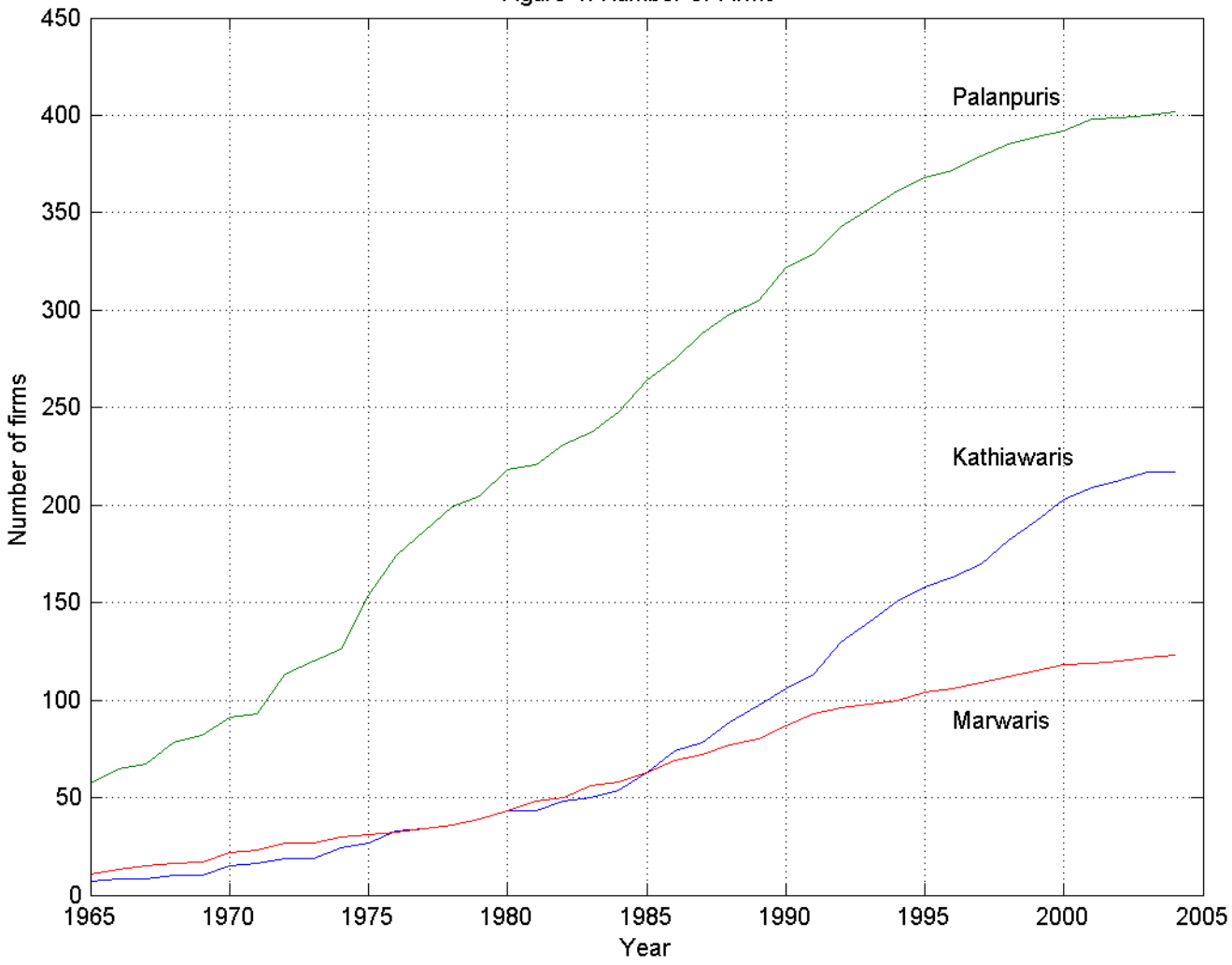

Figure 5: Number of Firms with Branches in Antwerp

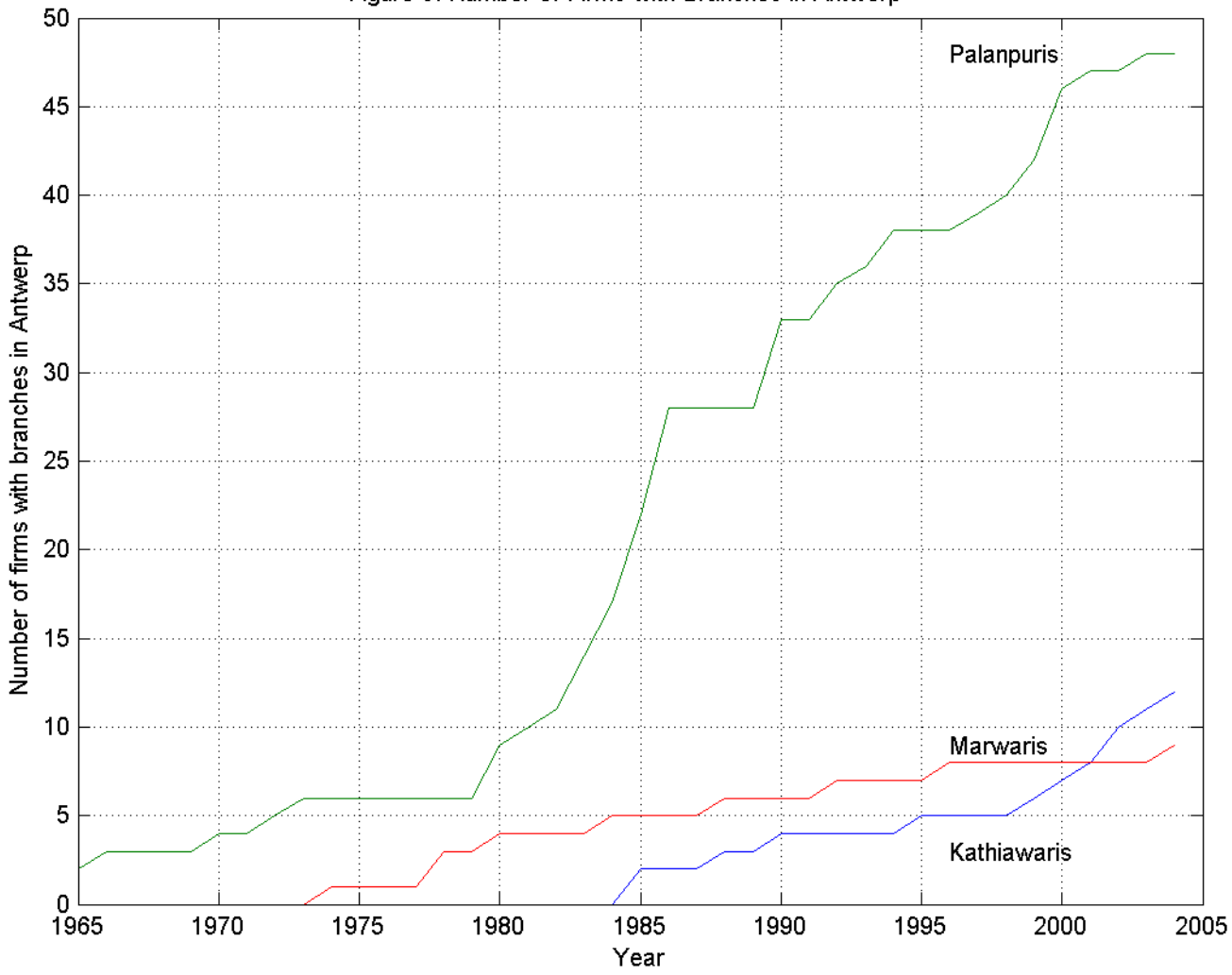

Figure 6: Number of Merchant Exporters

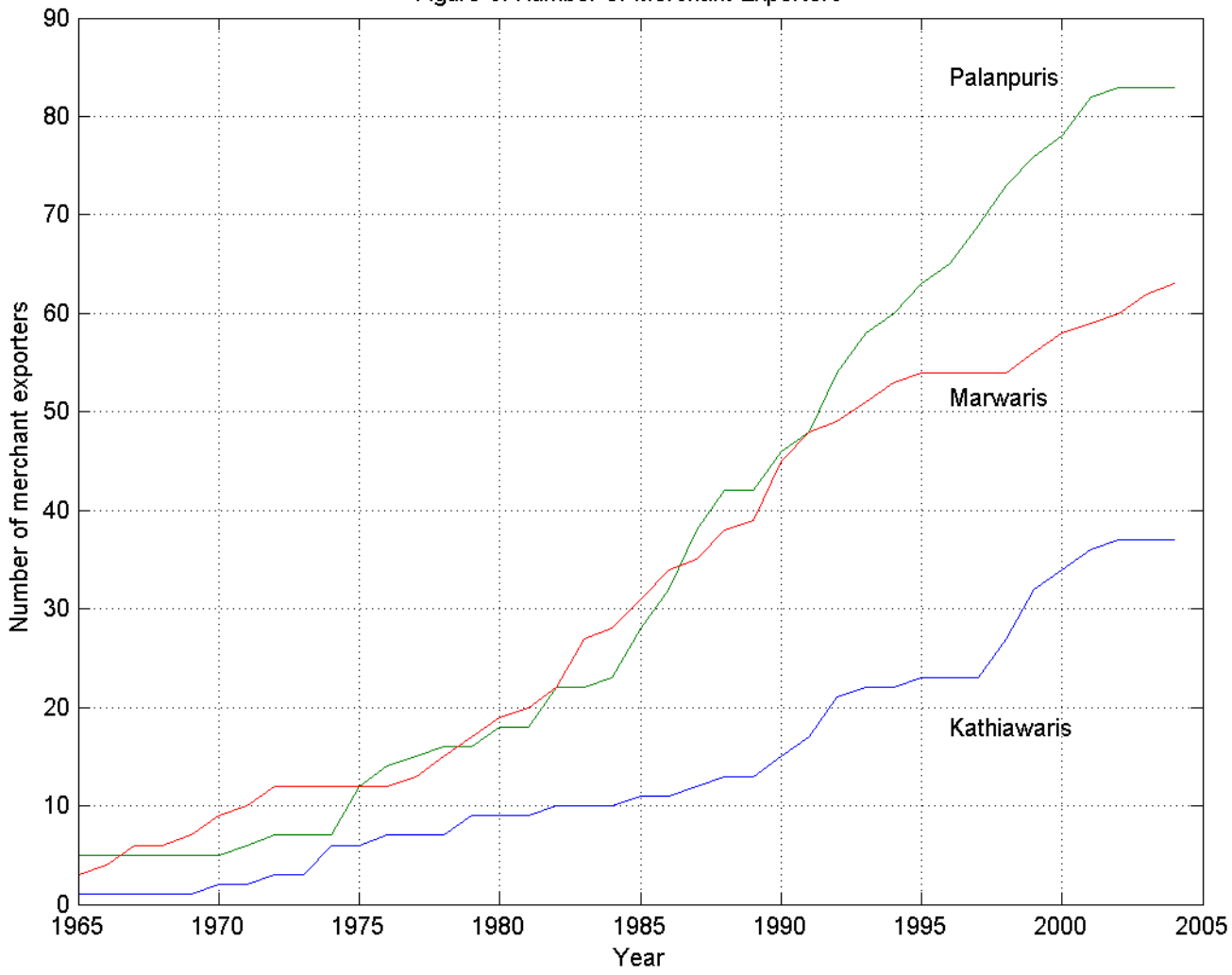

Figure 7: Family Background of Entering Entrepreneurs (Business)

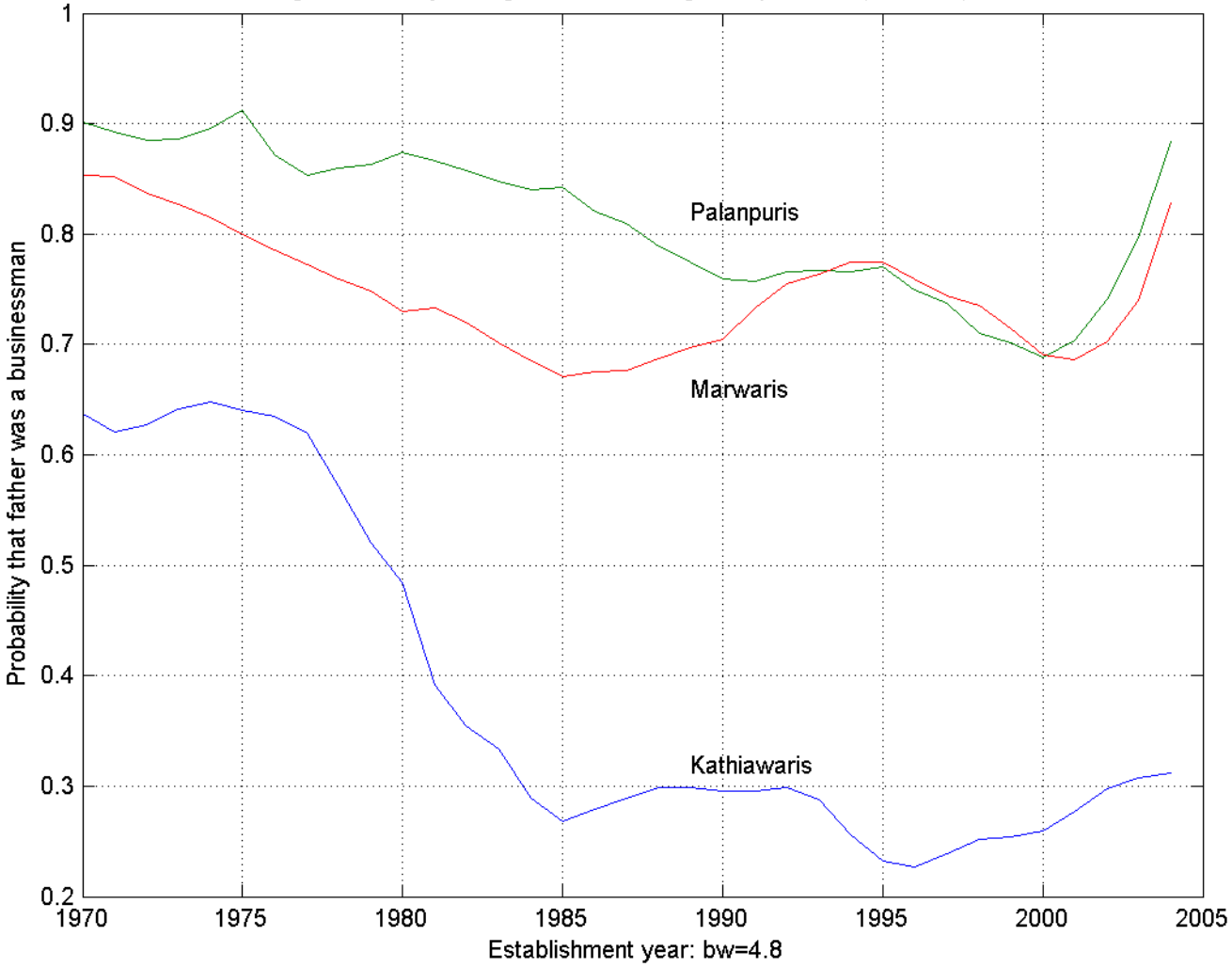

Figure 8: Family Background of Entering Entrepreneurs (Business)

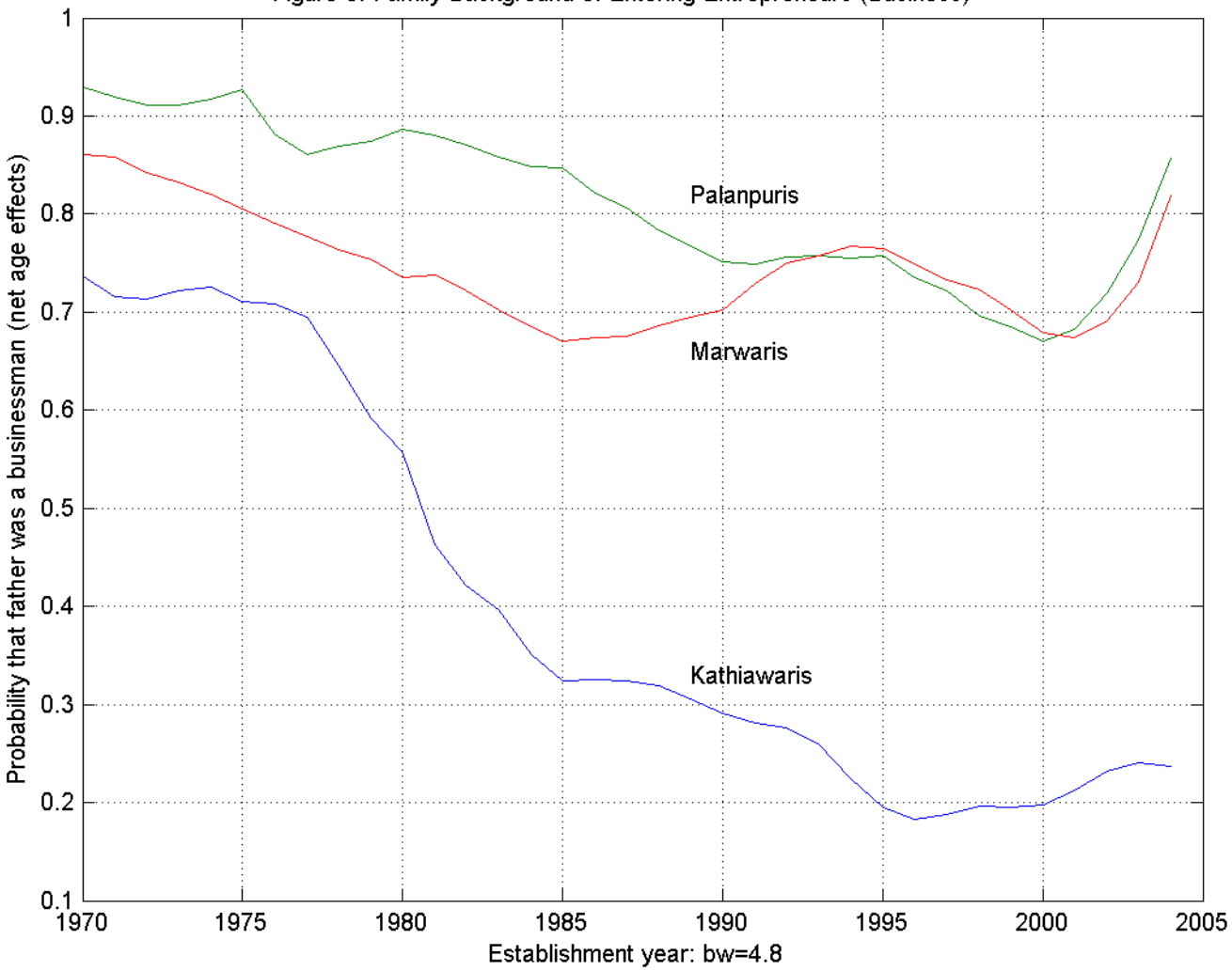

Figure 9: Family Background of Entering Entrepreneurs (Non-Agriculture)

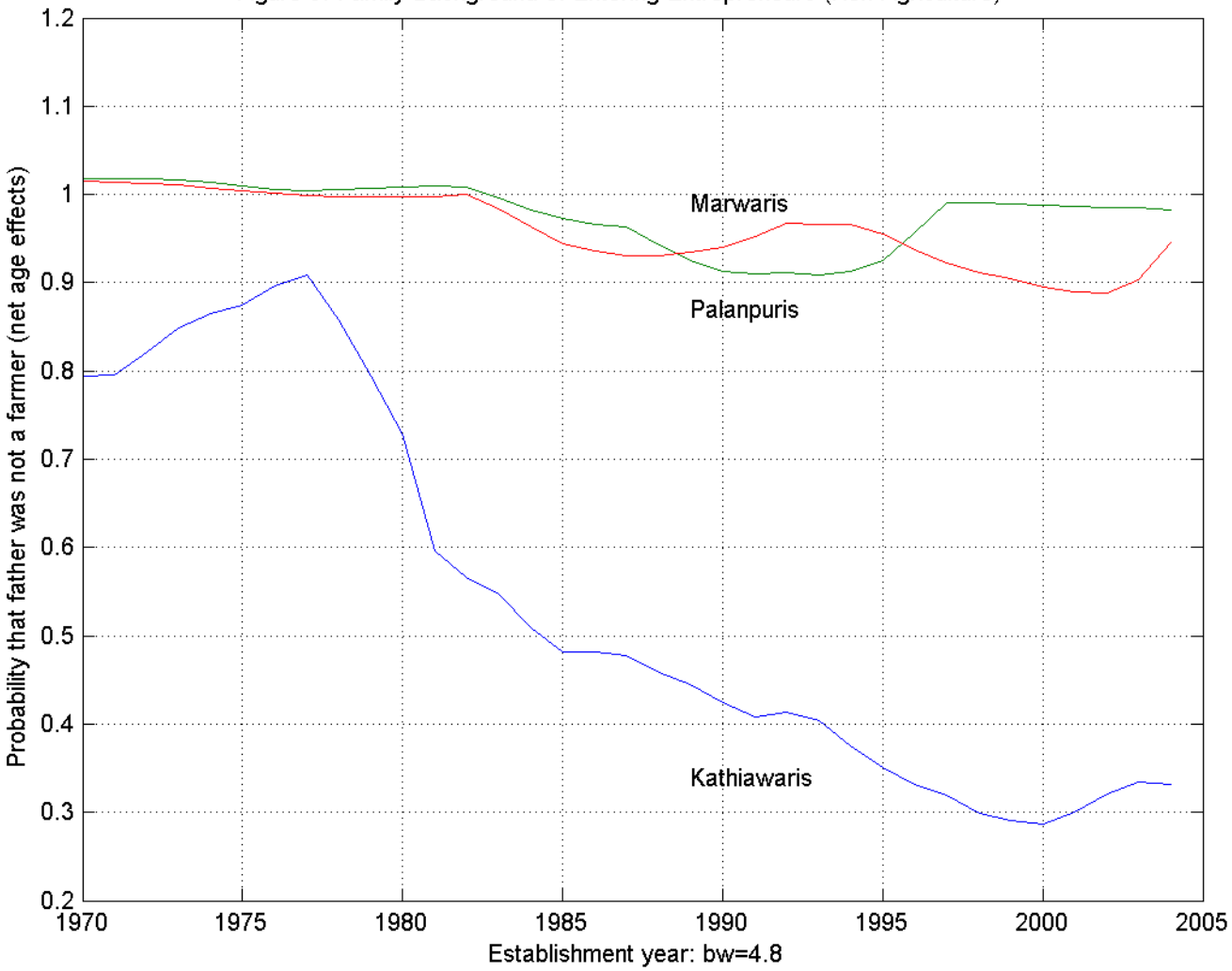

Table 1: Referral Pattern

Source of referrals:	number of individuals that provided referrals	total number of referrals provided	percent of referrals for Kathiawaris	percent of referrals for Marwaris	percent of referrals for Palanpuris
	(1)	(2)	(3)	(4)	(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: Exit Statistics

Sample:	All firms	Kathiawaris	Marwaris	Palanpuris
	(1)	(2)	(3)	(4)
Exit rates	1.53	1.79	1.14	1.55
Exit rates by age				
one-year old firms	2.43	1.94	1.01	3.57
two-year old firms	2.73	1.23	1.18	4.72
three-year old firms	2.73	5.56	3.23	0.96
four-year old firms	2.05	2.94	0.00	2.70

Note: exit rates, in percent, are computed over the 1995-2000 period.

A firm is assumed to have exited if it was active in a given year and then drops out of the database for three years or longer.

A firm is assumed to be one year old in a given year if it first shows up in the database in that year.

Exit rates for one-year olds can thus be computed over the 1996-2000 period, for two-year olds over the 1996-1999 period, for three-year olds over the 1996-1998 period and for four-year olds over the 1996-1997 period.

Table 3: Characteristics of Entrepreneurs

Community:	Kathiawari	Marwari	Palanpuri
	(1)	(2)	(3)
Panel A: Individual characteristics			
Age	42.46	46.13	49.05
	(11.37)	(10.32)	(10.48)
Years of schooling	10.84	14.41	12.87
	(3.77)	(2.09)	(2.51)
Percent that grew up in Mumbai	22.02	26.40	49.38
	(41.53)	(44.26)	(50.06)
Panel B: Family background			
Father's occupation (%)			
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	82.40	75.81
	(47.67)	(38.24)	(42.88)
Number of firms	218	125	405

Note: standard deviations in parentheses.

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

Table 4: Organization of Production

Business activity:	buying roughs	selling polished
	(1)	(2)
Number of suppliers/buyers per year	10.60	34.18
	(16.85)	(76.08)
Percent of firms with a single dominant supplier/buyer	71.18	58.64
	(45.34)	(49.28)
Percent of stones (by value) bought/sold directly abroad	70.26	63.10
	(33.80)	(37.74)
Percent of stones (by value) bought/sold on credit	77.10	82.08
	(29.58)	(25.59)
Average repayment period (days)	101.48	110.33
	(25.54)	(37.02)
Percent of transactions involving a written agreement	5.79	4.89
	(2.34)	(2.16)

Note: standard deviations 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.
Percent of stones bought directly abroad in Column 1 is computed using stones sourced from Antwerp alone.
Merchant exporters, who restrict their activity to the polished side of the market, are excluded from Column 1.

Table 5: Selection into the Industry

Dependent variable:	father business	father non-agric.	schooling	father business	father non-agric.	schooling
	(1)	(2)	(3)	(4)	(5)	(6)
Establishment year - Kathiawari	-0.011	-0.008	-0.017	-0.016	-0.016	-0.065
	(0.004)	(0.004)	(0.024)	(0.004)	(0.004)	(0.025)
Establishment year - Marwari	-0.003	-0.00004	0.025	-0.003	0.0001	0.031
	(0.002)	(0.001)	(0.017)	(0.003)	(0.001)	(0.018)
Establishment year	-0.002	-0.001	-0.022	-0.002	-0.001	-0.030
	(0.002)	(0.001)	(0.007)	(0.002)	(0.001)	(0.007)
Kathiawari	-0.134	-0.290	-1.404	0.333	0.448	2.187
	(0.105)	(0.096)	(0.667)	(0.214)	(0.213)	(1.434)
Marwari	0.135	0.006	1.153	0.224	-0.029	-0.532
	(0.047)	(0.007)	(0.367)	(0.182)	(0.059)	(1.182)
Constant	0.778	0.988	13.176	0.859	1.093	15.423
	(0.028)	(0.008)	(0.144)	(0.135)	(0.068)	(0.649)
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.

Establishment year is subtracted by 1965 so intercepts are interpreted as average levels in that year.

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 6: Selection into the Network

Dependent variable:	entrepreneur's characteristics			married within the industry	
	father business	father non-agric.	schooling	entrepreneur	children
	(1)	(2)	(3)	(4)	(5)
Network firm	-0.073	-0.043	-0.307	0.096	0.105
	(0.039)	(0.026)	(0.260)	(0.042)	(0.052)
Number of observations	743	743	743	743	592

Note: Standard errors in parentheses.

All regressions include a full set of community-establishment year dummies.

Column 5 also includes a gender dummy.

Network firms are organized to be reliant on the network and exclude merchant exporters and vertically integrated firms.

Table 7: Participation in the Network

Dependent variable:	network firm	married within the industry		children married within industry	
	(1)	(2)	(3)	(4)	(5)
Establishment year - Kathiawari	0.009	0.009	0.011	0.014	0.017
	(0.003)	(0.004)	(0.005)	(0.004)	(0.005)
Establishment year - Marwari	0.002	0.003	-0.0002	0.008	0.010
	(0.004)	(0.003)	(0.001)	(0.008)	(0.008)
Establishment year	-0.005	-0.001	0.007	0.001	0.002
	(0.001)	(0.002)	(0.004)	(0.002)	(0.004)
Kathiawari	-0.050	-0.372	-0.598	-0.441	-0.509
	(0.081)	(0.089)	(0.164)	(0.094)	(0.111)
Marwari	-0.255	-0.331	-0.489	-0.509	-0.567
	(0.081)	(0.070)	(0.082)	(0.108)	(0.143)
Constant	0.735	0.463	0.671	0.709	0.790
	(0.030)	(0.034)	(0.105)	(0.041)	(0.092)
Number of active firms in the community	No	No	Yes	No	Yes
Number of observations	742	742	742	588	588

Note: Standard errors in parentheses clustered by establishment year.

Establishment year is subtracted by 1965 so intercepts are interpreted as average levels in that year.

Network firms are organized to be reliant on the network and exclude merchant exporters and vertically integrated firms.

Columns 4-5 include a gender dummy as an additional regressor.

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 8: Firm Performance

Dependent variable:	exports					
Sample:	all firms		father non-business		all firms	
	(1)	(2)	(3)	(4)	(5)	(6)
Year-Kathiawari	1.874	7.419	10.076	16.752	2.744	8.266
	(1.511)	(2.223)	(4.758)	(5.242)	(1.626)	(2.362)
Year-Marwari	-7.514	-6.626	-8.018	-9.374	-8.214	-7.583
	(1.452)	(2.153)	(2.130)	(2.432)	(1.776)	(2.408)
Year	12.940	14.272	7.941	9.784	17.592	20.585
	(2.169)	(1.906)	(1.658)	(2.137)	(3.565)	(3.287)
Kathiawari	-22.282	-48.921	0.652	-31.167	-15.579	-44.070
	(5.454)	(11.357)	(16.602)	(13.913)	(5.833)	(11.568)
Marwari	-3.789	-8.163	-53.953	-47.865	-2.755	-4.287
	(4.773)	(13.964)	(8.815)	(9.201)	(5.639)	(14.051)
Constant	97.953	92.103	72.199	63.788	119.121	89.101
	(10.805)	(6.777)	(6.657)	(8.984)	(14.200)	(6.770)
Year-proportion small stones	--	--	--	--	-0.100	-0.123
					(0.035)	(0.031)
Firm fixed effects	No	Yes	No	Yes	No	Yes
Number of observations	6,114	6,114	2,034	2,034	5,965	5,965

Note: Standard errors in parentheses clustered by year.

Exports are measured in millions of 1994 Rupees. The exchange rate was 31 Rupees to the dollar in that year.

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

Proportion small stones is included as an additional regressor in Column 5.

The intercept and community dummies in the regressions with firm fixed effects are computed *ex post* from the estimated fixed effects.