

Working Paper
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Segmentation, Network Multipliers and Spillovers:
A Theory of Rural Urban Migration
for a Traditional Economy

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ABSTRACT

Economic theories portray wage differences and income-diversification as key determinants of rural-urban migration in developing countries. This paper develops a dynamic theory where economic and social variables work in tandem to shape and accelerate such movement. While existing theories portray migration as a single flow, the new theory highlights spillovers between and contrasts in how social networks and interactions impact on two separate, yet interconnected flows of rural urban migrants. Two empirical illustrations are deployed. In the first, adult male and autonomous child labour migrants make up the two flows; in the second we consider two flows in rural contexts where patterns of social interactions and network access are influenced by caste. Long-term migration features as equilibria in village level social systems. The comparative static analysis of these equilibria gives rise to social network multipliers, another key innovation.

Keywords: rural urban migration, social network multipliers, caste, spillovers, South-Asia

1. INTRODUCTION

South-Asian observations often challenge theoretical predictions about rural-urban migration and its causes. According to the author's field observations in Honnavara, a village in rural Mandya district, 91.5 percent of recent migration events was for jobs that were found informally. In 77 percent of the same events, migrants moved to take up jobs that had already been arranged. In most such cases, jobs were arranged in the same industry that the middleman was working¹. Bombay's industrial history is full of similar examples (e.g. Chandavarkar 1994; Munshi and Rosenzweig 2005). Holmstrom (1984:54) describes the underlying dynamic thus:

Both in large and small factories which villages or castes or language groups were first recruited into particular industries was largely a matter of chance: but once the pattern was established it was often perpetuated, as worker's friends and relatives followed them to town.

In such migration chains, social networks not only transmit information about vacancies, but are often employers' preferred channel for recruiting unskilled workers as well as child labourers². Such use of the networks of existing employees is common both in India and elsewhere (e.g. Holmstrom 1984; Panini 1996; McEntarfer 2002; Munshi 2003; Ioannides and Datcher Loury 2004)³. When the relevant networks are village-based, the result is clustering both at the source and destination end⁴. So far, however, economic theories of migration have paid only limited attention to such phenomena. This is at odds with the new social economics (e.g. Durlauf and Peyton Young 2002), the emerging literature on labour markets and social networks (e.g. Granovetter 1995, Dasgupta 2000, Ioannides and Datcher Loury 2004) and observations by other social scientists studying migration (e.g. de Haan 1999)⁵. Two notable exceptions are

¹ The prevalence of pre-arranged jobs in these observations is much higher than in Lucas's (1997) overview, where the incidence of pre-arranged jobs among migrants to Delhi is reported to have been only 17.3 %.

² Banerjee (1983) divides chain migration into *delayed family migration* and *serial migration*. Serial migration involves interaction with individuals who are not family members. "*The migration stream in serial migration, unlike that in delayed family migration, usually consists entirely of labor migrants (op.cit: 185).*" The focus here is on serial migration.

³ In the Indian context, this has been interpreted as an effective strategy for reducing turnovers and securing workforce stability (Holmstrom 1984:219). Marsden and Gorman (2001) argue that referrals reduce employer uncertainty about the productivity of new employees.

⁴ Via social structure, we show that the use of referrals compared to more open recruitment has important repercussions for the dynamics of rural-urban migration. See section 5.3 for more.

⁵ A substantive body of work has considered migration decision-making and residential clustering through the lens of language skills. Bauer et al. (2005) find that Mexican migrants who neither speak nor understand English are more likely to choose a Mexican enclave in the United States compared to individuals who either understand or speak and understand English.

Carrington et al. (1996) and Munshi and Rosenzweig (2005)⁶. The latter found caste-based networks to regulate recruitment into low-skilled male occupations in Dadar, Bombay, suggesting complete segmentation along caste or *jati* (sub-caste) lines.

Formally, the social network effects in Carrington et al.s (1996) theory of migration may be represented by:

$$M_t = f(M_{t-1}) \quad (1)$$

with the stock of migrants in period t linked to the size of the network in period t-1, with scope for variation in the functional form of the relationship between present and past migration⁷. Similarly, a migration version of Munshi and Rosenzweig's (2005) interpretation of labour market segmentation may be represented by:

$$\begin{aligned} M_t &= f(M_{t-1}) \\ m_t &= g(m_{t-1}) \end{aligned} \quad (2)$$

where m and M make up two segments or social categories of migrants such as two separate caste groups. 1) and 2) are state of the art representations of economic theories of migration but neither offer a satisfactory theorisation of the network and social effects observed in migration to cities from rural Karnataka.

To rectify these theoretical shortfalls, the present paper develops a new dynamic theory around two empirical illustrations from rural Mandya district, Karnataka. In the first, adult and autonomous child labour migrants make up the two migrant segments and social networks will be shown to operate in distinctly different ways within these two flows. Moreover, referral-based recruitment among employers in child-labour intensive industries creates an important spillover from adult to child labour migration at the village level. In the second illustration, the two segments are made up of two caste groups. A priori, we expect proximity in the local caste hierarchy to make network access including referral use relatively unproblematic. As with adult and child labour migration, it turns out that spillovers across caste groups in Honnavara are *unidirectional* and involve access by individuals of lower, middle caste backgrounds to the networks of the predominant, high caste Gowda community. These cross-caste spillovers involve members of the Gowda community pre-arranging jobs for individuals of Kuruba,

⁶ Segmentation is usually encountered in more descriptive accounts of migration (e.g. Holmstrom 1984 and de Haan 1999). For economic analysis, see Hatton and Williamson's (1998) work on the potential heterogeneity of emigration from Southern and Northern Italy towards the United States and Northern Europe.

Thogata and Gangamata (fishermen) castes, all of which belong to the middle-level local caste hierarchy. Upper-caste Brahmins, however, do not make similar arrangements for individuals of Scheduled Caste background. Hence, spillovers transcend caste boundaries and contribute to clustering in destination sectors, but proximity in the local caste hierarchy is a prerequisite for this to happen. The basic structure of the proposed new theory may be represented by:

$$\begin{aligned} M_t &= f(M_{t-1}) \\ m_t &= g(M_{t-1}, m_{t-1}) \end{aligned} \quad (3)$$

where M and m are the two social categories, i.e. either adults or children or members of different caste groups. In the latter case, m ranks below M in the local caste hierarchy.

To summarise, the present paper develops a new dynamic theory of rural-urban migration with two separate yet distinctly interconnected migration flows. Complete segmentation features as a special case, but empirical observations suggest that both spillovers across the two flows and heterogeneity in the social effects within the flows need to be accommodated. Furthermore, long-term migration is modelled as equilibria (M^* and m^*) in village social systems. The comparative static analysis of these equilibria gives rise to social network multipliers, a key innovation. The nature and size of these multipliers depend on patterns of social interaction and are sensitive to attributes such as the social fabric, caste composition, destination links and migration histories of rural source communities. The proposed theory also facilitates a precise breakdown of the relative contributions of economic and social forces to movement from village communities to cities in developing countries⁸.

The plan of the paper is as follows. Section 2 presents a brief review of the economic literature on migration, networks and social interactions, highlighting theoretical gaps. Section 3 introduces the context while Section 4 motivates the first empirical illustration. Section 5 develops the theory, introduces the concept of social network multipliers and integrates the empirical illustration of caste. We combine mathematics, graphics and empirical examples to explain variation in multiplier effects and migration incidence across source communities. Section 6 offers concluding remarks.

⁷ For a variant of Carrington et al.s model, see Bardhan and Udry (1999). Munshi (2003) notes that employed rather than all migrants define the relevant network size.

⁸ The development of a theory comprising the relevant variables is prioritised over the quest for correct functional form (s). The dynamic system presented below is linear and kept as simple as possible. Non-linearities may be introduced in empirical

2. THEORETICAL PRELIMINARIES

In Harris and Todaro (1970), risk-neutral individuals migrate in response to a gap between an expected urban and a de facto rural wage. High and institutionally determined urban wages make migration attractive even in the presence of urban unemployment. While wage gaps contribute to explain rural-urban migration in developing countries (e.g. Lucas 1997), Harris and Todaro's work has been the subject of much debate. Advocates of the 'new economics of migration' questioned the assumption of risk-neutrality and the individual orientation of the H-T framework, arguing that migration is a collective endeavour enabling rural households to diversify incomes (Stark and Levhari 1982; Stark 1991).

Both theoretical perspectives may be interpreted as placing the relevant analytical units, namely individuals and households, in a social vacuum. Moreover, whereas the importance of social networks is widely recognised among economists, network and social interaction effects are often amalgamated in theoretical work by a measure of the stock of existing migrants (Carrington et al 1996; Hatton and Williamson 1998; Bardhan and Udry 1999; Munshi 2003). The resort to such a rough proxy implies that key insights into social and other dimensions of migration may be lost.

A well-rehearsed argument is that migrants choose destinations where they are well connected (Lucas 1997). However, given the persistent grip of caste on social life in rural India (Srinivas 1996; Panini 1996), the question of whether network access transcends caste boundaries or not is fundamental. Existing evidence is both dated and mixed. Banerjee (1983) found no differences in the propensity to seek assistance from co-villagers for migrants who either had or lacked co-villagers of the same caste among migrants in Delhi. Banerjee's findings indicate that 'locational' ties dominate caste in determining network access⁹. In contrast, Holmstrom (1984), Panini (1996) and others, suggest that employment in many Indian industries has been monopolised by members of certain castes. Drawing on the work of Chandavarkar (1994) and on evidence from a survey of 4,095 students in Dadar, Mumbai, Munshi and Rosenzweig (2005) perceive sub-caste or *jati* as the relevant boundary for labour-market networks.

applications where formal tests of the theory can be informed by patterns in data rather than ad hoc assumptions about functional forms.

⁹ In a Mexican parallel, Massey et al (1987) found that sharing native community was a pivotal catalyst of Mexico-US migration. For more and a discussion of the challenges in isolating network effects in econometrics, see Munshi (2003).

In an econometric analysis of the influence of social ties on migration, Winters et al. (2001) examined the effects of family and community social networks on the propensity to migrate from Mexico to the United States. Their aim was to test whether strong and weak ties served similar or dissimilar functions in aiding migration. This could also be seen as an effort to shed light on whether boundaries in labour-market networks are operative in the Mexican case. Whether family networks provided informational or other advantages that surpassed cumulative public knowledge was tested by controlling for the impact of individual, household and community characteristics on the probability to migrate. Their findings indicate a catalytic role for locational ties, supporting the idea that once established at the community level, migration becomes a widely available rather than an exclusively confined option. Munshi's (2003) work on Mexican data offers further support to this finding.

In light of these fine-tuned empirical observations which suggest stark contrasts in network access between Mexico and Bombay, but not it should be noted, between Mexican migrants and migrants in Delhi, it is not surprising to find migration theory wanting. In a landmark theoretical paper, Carrington et al (1996) formalised the parallel between migration and technology adoption as a general labour-market externality where a growing migrant network reduces migration costs for subsequent movers. Early movers, they argue, may bestow different types of benefits on potential migrants back home. First, existing migrants provide valuable information about employment and housing opportunities. Moreover, early migrants reduce mobility costs by accumulating knowledge about risky (and costly) obstacles, such as border controls. Finally, existing migrants may reduce the costs of adjusting to a new life by adding vibrancy and value to destination enclaves. The combination generates mobility costs that decline with the expansion of the destination network¹⁰.

For extensions to the Indian context, Carrington et al's (1996) theory would readily capture Banerjee's observations for Delhi. Moreover, an extension of the model to segmentation as exemplified in (2) would accommodate Munshi and Rosenzweig's (2005) reasoning. These two cases are both important but may also be interpreted as representing two extremes – namely

¹⁰ Seeking to explain the slow initial pace and later acceleration of South-North migration by black communities in the United States in the early 20th century, the model includes endogenous wage formation and an exogenous distribution of individual opportunity costs associated with leaving the native household.

open access and complete segmentation. In the theory proposed these are interesting special cases that do not fit the more nuanced empirical observations from rural Mandya.

3. EMPIRICAL CONTEXT

The empirical observations that inform the present analysis is based on data from village communities in Nagamangala taluk in Mandya District, Karnataka. Located 110 kms west of Bangalore city, Nagamangala is a dryland area in northern Mandya. The sex-ratio in Mandya's two dryland *taluks* (the unit below district in India's administrative system) Krishnarajpet (1.014) and Nagamangala (1.042) exceed the district figure (0.969) and primarily reflects high out-migration among young males. However, even among adjacent villages in the *taluk*, migration destinations are quite different and far apart. While Bangalore has overtaken distant Mumbai's role as the principal destination, Mumbai's prevailing grip on some villages in spite of Bangalore's recent and rapid economic growth, supports the idea of migrants moving to destinations where they are well connected (i.e. Lucas 1997). The examples draw mainly on evidence from small South-Indian eating-places, popularly known as Udupi-hotels (Toft Madsen 1991). The owners of these undertakings, often natives of Udupi District on Karnataka's west coast, have spread their enterprises to Bangalore, Mumbai and numerous cities and small towns across India.

We next elaborate on the empirical observations that inform the two illustrations and start with the case of adult and autonomous child labour migration.

4. AUTONOMOUS CHILD LABOUR MIGRATION

The first migration flow in the first empirical illustration is the autonomous movement of young boys. The idea that children may exercise autonomy in making strategic life choices has received little attention from social scientists. Addressing transactions in child labour markets, Kanbur (2003: 46) asserts: '[W]e have to assume that parents or those in loco parentis are the transactors in this market on behalf of the children whose time is traded.' Evidence on child labour migration from rural Mandya suggests that Kanbur's claim is spot on for younger children of both sexes and girls in all age groups, but hard to defend for boys aged 12-14

(Iversen 2002)¹¹. The definition of autonomy adopted by Iversen (ibid.) captures the distinct independence from parents or guardians in decisions to leave home:

A migration decision satisfies a criterion of strong autonomy by being an unambiguous reflection of a migrant's independent wish to leave home, without any parental pressure on the migrant to leave and without any parental involvement in decision-making, in employment or in shelter arrangement.

The evidence from Mandya suggests that boys aged 12-14 regularly made labour migration decisions independently of their parents and often without the consent or even informing parents about their departure¹². Autonomous behaviour, even in this strict sense, was common among young boys of a rural background and more common in some villages than in others¹³.

The principal destination for this movement, small South Indian 'hotels' in Bangalore, offers implicit contracts that inter-link employment with accommodation and food transactions. These contracts include salaries, food, shelter and safety, i.e. features of particular appeal to autonomous migrants. Such a conducive urban labour market may be necessary, but is not sufficient for autonomous migration behaviour to evolve and spread.

While boys aged 12-14 are prominent in child labour statistics, they are also compelling candidates for peer-guided behaviour. Moreover, Bonnet's (1993: 372) casual observations of the impact of extra-familial social ties on rural-urban migration among African children suggest important cross-cultural parallels:

Between 12 and 13: these children are beginning to move away, psychologically and mentally from their parents, in order to associate with children of their own age. This shift, often associated with leaving school, migrating to the city and the need to make a living, exposes this

¹¹ A common presumption is that children have no autonomy or say in child labour supply decisions (e.g. Basu and Van, 1998; Baland and Robinson, 2000). "Children" and "young individuals" are used interchangeably to refer to individuals below 15 years of age.

¹² The data are based on a purposive sample of villages, carefully selected to ensure representativity at the taluk level. Migration accounts were subjected to thorough consistency checks. Information was elicited through interviews with parents, child migrants and others. Questions to detect covert or overt parental pressures on migrants to leave home were necessary to avoid classifying decisions reflecting migrant response to parental "push" as autonomous behaviour. Of the 146 boy migrants in the sample, 30.1 % were classified as autonomous migrants.

¹³ These behavioural patterns are not unique: The Development Research Centre on Migration, Globalisation and Poverty at the University of Sussex is funding four comparative studies of autonomous child labour migration in Bangladesh, South-India, Ghana and Burkina Faso.

age-group to feelings of insecurity, psychological instability and susceptibility to outside influences.

Similarly, Nieuwenhuys (1995) found that social interactions with friends and neighbours, who were working in prawn-curing factories in distant Gujarat and Maharashtra, were catalysts for behavioural change in girls as young as 12 in Kerala. These girls had to persuade their fathers to join their acquaintances on the journeys north, notwithstanding the negative impacts this had on the social status of their fathers. Synthesising observations from 21 villages in rural Mandya, the next paragraphs spell out the empirical foundation for the social network and interaction effects that feature in the benchmark version of the new theory.

4.1 Networks, Interactions and Migration: Evidence from Rural Mandya

We begin by noting that exchange of services such as employment and shelter arrangements does not occur among autonomous child labour migrants. Among the 44 migrants in this category, there were no observations of children recruiting other children for jobs:

**Table 1: Social Networks and Pre-arranged Employment
Among Autonomous Child Labour Migrants¹⁴**

	Arrangement through child migrant's village networks		Arrangement through household networks	
	Senior migrants	Other child migrants	Relatives	Friends
No pre-arrangement			Destination networks	
58.5%	29.2 %	0 %	12.2%	0 %

¹⁴ The table is based on 41 observations. The definition of autonomous behaviour would usually rule out access to family networks for shelter and employment arrangements. In a few instances, clearly autonomous migrants use networks of relatives to enter into what resembles a fostering arrangement without any form of parental

In addition, there is no evidence of new migrants leaving and anticipating support from other child migrants already working in the city. In short, serial migration in the conventional sense has no clear parallel among autonomous child migrants. Even so it would be wrong to dismiss social networks and interactions as unimportant for such movement. While child migrants do not provide employment or accommodation services to their peers, children's own social networks are pivotal for arranging employment and shelter. But for prearranging jobs, it is ties to adults that matter. This mirrors the recruitment strategies of Bangalore's Udupi hotels; employers do not, in general, trust child employees with recruitment responsibility and assign the role of middlemen to more mature members of staff. One hotelier describes this strategy as a reward conferring prestige on employees, thus cementing the relationship to the employer as long as the middleman delivers¹⁵. This creates unique village-level links between adult and child migration.

These employment transactions are usually entered into and finalised during senior migrants' visits to their native villages for regular religious festivals or social calls. Once a deal is struck, the new migrant accompanies the senior on his return to the urban workplace. Such connections with senior migrants usually involve weak ties and enable autonomous child labour migrants to overcome mobility and transaction costs – the oral testimonies from autonomous boys describe these senior migrants as village neighbours and friends¹⁶. As suggested in Table 1, such link ups were operative in 29.2 percent of the autonomous migration observations with the age of the 'middlemen' ranging from 16 to 50 years.

With Bangalore being the principal destination, hotels and restaurants absorbed 95 percent of the autonomous child migrants from the study area. In spite of the link between senior and child migration, 58.5 percent of the autonomous child migrants left home without having a prearranged job¹⁷. At first, this looks damaging to the claim of social interactions as migration catalysts. However, data on travel company and travel finance dispels this concern; only in exceptional circumstances did autonomous migrants leave for the city alone. Moreover, for

involvement. Examples include a boy who ran away from home to live and work with his uncle and another boy who refused to return to the village after a holiday with relatives in Bangalore.

¹⁵ See note 3 above on the benefits to employers from referral-based recruitment.

¹⁶ Notice that this resort to extra-familial ties often is deliberate; there are compelling grounds for why family and kinship networks are avoided.

migration episodes where jobs had not been arranged in advance, autonomous migrants typically left for the city in small groups of friends and peers.

5. MIGRATION DYNAMICS: THEORY AND EMPIRICAL ILLUSTRATIONS

In the first example, we follow the convention of amalgamating social effects when modelling adult serial migration. We also begin by assuming that recruitment of adult labour is open (not referral-based) while household and community networks transcend caste boundaries and are substitutes in servicing new migrants.

The link ups with senior migrants illustrate how a specific pattern of social interactions shape autonomous child labour migration. The theory should include this *potential* link between adult and child migration and the dearth of a conventional serial effect (i.e. a labour market externality) in interactions *among* autonomous child labour migrants. In the latter case, the serial effect operates through the social interaction with and emulation of peers. The benefits accruing from such interactions differ from having a job and/or a place to stay lined up, and can be captured analytically by invoking ideas from Granovetter (1973), Dasgupta (1993) and Akerlof and Kranton (2000). It is therefore assumed that benefits from autonomous child labour migration increase with average behaviour in the peer (social reference) group. With simple, adaptive dynamics, the gains to autonomous migration in a single village will now rise with the peer group incidence of such behaviour¹⁸. This peer group effect captures life-style emulation and has empirical manifestations that could include verbal showing off about the temptations and attractions of city life.

Social reference groups form the backbone of our model. It is customary to truncate the age-distribution of adult male migrants around age 15 (e.g. Lucas 1997). Moreover, rural-urban labour migration typically peaks among males in the early to mid-20s, after which it gradually recedes. The ages between 15 and 35 therefore constitutes a reasonable age range for a

¹⁷ Based on 42 observations. The inter-linkage of employment and shelter transactions is an important attractor. However, the rapid absorption into these jobs was also accommodated by employment agents operating in the vicinity of the main arrival points to the city, e.g. Bangalore Railway Station and the Bus Station. Among autonomous migrants arriving in the city without a prearranged job, 94 % had found a job by the end of their day of arrival.

¹⁸ The theory allows for flexibility in interpreting "incidence" as (a) the fraction of a social reference group who were migrants in period $t-1$ or (b) the absolute number (stock) of migrants in the social reference group in period $t-1$.

reference (village) population of candidate adult male migrants. In rural Karnataka, autonomous child labour migration is confined to boys and typically peaks among 12-14 year olds. The group of potential autonomous migrants can therefore be proxied by the village population of boys aged 10-14. The first example thus presumes quite general social reference groups.

We next introduce the notion of a village level migration equilibrium¹⁹, where benefits equal the costs of migration for the marginal migrant within each migration flow. From (3), the model has two equilibrium conditions, one for adult male and one for autonomous child migrants.

Starting with the latter, the left hand side in (4) displays a boy's welfare as a migrant while the right hand side displays his welfare under co-residence with the native household:

$$[V_c(w_u) + a_2 e(m_{t-1})] - [c - a_1 M_{t-1}] = V_c(w_r) + \gamma_c m_t \quad (4)$$

As a migrant his welfare is assumed to have two dimensions, captured by the value function $V_c(w_u)$ and by an emulation function $e(m_{t-1})$. w_u is the urban child wage, and a_2 reflects the intensity of peer group emulation. Costs of travel and job search are summarised by c , while access to networks of adult migrants reduces these mobility costs and eases transition to city life. This is captured by $-a_1 M_{t-1}$, where a_1 measures the strength of the adult-child serial effect. Welfare under co-residence with the native household is determined by the rural child wage, w_r , and by other welfare dimensions summarised by $\gamma_c m_t$ ²⁰. $\gamma_c m_t$ represents the distribution of individual welfare sacrifices associated with leaving home among members in the village peer group. The latter is increasing in types²¹, ensuring individual heterogeneity in the 'costs' of leaving home. The corresponding equilibrium condition for adult migration is given by:

$$V_a(W_u) - [C - b_1 M_{t-1}] = V_a(W_r) + \gamma_a M_t \quad (5)$$

¹⁹ Facing the choice between comparative static analyses of migration equilibria and deriving the model's analytical solution and associated equilibrium path, we opted for the former. The aim of explaining long term contrasts in migration incidence across village communities makes it appropriate to study migration equilibria. These are equilibria in social systems (see Dasgupta 1993); here represented by village level social systems.

²⁰ Alternatively, one could endogenise village level wages for adults and children. For the latter this could be accomplished by letting $w_r = w_r^0 + m_t$, with w_r^0 as the initial wage. Since migration from a single village has negligible impacts on the urban labour market, rural wage endogeneity is more appealing than endogenous urban wages.

²¹ The individual welfare of members of the social reference group is thus represented by a continuum along a straight, positively sloped line.

The interpretation is a direct parallel to (4) with W_u representing the adult urban and W_r the adult rural wage. The costs of adult migration and job search are summarised by C , while $-b_1M_{t-1}$ captures the reduction in job search and transition costs that result from accessing the adult network. b_1 measures the strength of this serial effect in adult migration. As above, $V_a(W_r) + {}_aM_t$ implies that welfare as a rural resident has both an adult rural wage and an individual component. As above, ${}_aM_t$ implies heterogeneous opportunity costs of migration which are rising among members in the social reference group²².

The access to adult network services depends on the social composition and social fabric of the source community. A cohesive community with broad and general network access would be consistent with a high value for b_1 . As noted, we initially assume that locational ties transcend caste boundaries in securing access to adult network services. However, the realism of this assumption depends on the recruitment strategies adopted by urban employers. The combination of a hierarchical social context and referral-based recruitment is likely to make access much more restrictive. When recruitment is open and a network's primary function is information dispersion, access becomes a less sensitive issue.

5.1 Social Network Multipliers, Graphics and Comparative Statics

The phase diagram in Figure 1 displays equilibrium lines for adult and autonomous child labour migration in a village-level social system where the relevant social reference groups (here, village populations) are normalised to 1 and measured along the horizontal (adult males aged 15-35) and vertical (boys aged 10-14) axes.

²² For the caste example, the two social reference groups would instead comprise adult males of two caste groups. While female migration for work is on the rise in rural Mandya, it still comprises only about 5 % of the migration events in Honnavara village. As in the preceding sections, individuals in each social reference group are differentiated i) by the opportunity costs of leaving home (the equivalent of ${}_a$ and ${}_c$ in (4) and (5)), ii) by mobility costs (the equivalent of C and c in (4) and (5)) and iii) by the scope for social interaction within and beyond one's social group. The main difference would be in the wages, where for the case of referral-based recruitment the same rural and the same or different urban wage rates could apply to the two caste groups.

Since autonomous child migration exerts no influence on adult migration, the equilibrium line for adult migration, $M_t=0$ is vertical and given by²³:

$$M_t = M_{t-1} = M^* = \frac{[V_a(W_u) - V_a(W_r) - C]}{(\gamma_a - b_1)} \quad (6)$$

This is already a reduced form expression. The equilibrium line for autonomous child migration, $m_t=0$, is given by²⁴:

$$m_t = m_{t-1} = m^* = \frac{[V_c(w_u) - V_c(w_r) - c]}{(\gamma_c - a_2)} + \frac{a_1}{(\gamma_c - a_2)} \cdot M_{t-1} \quad (7)$$

where M^* and m^* refer to equilibrium levels of migration for adult and autonomous child labour migrants in a village social system. Notice that (7) has an intercept and a slope term. Figure 1 portrays the case with a zero slope.

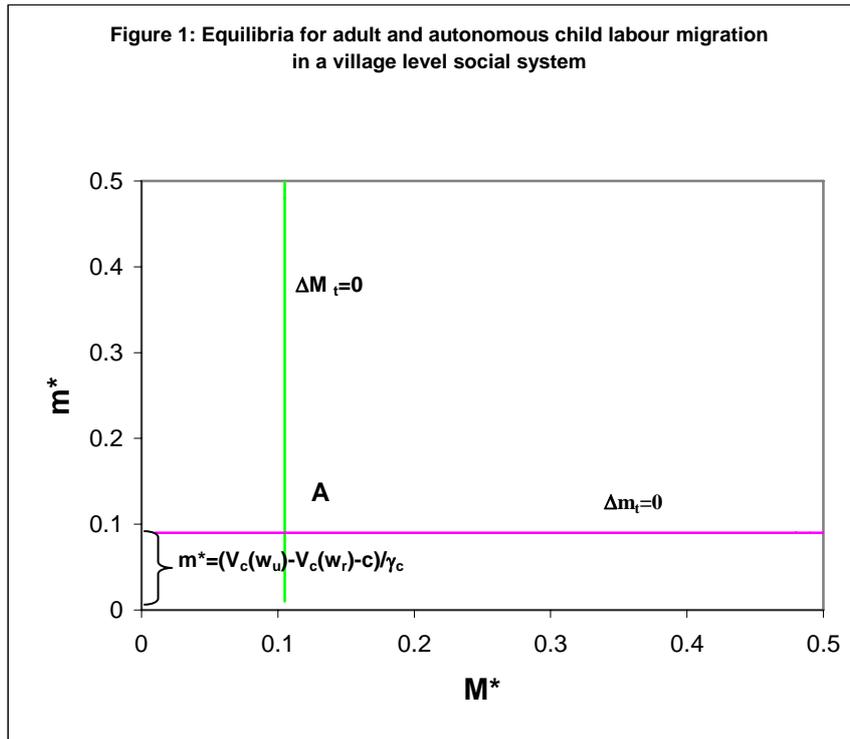
5.1.1 Rural-Urban Wage Differences in a Social Vacuum

Suppose that none of the emulation or social network effects are operative, so that $a_1=a_2=b_1=0$. The equilibrium incidence of adult and autonomous child labour migration in a village social system, illustrated by point A in figure 1, is now uniquely determined by $M^* = (V_a(W_u) - V(W_r) - C) / a$ and $m^* = (V_c(w_u) - V_c(w_r) - c) / c$. This resembles a Harris-Todaro world where rural-urban wage differences and mobility costs (including the welfare sacrifices captured by a and c) determine the village equilibrium of rural-urban migration within each migration flow. There are no social interactions within and no spillovers across the two flows: this is the case of *complete* segmentation in a social vacuum.

²³ From the normalisation of the reference village populations we have that $M \in [0,1]$, $m \in [0,1]$. Hence, appropriate bounds must be placed on parameter values to ensure convergence (see Cooper 1999). From (4) and (5) it is evident that $c > a_2$ and $a > b_1$ are two necessary conditions.

²⁴ This village level social system gravitates towards long-term equilibria for adult and autonomous child labour migration. Stability can be checked by considering vector forces in the four regions of the diagram; SW, SE, NW and NE. The directions of the vector forces are determined by:

$m_t < 0$ implying that $m_{t-1} > [V_c(w_u) - V_c(w_r) - c] / (c - a_2) + [a_1 / (c - a_2)] M_{t-1}$ (NW, NE)
 $m_t > 0$ implying that $m_{t-1} < [V_c(w_u) - V_c(w_r) - c] / (c - a_2) + [a_1 / (c - a_2)] M_{t-1}$ (SW, SE)
 $M_t < 0$ implying that $M_{t-1} > [V_a(W_u) - V_a(W_r) - C] / (a - b_1)$ (SE, NE)
 $M_t > 0$ implying that $M_{t-1} < [V_a(W_u) - V_a(W_r) - C] / (a - b_1)$ (SW, NW)



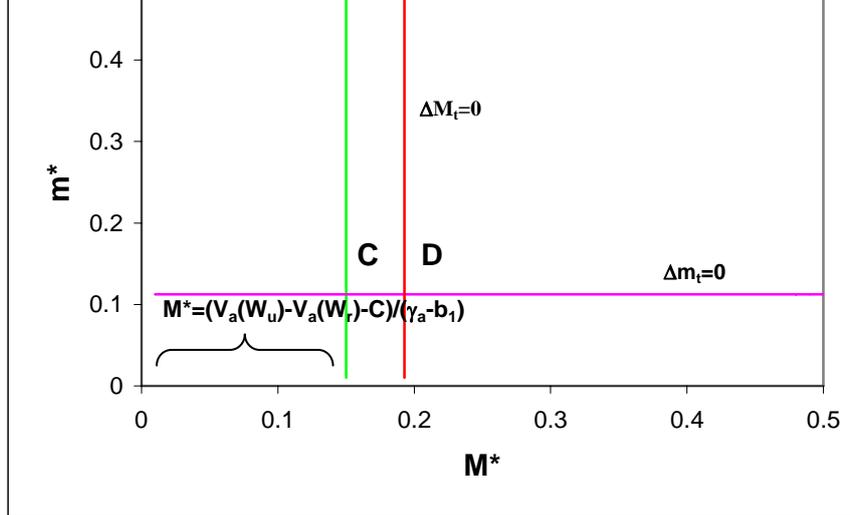
Exogenous changes in wages or in migration costs prompt shifts in the equilibrium lines²⁵.

5.1.2 Wage Differences, Mobility Costs and Intra-segment Social Effects

Consider, alternatively, a situation where effects of emulation and network access is confined exclusively to individuals within each migration segment (group), so that $a_2 > 0$, $b_1 > 0$ and $a_1 = 0$. The impacts on the long-term incidence of rural-urban migration, before and after a rise in adult urban wages, are indicated in Figure 2.

²⁵ The direction of the vector forces are not indicated in figure 1 or the following diagrams. Footnote 24 verifies the stability of the dynamic system.

Figure 2: Equilibria for adult and autonomous child labour migration in a village level social system with intra-segment emulation and network access: the effect of a 10 % increase in adult urban wages



This model version has two social network multipliers, specific to each of the two migration segments. Notice that the initial equilibrium in C denotes higher levels of out-migration in the two groups, while the effect on adult migration of the rise in the adult urban wages is amplified compared to above; it is easy to verify that the village-level response in adult migration to the adult wage rise will be given by:

$$\frac{dM^*}{dW_u} = \frac{V'_a}{(\gamma_a - b_1)} > 0 \quad (8)$$

Compared to the above (where the response in M^* to an adult wage increase was V'_a / γ_a), the equilibrium response is amplified by the adult network expansion. The magnitude of this response hinges on the value of b_1 . As in the preceding example, segmentation is complete, but migration no longer takes place in a social vacuum. Instead, migrants within each segment pull each other along – among adults because of a recruitment chain with a strength contingent on the social fabric of the village community; for autonomous boys because of the additional pull generated by peer group emulation. There are no spillovers across the two flows. The parallel version for two caste groups would now echo Munshi and Rosenzweig's (2005) reasoning, with boundaries of labour market networks defined by caste and network and multiplier effects operating separately within the two groups.

5.1.3 The Full-fledged Model

Consider, now, the full-fledged model where patterns of social interactions and therefore social effects transcend the boundaries of the two segments. The equilibrium lines for adult and autonomous child labour migration were given in (6) and (7). Since there are no spillovers from child to adult migration, (6) remains vertical. Meanwhile (7), i.e.

$$m_t = m_{t-1} = m^* = \frac{[V_c(w_u) - V_c(w_r) - c]}{(\gamma_c - a_2)} + \frac{a_1}{(\gamma_c - a_2)} \cdot M_{t-1} \quad (7')$$

has a positive slope which depends both on the strength of the link between adult and autonomous child labour migration and the intensity of peer group emulation: hence emulation reinforces the effect of the adult network expansion. In this case, the village level migration equilibria are uniquely determined by the strengths of the emulation, spillover and network effects, by the relative attractiveness of urban employment and by the individual opportunity costs of migration, i.e. a_1 , a_2 , b_1 , C , c , W_r , W_u , w_r , w_u , a and c .

Two neighbouring villages may now have identical distributions of opportunity costs of migration (i.e. $V(W_r) + M_t$ and $V(w_r) + m_t$) and yet be 'high' and 'low' migration communities. Contrasting fortunes (historical 'accident') manifested in social cohesiveness (fragmentation due to social distance between dominant caste groups) or variation in employment links into rapidly growing (fading) urban industries, will amplify (dampen) migration response to market signals, turning one village into a migration cluster while its neighbour experiences only modest out-migration.

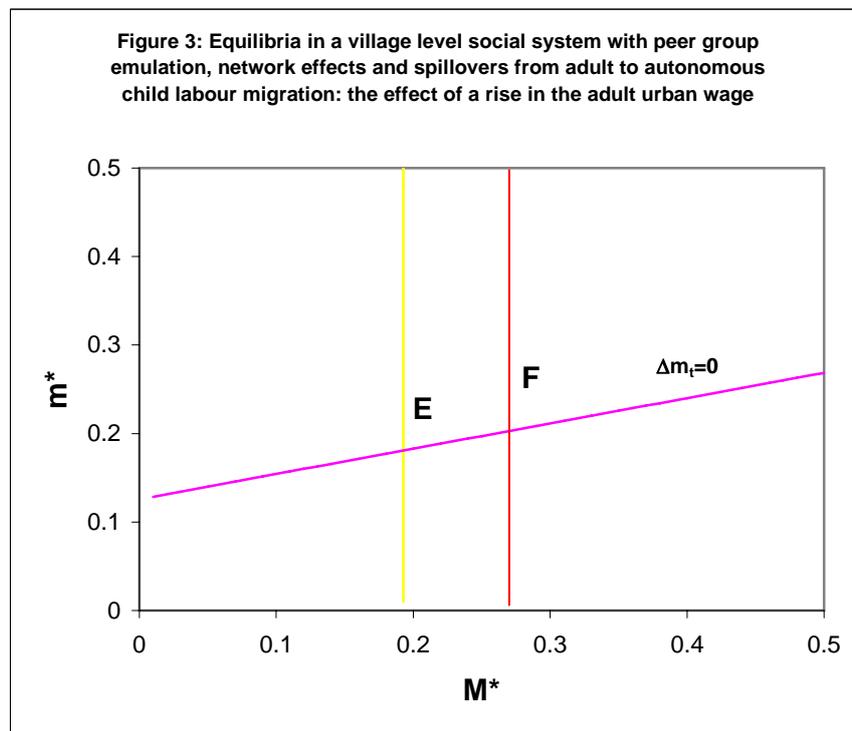
It is also evident that an adult urban wage rise has repercussions beyond adult migration and will spill over to the equilibrium level of autonomous child labour migration. In reduced form, we have:

$$m^* = \frac{[V_c(w_u) - V_c(w_r) - c]}{(\gamma_c - a_2)} + \frac{a_1[V_a(W_u) - V(W_r) - C]}{(\gamma_c - a_2)(\gamma_a - b_1)} \quad (8)$$

with m^* being a function of adult and child wages (rural and urban), the adult and child costs of migration and the strength of each of the social network and interaction effects. The effect on m^* of the adult urban wage rise is seen from the following social network multiplier:

$$\frac{dm^*}{dW_u} = \frac{a_1 V_a'}{(\gamma_c - a_2)(\gamma_a - b_1)} \quad (9)$$

and is illustrated by the move from E to F in Figure 3.



The rise in the adult urban wage triggers an interesting chain of events. Firstly, by prompting an increase in adult migration, the adult migrant network and the ties available to prospective autonomous child labour migrants expand. The proliferation of these adult links depends on the social fabric of the source community. However, because of the limited capabilities to utilise destination networks in the same pre-meditated ways as adults, prospective autonomous migrants will benefit from this expansion only if senior migrants' interact with their native villages.

The effect of the adult network expansion will also depend on the destination sector (s) of adult migration. Adult migration towards hotels or other child labour intensive industries that practice

referral-based child recruitment would ensure a high value of a_1 and thus a large multiplier. The steeper the equilibrium line for autonomous child labour migration, the stronger the multiplier effect (the determinants of the slope may be gauged from (7')).

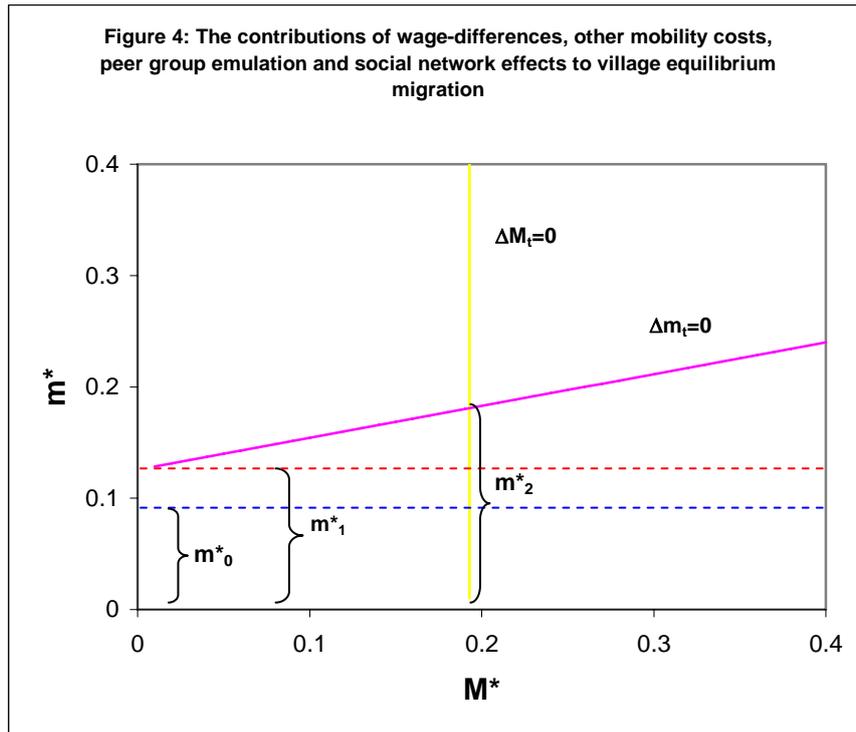
A parallel model version with two caste groups is straightforward with the slope of the equilibrium line for low-caste migration determined by the within group effect and the strength of the spillover from M to m . With caste representing the relevant social category²⁶, the a priori expectation about spillovers in would, as noted, depend on the social distance between the two groups of (prospective and existing) migrants. Moreover, referrals in urban employers' recruitment strategies will impact on the nature of the spillovers that we expect to observe.

As suggested by Chandravarkar (1994), Munshi and Rosenzweig (2005) and others, network-based recruitment contributes to sectoral clustering. Using the data from Honnavara, we consider the empirical question of the respective contributions of family ties, within caste ties and spillovers that transcend caste boundaries to such sectoral clustering. In 44 percent of the migration events where jobs were pre-arranged informally, recruitment was into the sector where the middleman was working. Within this subset of observations, 15.8 percent represented cases where co-villagers of a different caste than the migrant arranged the job for the migrant while 21 percent were cases where co-villagers of the same caste, but not related to the migrant, arranged the job. In a considerable majority of the cases, thus, family members were responsible for pre-arranging jobs while cross-caste network use was almost as common as the resort to extra-family contacts within the same caste. In other words, spillovers that were observed to link adult and autonomous child labour migration above has important parallels in adult migration involving different caste groups.

5.2 Economic and Social Forces: Contributions to Long-term Migration

Returning to the case of adult and autonomous child labour migration, the complete model facilitates a breakdown of the contributions of wage differences, other mobility costs, peer group emulation and different social network effects to long-term migration from a village community.

²⁶ The account of social hierarchy and caste is informed by a village study of migration flows completed in spring 2005. The data are based on 47 first migration events from a random sample of 129 households in the period 1990-2005 in Honnavara village, Nagamangala taluk, Mandya district. The focus on relatively recent migration events reduces problems of recall.



For autonomous child labour migration, m^*_0 represents equilibrium migration when migration is driven by wage differences and mobility costs alone: m^*_1 is the equilibrium when wage differences and peer group emulation are accounted for, while m^*_2 includes the effects of access to and interaction via adult migrant networks. The contributions to long-term migration of economic and social variables are thus:

Table 2: Determinants of Equilibrium Incidence of Autonomous Child Labour Migration

	Wage-differences and mobility costs (1)	(1) + Peer-group emulation (2)	(2) + Spill-overs between adult and autonomous child labour migration
Equilibrium migration	m^*_0	m^*_1	m^*_2
Contributions to overall migration	m^*_0	$m^*_1 - m^*_0$	$m^*_2 - m^*_1$

Social effects thus accelerate rural-urban migration from a village community: at the same time, each of the identified social network and interaction effects are sensitive to context. For instance, a_1 would be close to zero in a high migration community if adult migration historically

targeted skill or education-intensive urban sectors with little or no scope for child employment. One example is the early movement of well-educated Brahmins for government jobs in Mysore and Bangalore (Srinivas 1976). Similarly, strong life-style emulation requires that autonomous migrants regularly visit their native places²⁷.

5.3 More on Caste and the Boundaries of Labour Market Networks

Finally, consider the upper and bottom end of the local caste hierarchy, namely Brahmins and Scheduled Castes (SC). For migration dynamics it is pivotal to distinguish very clearly between referral-based and open recruitment. For the former, establishing early entry points into attractive urban employment, such as a Mumbai factory is difficult and costly (C is high and $a_1M_{t-1}=0$). While economic and other incentives would suggest that SCs move first, the high initial C implies that early migrants may depend on substantive financial resources. As noted by Srinivas (1966), Brahmins and other upper castes gained early advantages by securing entry points into and control over important urban factory jobs (otherwise below their status) and subsequently influenced recruitment. If referral-based recruitment persists and social distance is large, migration dynamics will be driven by rural-urban wage differences, mobility costs and social interactions within each caste group. We could thus observe *complete* segmentation, high mobility within the upper and low mobility in the lower caste group, and no spillovers. The latter is consistent with recent all-India findings suggesting a negative impact of SC-background on mobility (Dubey et al. 2004). The strength of barriers to interactions also depends on destination sector. While a Brahmin is unlikely to vouch for a member of the SC-community in any urban job, it is unthinkable that he would agree to recruiting a member of the SC-community for employment in a small South-Indian eating place. The sensitivity related to work in eating places is indicated by the tactics deployed by individuals of SC-background in approaching owners of such enterprises in Bangalore:

On his arrival in Bangalore, he spent a couple of days with his uncle who took him to hotel ML owned by a Billava from Mangalore, next to the Railway Station. When introduced by his uncle, he was presented as a Gowda. There were few risks in the first workplace since none of the other workers were themselves Gowdas which meant that more detailed canvassing of which

²⁷ The evidence from rural Karnataka supports this conjecture – while autonomous migrants act independently and often in direct conflict with parental will, it is extremely rare that bonds to the native household are permanently severed.

sub-sect of Gowdas he belonged to was avoided. In other workplaces, he made a habit of introducing himself as a Gowda (Iversen and Raghavendra 2005).

One route by which complete segmentation may not hold is if urban employers shift from referral based to open recruitment. One implication is that information about vacancies is likely to become more widely dispersed, resulting in leakage and *informational* spillovers that transcend caste boundaries. The extent of such information leakage will determine the slopes of the two equilibrium lines, but is again likely to be unidirectional, i.e. from Brahmins to SCs rather than the other way around. The residential organisation of Indian villages militates, in particular, against informational spillovers trickling down to the SC-community – SC-colonies are often located out of sight and close to village boundaries. In short, even the strength of information-based links between different social groups may vary – if recruitment becomes more open, the dynamic links between Brahmin and SC-migration may continue to be weak.

6. CONCLUSION

This paper argued that an improved model of migration dynamics and the social network and relational ties that structure movement from rural to urban areas requires considerable attention to empirical detail. A key claim was that social networks and interactions fulfil distinctly different roles in adult and autonomous child labour migration. While arrangement of jobs, shelter and provision of other services feature regularly in interactions involving existing and prospective adult migrants, similar exchanges are distinctly absent among autonomous child migrants. Empirical illustrations from rural Mandya were used to show that in the presence of referral-based recruitment, instrumental social interactions were confined to social groups that were close in rank in the local caste hierarchy. As in the case of spillovers between adult and autonomous child labour migrants, the spillovers between migrants from the predominant Gowda community to individuals of middle level local caste groups was unidirectional with Gowdas arranging jobs for others. In Honnavara, such interactions were almost as common as extra-familial within caste pre-arrangement of jobs. For the example of Brahmins and Scheduled Castes it is almost unthinkable that a Brahmin would provide referral for an individual of Scheduled Caste background. In a setting with referral-based recruitment, we would thus expect to observe strict segmentation for an analysis based on the two latter caste groups.

If recruitment processes become more open, informational spillovers are likely to result. However, whether these spillovers leak out and spread to all social groups is an empirical question. The physical isolation of many Scheduled Caste communities in villages in rural India makes even such spillovers unlikely to benefit this group.

Finally, the proposed theory and the social network multipliers introduced illustrates the interplay between social and economic forces in structuring rural-urban migration, and show why and how conventional theories that overlook social aspects and dynamic spillovers between different migration flows are likely to misjudge migration response to market signals.

The present paper adopted an inductive approach, building a theory around empirical observations from rural Karnataka. The impacts of the new dimensions our theory adds to the analysis of rural-urban migration depend on the social fabrics of source communities, their respective links into urban workplaces and on a variety of other factors. Ultimately, the theory's merit needs to be judged from more formal testing. While integrating social interaction and network effects into empirical analysis of the determinants of migration is challenging (see Manski 2000), the neglect of other than simplistic representations of social effects makes empirical analysis vulnerable to omitted variable bias and a risk of overstating the contributions of economic variables to rural-urban migration, especially in the South-Asian context.

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