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M.A. Teteryatnikova
HSE University, Moscow, Russia

A model of migration decisions in social networks[1]

Abstract. This paper is motivated by rich empirical evidence on the importance of social connections for the decision making of potential migrants. It provides a microfoundation for the well-established hypothesis in the chain migration literature that attributes much of the impact of social contacts to their role as information providers about jobs in the foreign labor market. The proposed theoretical model has two countries, home and destination, and agents in both countries share information about job opportunities via an explicitly modelled network of social relations. The job information affects agents' employment prospects and expected income in each country. These, in turn, determine the decisions of the home country residents on whether to migrate or to stay, which in the model is represented by an outcome of the migration decision game. We study the effects of social networks on equilibrium migration decisions and in particular, the effects of a small change in the number of social contacts in the destination country on the size of the migration flow. Using the results of analytical work and numerical simulations, we find that even a marginal increase in the number of links between countries may lead to a substantial increase in migration.

Keywords: *migration decision, social networks.*

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1. Introduction

The key finding of the *chain migration* literature is that past migration facilitates further migration along the same route[2]. One of the main hypotheses in the literature attributes much of this effect to the role of previous migrants as information providers about jobs in the destination country. In this paper we offer a microfoundation for this hypothesis.

One remarkable phenomenon that motivates this and many previous studies of chain migration is the tendency of same-ethnicity immigrants to locate within the same geographically defined area(s) in the destination country. Such geographical concentration leads to the formation of so-called ethnic enclaves, ethnic neighborhoods in the host country with specific cultural identity and economic activity[3]. Numerous examples include China towns in New York, the large overseas community of Poles in Chicago, Little Havana and Spanish barrios in different cities across the U.S., Little Odessa and Ukrainian Village in New York and Chicago, the Japanese community in the district of Liberdade in Sao Paulo, Turkish enclaves Marxloh in Duisburg and Kreuzberg in Berlin, and a range of other ethnic communities including the Central Asian commu-

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[2] Important papers in this literature include (Massey, 1986, 1987; Taylor, 1987; Munshi, 2003; Drever, Hoffmeister, 2008; etc.). See section 2 for a more detailed discussion.

[3] See, for example, (Abrahamson, 1996; Portes, Jensen, 1992; MacDonald J., MacDonald B., 1964).

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nities (mainly Tajiks, Uzbeks and Kyrgyz) in Russia, the Icelandic community in the town of Gimly in Canada, Greektown in Toronto, Little India in Bangkok, etc.

Even more suggestive is the case of the 19th century Italian emigration, that for concreteness we will use as the main motivating example of the paper[4]. Originally emigrants from Italy revealed strong preferences for countries of South America, especially Argentina and Brazil. As emigration from Italy grew, prominence of the United States as a destination increased. Most of this shift occurred due to emigration from the southern part of Italy where emigration traditions to South America were the weakest. However, despite the substantial wage gaps favoring North America over South America and despite the higher level of urbanization in North America, urban Northern Italians continued migrating to rural South America[5]. Over time this resulted in an essential difference in Italian regional emigration; the Southern Italians migrated in large numbers to the United States, while the Northern Italians predominantly moved to South America[6].

The phenomenon of ethnic enclaves and the pattern of the 19th century Italian emigration imply that friends and family ties play an important role in promoting migration. The chain migration literature proposes several hypotheses as an explanation, among which job information provision is considered to be of major importance[7]. Empirical evidence supports this hypothesis with the findings of high rates of employment among new migrants via assistance of their relatives and friends. For example, (Massey, Espinosa, 1997) show in a survey of Mexican immigrants to the United States, that almost 40% of migrants received jobs through informal networks of friends. Even larger proportion – about three-fourths of migrants – obtained jobs via relatives and friends according to (Gilani, Khan, Iqbal, 1981), in their study of Pakistani migration to the Middle East[8].

In this paper we aim to contribute to the chain migration literature by offering a microfoundation for the *job information provision hypothesis*. We build a formal theoretical model to show *how* the job information from previous migrants transforms into migration decisions of would-be migrants and examine the effect of (even marginal) changes in the information transmission on migration flows. Despite the stated importance of the job information factor in shaping migration decisions and the substantial empirical evidence supporting that fact, this seems to be the first theoretical model that *explicitly* accounts for the role of previous migrants as job information providers in determining migration choices of their social contacts at home.

One earlier theoretical study that addressed the role of previous migrants in perpetuating migration streams is Carrington with coauthors (Carrington et al., 1996). It examines a competitive equilibrium model of labor migration and shows that when moving costs decrease with the number of migrants already settled in the destination

[4] This case is particularly remarkable since having taken place in the era of “free migration”, it is exempt from the influence of family reunification laws and policies, which to a certain extent account for contemporary migration movements.

[5] Baily S. describes that “only 25% of those who migrated to the United States and 40% of those who migrated to Argentina were listed as skilled or white-collar workers” (Baily, 1983, p. 295). Furthermore, Italians from the north were «in general not only more skilled and literate than Italians from the south but also more familiar with organizations such as labor unions and mutual aid societies” (p. 296).

[6] This apparent anomaly has attracted the attention of historians and migration economists. See, for example, (Baily, 1983; Klein, 1983; Hatton, Williamson, 1998).

[7] See section 2 for more detail.

[8] Similar results are found for immigrants from Bangladesh and India to the Middle East (over 63% according to (Mahmood, 1991; Nair, 1991), from Pakistan and Cyprus to Britain (Joly, 1987; Josephides, Rex, 1987), from Portugal to France (Hily, Poinard, 1987), and from Turkey to Germany (Wilpert, 1988)).

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country, migration flows may increase even as wage differentials between countries narrow. However, while in (Carrington, Detragiache, Vishwanath, 1996) the cost of moving is *assumed* to be decreasing with the number of previous migrants, in this paper we specifically focus on studying *why and how it is decreasing*, with the only presumption that this happens due to the job information provided by the previous migrants.

To study the role of individual social links, the structure of social connections between people is modelled formally and explicitly. Residents of the home and destination country use social network to share information about employment opportunities, which is modelled as in (Calvó-Armengol, Jackson, 2004). By either providing job information or competing for it, agents influence each others' expected income and thus, migration choices of the home country residents (potential migrants). The resulting decisions of potential migrants (to migrate or to stay) are determined as a Nash equilibrium outcome of a one-shot simultaneous move game between them. We study how this outcome depends on the structure of links between potential migrants and residents of the foreign country.

The advantages of modelling job information exchange via a social network are twofold. First, in compliance with the main goal of the paper, the explicit design of the network allows us to study the impact on migration decisions of just a *marginal change* in the structure of information transmission. For example, a change in just one link between a potential migrant and his contact in the destination country may impact not only his own migration decision but also the migration decisions of his friends since their employment prospects at home and abroad are affected by the decision of that potential migrant. Second, the social network approach seems but natural as it merely establishes the "missing link" between two empirically and theoretically asserted facts. The first fact is the relevance of social network structure for individual employment prospects. The second is the key influence of employment prospects on emigration rates. For the first fact, a range of studies document that 30 to 60% of jobs are found through friends or relatives[9]. Furthermore, (Calvó-Armengol, Jackson, 2004, 2007; Calvó-Armengol, 2004) establish theoretically that agents' employment and wages over time depend on their position in the social network[10]. As for the second fact, the strong influence of employment prospects, defined in terms of earnings and employment rates, on migration decisions constitutes the core statement of traditional migration literature. It is confirmed by both theoretical and empirical findings (Sjaastad, 1962; Harris, Todaro, 1970; Todaro, 1969, 1976, 1989).

The migration decision game between home country residents is similar to the drop-out decision game in (Calvó-Armengol, Jackson, 2004) where labor market participants decide whether to stay in the work force or drop out. However, there are two important differences between the games. First, in (Calvó-Armengol, Jackson, 2004) a value of the outside option (to staying) is normalized to zero, whereas in this paper, the outside option is a labor market of the other country. The value of this option is the expected stream of income in that country, which depends on the structure of social connections in that country and on the decisions of other potential migrants with whom a given player is directly or indirectly linked. Second, and more important, A. Calvó-Armengol and M. Jackson (Calvó-Armengol, Jackson, 2004) assume that the network structure of the labor market is not altered when an agent drops out; the drop-

[9] See, for instance, (Granovetter, 1973, 1995; Bewley, 1999).

[10] Quantitatively, the effects of the social network structure on employment are tested in (Burt, 1992; Podolny, Baron, 1997; Gabbay, 1997; etc.).

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out's employment status is simply set to be zero forever, but his social contacts continue to pass on information about the jobs. Instead, in our model, migration actually alters the structure of the labor market in both countries. When someone migrates, he is de facto removed from the set of home country residents, added to the set of destination country residents and cannot exchange job information with those who decided to stay. This results in a different dynamics of employment and a more complicated strategic setting, so that an analytical solution of the migration decision game appears feasible only for the case of complete networks, while equilibria in other network structures are obtained numerically.

We start the analysis by showing that for any configuration of the social network, there exists a unique stationary distribution of agents' employment states in every country. Moreover, the stationary probability of employment of an agent is increasing with the number of his social connections in the country. Therefore, at least in case of a complete network, where all agents are connected with each other, the long-run probability of employment in the home country is *decreasing* with migration, whereas the probability of employment in the destination country is *increasing* with migration. As a result, when agents assign substantial weight to their long-run expected earnings, their migration decisions are *strategic complements*. The theory of games in strategic complements then suggests that there exists a *unique maximal Nash equilibrium* in pure strategies[11]. Moreover and most importantly, a marginal change in the number of social connections between the countries may cause a large variation in agents' equilibrium migration decisions. In the simplest case, when the network of social relations is complete, there exists a threshold value for the number of social links to the destination country/region, such that in the maximal equilibrium, no one migrates from a given home region or social group when the number of these links is below the threshold, but everyone migrates when it is above the threshold. For other network topologies, the findings are consistent: even a small increase in the number of foreign contacts may lead to a substantial increase in migration. In particular, the substantially higher migration to North America from the south of Italy than from the north could have indeed be a result a minor superiority in the initial number of North American connections of Italians from the south.

The remainder of the paper is organized as follows. Section 2 discusses the main findings and hypotheses of the chain migration literature. Section 3 describes the model and section 4 presents the results of both analytical work and simulations. Finally, section 5 concludes.

2. Chain migration literature: findings & hypotheses

The chain migration literature documents a strong effect of previous migrations on continuation of migration flow[12]. For example, (Hatton, Williamson, 1998) report that as many as 90% of immigrant arrivals to the US at the turn of the 19th century were travelling to meet a friend or relative who had previously emigrated. Their estimation results suggest that for each thousand of previous emigrants a further 20 were "pulled" abroad each year. To demonstrate the relevance of past migrations, the

[11] In the maximal equilibrium, the set of players staying at home is maximal, i.e. it is a superset of non-moving players in any other equilibrium.

[12] See, for instance, (Munshi, 2003; Drever, Hoffmeister, 2008; Faist, 2000; Gurak, Caces, 1992; Levy, Wadycki, 1973), as well as (Chernov, Basinskaya, 2009; Rybakovsky, 2017; Trushkova, 2018). For a survey of migration literature, see (Massey et al., 1993; Boyd, 1989; Gurgand et al., 2012).

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chain migration literature mostly uses a *lagged emigration rate* or a *migrant stock* as an explanatory variable, the latter pertaining to the cumulative number of all previous migrants from a source region. The estimated positive effect on the probability of migration or the size of current migration flow is then attributed to various forms of assistance that previous migrants provide to newcomers.

The commonly discussed forms of assistance can be formulated as three hypotheses regarding the influence of past migrants on the the decisions of new migrants. The first hypothesis is information provision. Previous migrants often provide their friends with information about jobs, housing, health care and social services, customs and practices of the foreign culture, etc. (Grossman, 1989; Lin, 1999; Gottlieb, 1987; Aguilera, 2005; Drever, Hoffmeister, 2008; Yugai, 2022). The second hypothesis is financial assistance. Previous migrants can offer food, temporary lodging, credit and even money to finance moves (Grossman, 1989; Munshi, 2003; Granovetter, 1995). Finally, the third hypothesis is social and psychological help, such as access to ethnic goods and recreation and emotional support (Massey et al., 1987; Marks, 1989; Mazzucato, 2009; Menjívar, 2002). All these ways of assisting new migrants lower the costs and risks of movement and increase the expected net returns to migration.

In this paper, we focus on the first, information provision hypothesis and develop a formal model to study how the job-search assistance of previous migrants affects migration decisions of their acquaintances at home.

3. Model

3.1. The economy

There are two countries/regions: the home country (H) and the destination country (D). The economy in (H) and (D) is infinite horizon in discrete time, $t \in \{1, 2, \ldots\}$.

In the beginning of period 1, some residents of (H) migrate to (D). An agent in (H) migrates to (D) as soon as his expected life-time income in (D), net of the sunk moving cost c, is higher than his expected life-time income in (H). Having decided to migrate, the agent leaves (H) *immediately*, before any other event has taken place, and becomes *initially unemployed* resident of (D). The migration decision is made just once and no reentry is allowed for agents who have chosen to migrate[13]. Two ideas are implicit in the "no reentry" condition. First, the majority of *costs of staying* in the labor market of a particular country (education, acquiring labor market specific skills and opportunity) are usually borne at an early stage of an agent's career and are sunk, so that there is little incentive to change the migration decision. Second, *costs of moving* are also sunk and usually high, which also reduces the incentives for return migration. Finally, all *native* residents of (D) stay in their country permanently; they do not make any migration decisions[14].

Let H be the set of all initial residents in (H), D be the set of all initial residents in (D) and $\mathcal{M}$ be the set of migrants. Let $a_H = |H|$, $a_D = |D|$, $m = |M|$, and $a_H \geq 0$, $a_D \geq 0$, $0 \leq m \leq a_H$. So, after migration the total number of residents in (H) is $a_H - m$ and the total number of residents in (D) is $a_D + m$.

[13] Similar assumptions are made for the drop-out decision game in (Calvó-Armengol, Jackson, 2004).

[14] The precise description of the migration process is presented in section 3.5.

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For convenience, assume that residents of both countries are assigned a number so that $H = \{1, \ldots, a_H\}$ and $D = \{a_H + 1, \ldots, a_H + a_D\}$. Besides, to address residents of (H) and (D) *after* the migration, we define two bijections $\alpha : H \setminus \mathcal{M} \to \{1,..,a_H - m\}$, $\gamma : D \cup \mathcal{M} \to \{1,..,a_D + m\}$, such that α associates a certain number $\alpha(i) \in \{1, \ldots, a_H - m\}$ with each agent i who is a *permanent* resident of (H) and γ associates a certain number $\gamma(j) \in \{1,..,a_D + m\}$ with each agent j who is either a migrant from (H) or an initial resident of (D).

Agents in (H) and (D) are connected by the network of social relations, G. Network G is undirected and for any $i \neq j$, $G_{ij} = 1$ indicates that there is a link between i and j, i.e., agents i and j know each other, and $G_{ij} = 0$ indicates that there is no link between i and j, i.e., they do not know each other. Any directly linked agents are called direct contacts or *neighbors* of each other. Agents that are not linked directly but have a common direct neighbour, are considered to be two links away from each other. All direct and two-links-away neighbours of i form i's *two-links-away neighborhood*. Also, by convention, $G_{ii} = 0$ for any agent i. We assume that network G is given exogenously and its structure does not change over time.

All residents of (H) and (D) are labor market participants. Jobs within each country are identical with the wage rate w_H per period in country (H) and the wage rate w_D per period in country (D). Both wages are exogenous and $w_D > w_H$. Unemployed agents in each country earn nothing and receive no unemployment benefits.

For any period $t \geq 1$, the end-of-period t employment state of the labor market in (H) and (D) is characterized by vectors h_t and d_t, respectively. If agent i from (H) (or (D)) is employed *at the end of period* t, $h_t(\alpha(i)) = 1$ ($d_t(\gamma(i)) = 1$), otherwise $h_t(\alpha(i)) = 0$ ($d_t(\gamma(i)) = 0$). Thus, at any $t \geq 1$ h_t is a 0-1 vector of length $a_H - m$ and d_t is a 0-1 vector of length $a_D + m$, that is, $h_t \in \{0, 1\}^{a_H - m}$ and $d_t \in \{0, 1\}^{a_D + m}$. Similarly, vectors h_0, d_0 characterize the *initial* employment state of the labor market in (H) and (D) or equivalently, the initial distribution of employment among agents in the two countries. To be precise, h_0 is a vector of starting employment statuses in (H) of all *initial* (H) residents and d_0 is a vector of starting employment statuses in (D) of all initial (D) *and* (H) residents. For the purposes of further analysis, the initial employment statuses in (D) of agents from H are set to unemployment, the status they would obtain in the beginning of period 1 *if* they migrated to (D). Just like vectors h_t, d_t for $t \geq 1$, vectors h_0, d_0 are composed of 0's and 1's, with 1 indicating initial employment and 0 initial unemployment; $h_0 \in \{0, 1\}^{a_H}$ and $d_0 \in \{0, 1\}^{a_H + a_D}$.

Let us also denote by E_H all initially employed and by U_H all initially unemployed in (H) agents from H. Similarly, E_D denotes initially employed and U_D — initially unemployed in (D) agents from D. Formally,

$$E_H = \{i \in H \text{ s.t. } h_0(i) = 1\}, U_H = \{i \in H \text{ s.t. } h_0(i) = 0\},$$

$$E_D = \{i \in D \text{ s.t. } d_0(i) = 1\}, U_D = \{i \in D \text{ s.t. } d_0(i) = 0\}.$$

Clearly, $E_H \cup U_H = H$ and $E_D \cup U_D = D$. Let the cardinalities of these sets be $e_H = |E_H|$, $e_D = |E_D|$, $u_H = |U_H|$, and $u_D = |U_D|$.

For any agent i, the set of his *direct* contacts in H is composed of those who are initially employed in (H), E_H^i, and those who are initially unemployed in (H), U_H^i. Likewise, the set of i's direct contacts in D consists of those who are initially employed in (D), E_D^i, and those who are initially unemployed in (D), U_D^i:

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$$E_H^i = \{ j \in H \text{ s.t. } G_{ij} = 1,\ h_0(j) = 1 \},\ U_H^i = \{ j \in H \text{ s.t. } G_{ij} = 1,\ h_0(j) = 0 \},$$
$$E_D^i = \{ j \in D \text{ s.t. } G_{ij} = 1,\ d_0(j) = 1 \},\ U_D^i = \{ j \in D \text{ s.t. } G_{ij} = 1,\ d_0(j) = 0 \}.$$

Let $e_H^i = |E_H^i|$, $e_D^i = |E_D^i|$, $u_H^i = |U_H^i|$, and $u_D^i = |U_D^i|$.

Below we describe the job information transmission and dynamics of employment in the network, modelled as in (Calvó-Armengol, Jackson, 2004).

3.2. Timing of events within each period

Each period $t \geq 1$ starts with some agents being employed and others unemployed as described by the employment states h_{t-1}, d_{t-1} of the previous period. Then the timing of events in period t is the following. First, residents of both, (H) and (D), obtain information about new job openings *in their own country*. Any agent in (H) and (D) hears of a new job opening *directly* with a probability $p_a \in (0,\ 1)$. This job arrival process is independent across agents. If the agent is unemployed, he accepts the job offer. If the agent is already employed, he passes the offer along to one of the direct unemployed contacts *in the same country*. This is where the network structure of relationships between people becomes important: it determines the chances of employment and expected earnings of any agent.

Finally, some employed agents lose their jobs, and this is the last event that happens in a period. This happens randomly with a breakup probability $p_b \in (0,\ 1)$ which is also independent across all agents in (H) and (D).

Admittedly, the assumption that job arrival and breakup rates, p_a and p_b, are constant and independent of the number of workers are rather restrictive. However, keeping all economic conditions (wages and rates p_a, p_b) fixed allows us to (a) isolate the effects of network structure on migration decisions in an otherwise simple setting and (b) focus on the supply side of the labor market, i.e., workers and job information exchange between them, which constitutes the main subject of interest in this paper.

3.3. Job information exchange

We consider the job information exchange between agents that satisfies four properties.

First, the job information is transmitted in *at most one stage*[15]: if the job offer is neither taken by the agent who hears of the job directly nor by the direct contacts of this agent, the job opportunity is wasted rather than being passed on to some other needy party. Second, if several job offers arrive to one unemployed agent, he randomly selects only one of them and all other job offers remain unfilled. These first two properties rule out the study of chain effects in the transmission of job information. However, the one-stage information transmission is strongly supported by the empirical study in (Granovetter, 1974), according to which information chains of length two or more account for only 15.6% of the sample. Third, an employed agent passes the job information to one of his direct unemployed contacts with *uniform randomization.* This is a so-called *equal neighbors treatment* assumption from (Calvó-Armengol, Jackson, 2004). Finally, the information may only flow between agents *within the same country*, that is, those who decided to stay in (H) can only share job information with other agents in (H) and those who decided to migrate can only exchange information with other migrants and with the initial residents in (D).

[15] The terminology of (Boorman, 1975).

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Notice that the last property *does not mean* that agents in (H) can never obtain job information from their contacts in (D). They can obtain the information from (D) conditional on making a decision to migrate. In fact, as we explain in section 3.5, decisions to stay or migrate are made at the very beginning of period 1, *before* any information about new job openings arrived in either of the two countries. Given that and given the irreversibility of the decisions, this means that whenever an agent has chosen to stay in (H) or to migrate to (D), employment prospects in the other country become irrelevant to him, and also he himself becomes irrelevant to the employment conditions in the other country. Technically, links between an agent in (H) and agents in (D) are only "active» if the agent from (H) migrates to (D). At the same time, links between a migrant and his friends in (H) "stop being active"[16].

3.4. Transition between employment states

The evolution of employment of any agent i over time is determined by the sequence of stochastic events in each time period. For example, the transition from unemployment at the end of period $t-1$ to employment at the end of period t is possible if agent i either receives a job offer directly, at rate p_a, or hears about a job offer from one of his direct employed contacts. The chance to hear about a job offer from an employed friend is increasing in probability p_a that this friend will receive an extra job offer but is decreasing in the number of other unemployed contacts of this friend. Moreover, having received a job, the agent can only keep it till the end of a period with probability $1-p_b$. On the other hand, the transition from employment at the end of period $t-1$ to unemployment at the end of period t is fully determined by the breakup rate, p_b, and does not depend on the pattern of social connections. The other two transitions, when the employment status of an agent does not change over the period, are defined by the corresponding complementary events. Formally, for any agent $i \in H \setminus \mathcal{M}$ and for any $t \geq 2$, the four probabilities of transition between employment states are given by:

$$P(h_t(\alpha(i))=1 \mid h_{t-1}(\alpha(i))=0)=$$

$$=\begin{cases}(1-p_b)\left[1-(1-p_a)\prod\limits_{j\in E^i_{H\setminus\mathcal{M},t-1}}\left(1-p_a/\left|U^j_{H\setminus\mathcal{M},t-1}\right|\right)\right], & \text{if } E^i_{H\setminus\mathcal{M},t-1}\neq\varnothing;\\ (1-p_b)p_a, & \text{if } E^i_{H\setminus\mathcal{M},t-1}=\varnothing\end{cases}= \quad (1)$$

$$=(1-p_b)\left[1-(1-p_a)\left(\prod_{j\in E^i_{H\setminus\mathcal{M},t-1}}(1-p_a/\left|U^j_{H\setminus\mathcal{M},t-1}\right|)\right)^{\mathbf{1}_{E^i_{D\setminus\mathcal{M},t-1}}}\right],$$

$$P(h_t(\alpha(i))=0 \mid h_{t-1}(\alpha(i))=0)=1-P(h_t(\alpha(i))=1 \mid h_{t-1}(\alpha(i))=0); \quad (2)$$

$$P(h_t(\alpha(i))=0 \mid h_{t-1}(\alpha(i))=1)=p_b; \quad (3)$$

$$P(h_t(\alpha(i))=1 \mid h_{t-1}(\alpha(i))=1)=1-P(h_t(\alpha(i))=0 \mid h_{t-1}(\alpha(i))=1)=1-p_b, \quad (4)$$

where $E^i_{H\setminus\mathcal{M},t-1}$ is the set of direct contacts of agent i in $H\setminus\mathcal{M}$ who are employed in (H) at the end of period $t-1$, $U^j_{H\setminus\mathcal{M},t-1}$ is the set of direct contacts of agent j ($j\in E^i_{H\setminus\mathcal{M},t-1}$) in $H\setminus\mathcal{M}$ who are unemployed in (H) at the end of period $t-1$, and $\mathbf{1}_{E^i_{H\setminus\mathcal{M},t-1}}=\mathbf{1}$, if $E^i_{H\setminus\mathcal{M},t-1}\neq\varnothing$, but $\mathbf{1}_{E^i_{H\setminus\mathcal{M},t-1}}=0$ otherwise.

[16] Such specification of the model suggests that although migration does not change the structure of the whole network *G*, it actually alters the structure of the labor markets in (H) and (D). This feature is of essential difference from the specification of the drop-out decision game in (Calvó-Armengol, Jackson, 2004), where the network structure of the labor market is not altered when an agent drops out.

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Similarly, for any agent $i \in D \cup \mathcal{M}$ and any $t \geq 2$, the probabilities of transition between employment states are defined by the four equations:

$$P(d_t(\gamma(i)) = 1 \mid d_{t-1}(\gamma(i)) = 0) = \\ = \begin{cases} (1-p_b)\left[1-(1-p_a)\prod_{j\in E^i_{D\cup\mathcal{M},t-1}}\left(1-\frac{p_a}{\left|U^j_{D\cup\mathcal{M},t-1}\right|}\right)\right], & \text{if } E^i_{D\cup\mathcal{M},t-1} \neq \varnothing; \\ (1-p_b)p_a, & \text{if } E^i_{D\cup\mathcal{M},t-1} = \varnothing \end{cases} = \\ = (1-p_b)\left[1-(1-p_a)\left(\prod_{j\in E^i_{D\cup\mathcal{M},t-1}}\left(1-\frac{p_a}{\left|U^j_{D\cup\mathcal{M},t-1}\right|}\right)\right)^{\mathbf{1}_{E^i_{D\cup\mathcal{M},t-1}}}\right]; \quad (5)$$

$$P(d_t(\gamma(i)) = 0 \mid d_{t-1}(\gamma(i)) = 0) = 1 - P(d_t(\gamma(i)) = 1 \mid d_{t-1}(\gamma(i)) = 0); \quad (6)$$

$$P(d_t(\gamma(i)) = 0 \mid d_{t-1}(\gamma(i)) = 1) = p_b; \quad (7)$$

$$P(d_t(\gamma(i)) = 1 \mid d_{t-1}(\gamma(i)) = 1) = 1 - P(d_t(\gamma(i)) = 0 \mid d_{t-1}(\gamma(i)) = 1) = 1 - p_b, \quad (8)$$

where $E^i_{D\cup\mathcal{M},t-1}$ is the set of direct contacts of agent i in $D \cup \mathcal{M}$ who are employed in (D) at the end of period $t-1$, $U^j_{D\cup\mathcal{M},t-1}$ is the set of direct contacts of agent j ($j \in E^i_{D\cup\mathcal{M},t-1}$) in $D \cup \mathcal{M}$ who are unemployed in (D) at the end of period $t-1$, and $\mathbf{1}_{E^i_{D\cup\mathcal{M},t-1}} = 1$ if $E^i_{D\cup\mathcal{M},t-1} \neq \varnothing$ but $\mathbf{1}_{E^i_{D\cup\mathcal{M},t-1}} = 0$ otherwise.

Essentially the same equations determine the transition probabilities from the *initial* employed or unemployed status to end-of-period 1 status in both countries. The equations should only be corrected for the fact that the initial employment status of any agent $i \in H \setminus \mathcal{M}$ is given by $h_0(i)$, and the initial employment status of $i \in D \cup \mathcal{M}$ is given by $d_0(i)$.

Remark. Time t employment status of any agent i in a given country is fully determined by the job arrival and breakup rates, p_a and p_b, and by the two-links-away neighborhood of i in that country: by its network structure and agents' time $t-1$ employment status. The probability of being employed at period t for agent i who is unemployed at the end of period $t-1$ is increasing in the number of direct employed contacts and decreasing in the number of those two-links-away unemployed contacts who share at least one of their direct employed contacts with i.

In a *one-period-ahead* perspective, direct employed contacts of an unemployed agent i improve his prospects for hearing about a job offer while unemployed two-links-away contacts are "competitors" with agent i for potential job information and therefore, decrease his chances of employment. More distant relationships do not have an impact on one-period-ahead employment prospects of agent i. However, in a longer term, the larger network affects employment prospects of i through the effect it has on agent i's connections.

Given the defined transition probabilities for each agent, the transition probabilities between any two employment states of the whole labor market is simply a product of the transition probabilities between the corresponding employment states of agents. So, for any two employment states h, h' in (H) and d, d' in (D) and for any $t \geq 2$, we have:

$$P(h_t = h' \mid h_{t-1} = h) = \prod_{i\in H\setminus\mathcal{M}} P\big(h_t(\alpha(i)) = h'(\alpha(i)) \mid h_{t-1}(\alpha(i)) = h(\alpha(i))\big), \quad (9)$$

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$$P(d_t = d' \mid d_{t-1} = d) = \prod_{i \in D \cup \mathcal{M}} P\big(d_t(\gamma(i)) = d'(\gamma(i)) \mid d_{t-1}(\gamma(i)) = d(\gamma(i))\big). \quad (10)$$

The Remark and equations (9) and (10) imply that the employment states h_t, d_t of the labor markets in (H) and (D) follow two separate finite-state *Markov processes*. We denote by $M(G[H \setminus \mathcal{M}], p_a, p_b)$ the Markov process for h_t and by $M(G[D \cup \mathcal{M}], p_a, p_b)$ the Markov process for d_t[17].

Markov processes $M(G[H \setminus \mathcal{M}], p_a, p_b)$ and $M(G[D \cup \mathcal{M}], p_a, p_b)$ have several important characteristics. First, they are both *homogenous*. This follows from the fact that job arrival and breakup probabilities, p_a and p_b, are constant and the structure of the network in (H) and (D) does not change after the migration at the beginning of period 1. Second, Markov chains for h_t and d_t are *irreducible* and *aperiodic*, since all transition probabilities are strictly positive.

These properties imply the following result:

Proposition 1. *There exists the unique stationary distribution of employment states in* (H) *and the unique stationary distribution of employment states in* (D).

The stationary distribution of employment states in (H), denoted by μ, and the stationary distribution of employment states in (D), denoted by ν, define a *unique* steady-state probability of employment of every agent in each country:

$$p_{ss}^i = \sum_{h s.t. h(\alpha(i))=1} \mu(h) \ \ \forall \ i \in H \setminus \mathcal{M}, \quad (11)$$

$$q_{ss}^i = \sum_{d s.t. d(\gamma(i))=1} \nu(d) \ \ \forall \ i \in D \cup \mathcal{M}. \quad (12)$$

3.5. Migration decision game

3.5.1. Description of the game

Migration decisions of residents in country (H) are modelled as a *one-shot simultaneous move game* with complete information. The game takes place in the beginning of period 1 when no information about new job openings has yet arrived in either of the two countries. The players are all residents of (H). They simultaneously choose one of two actions: staying in (H), denoted by s, or migrating to (D), denoted by m, so as to maximize their life-time expected income. In the strategic form, the game is $\Gamma = (H, \Sigma, \{\pi^i\}_{i \in H})$, where H is a set of players, $\Sigma = \{s, m\}$ is each player's set of pure strategies, and $\pi^i : \Sigma^{a_H} \to \mathbb{R}_+$ is a payoff function of player i, representing the expected income of i in country (H) if the strategy of i is $\sigma(i) = s$ or the expected income in (D) if $\sigma(i) = m$. The economy and all elements of the game are common knowledge.

3.5.2. Strategies, payoff functions and equilibrium

Let $\sigma = (\sigma(1), \ldots, \sigma(a_H))$ be a profile of *pure strategies* of all players in H, where $\sigma(i) \in \Sigma$, and $\sigma(-i)$ denotes a profile of pure strategies of player i's opponents. Let $v_H^i(\sigma(-i))$ and $v_D^i(\sigma(-i))$ represent the life-time expected income of player i in (H) and (D), respectively, provided that i's opponents play $\sigma(-i)$. Then for each player $i \in H$ and any strategy profile σ, the payoff function π^i is defined by:

$$\pi^i(s, \sigma(-i)) = v_H^i(\sigma(-i)),$$
$$\pi^i(m, \sigma(-i)) = v_D^i(\sigma(-i)).$$

[17] $G[A]$ denotes a network induced by graph G on the set of agents A, i.e., a network where the set of agents is A and the set of links are those links of the original network G that connect agents in A.

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To define functions v_H^i and v_D^i explicitly, we impose an important simplifying assumption. For the rest of the paper we assume that agents in both countries start in period 1, and then jump to the steady state in the next "period"[18].

Assumption 1. *All agents obtain steady-state payoffs from period 2 onwards. This gives a rough representation of the life-time optimization problem of players, but enough to see the effects of their interaction in the short and in the long run.*

Under this assumption, the expected life-time income of player i in either country is the sum of the expected income in period 1 and the present discounted value of the future expected income starting from period 2 onwards. The future expected income is represented by the infinite flow of the *identical* one-period expected earnings determined by the product of the steady-state probability of employment and constant wage rate. So, each player i who stays in (H) receives a payoff

$$v_H^i(\sigma(-i)) = \begin{cases} w_H + \beta w_H p_{ss}^i(\sigma(-i)) + \beta^2 w_H p_{ss}^i(\sigma(-i)) + \ldots, & \text{if } h_0(i)=1, \\ w_H p^i(\sigma(-i)) + \beta w_H p_{ss}^i(\sigma(-i)) + \beta^2 w_H p_{ss}^i(\sigma(-i)) + \ldots, & \text{if } h_0(i)=0 \end{cases} =$$
$$= \begin{cases} w_H + \dfrac{\beta}{1-\beta} w_H p_{ss}^i(\sigma(-i)), & \text{if } h_0(i)=1, \\ w_H p^i(\sigma(-i)) + \dfrac{\beta}{1-\beta} w_H p_{ss}^i(\sigma(-i)), & \text{if } h_0(i)=0, \end{cases} \quad (13)$$

where p^i and p_{ss}^i are the probabilities of player i to be employed in (H) at the beginning of period 1 (if i is initially unemployed) and at the steady-state, respectively, and $0<\beta<1$ is a constant discount factor. The probability p_{ss}^i is defined in equation (11), while p^i is determined by the probability of transition between initial unemployment and end-of-period-1 employment, divided by $1-p_b$, $p^i = P(h_1(\alpha(i))=1 \mid h_0(i)=0)/(1-p_b)$, since it describes the chance of getting employed in the beginning of period 1 *irrespective* of the fact that the job can be lost in the end of the period.

Another way to write (13) is as follows:

$$v_H^i(\sigma(-i)) = w_H\left[(1-h_0(i))p^i(\sigma(-i)) + h_0(i)\right] + \frac{\beta}{1-\beta} w_H p_{ss}^i(\sigma(-i)). \quad (14)$$

Likewise, if player i moves to (D), he receives a payoff

$$v_D^i(\sigma(-i)) = w_D q^i(\sigma(-i)) - c + \beta w_D q_{ss}^i(\sigma(-i)) + \beta^2 w_D q_{ss}^i(\sigma(-i)) + \ldots =$$
$$= w_D q^i(\sigma(-i)) - c + [\beta/(1-\beta)] w_D q_{ss}^i(\sigma(-i)), \quad (15)$$

where q^i and q_{ss}^i are the probabilities of player i to be employed in (D) at the beginning of period 1 and at the steady-state. The probability q_{ss}^i is defined in (12), while q^i is given by $q^i = P(d_1(\gamma(i))=1 \mid d_0(i)=0)/(1-p_b)$. Note that the definition of v_D^i takes into account that any migrant is initially unemployed in (D).

The equilibrium of game Γ is a standard Nash equilibrium in pure strategies.

4. Results

First, we consider a special case when network G of social connections is *complete* (or represents a union of complete components), so that all individuals in the network are linked with each other. Furthermore, we assume that the discount factor β is sufficiently close to 1, so that the weight $\beta/(1-\beta)$ assigned by agents to their expected earnings from period 2 onwards is substantially bigger than the weight assigned to period 1. In this case,

[18] The same simplification is considered in (Calvó-Armengol, Jackson, 2004).

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agents mainly care about their expected earnings in the long run, and the migration decisions of the home country residents are essentially driven by the long-run income considerations. In this environment, we solve the model analytically. We prove the existence of equilibrium and study the change in the equilibrium migration choices as the number of links to the destination country changes marginally. After that, in the numerical analysis, we relax the restrictions on the network structure and the discount factor.

4.1. Steady-state probability of employment and maximal Nash equilibrium in the complete network

The long-run expected income in (H) and (D), that determines migration choices at sufficiently large β, depends on the steady-state probability of employment. Below we consider the dependence of the steady-state probability of employment in the complete network on the total number of agents, or alternatively, on the number of direct contacts of each agent[19].

We derive the steady-state probability of employment of an agent using the *subdivision of periods* – procedure proposed in (Calvó-Armengol, Jackson, 2004). The idea is that as we divide the job arrival rate, p_a, and job breakup rate, p_b, by some larger and larger factor, we are essentially looking at arbitrarily short time periods. In the limit, the resulting process for employment approaches a continuous time (Poisson) process, which is a natural situation where the short-run effects of agents' interaction are inconsequential and employment prospects of any individual are determined by the long-run effects[20].

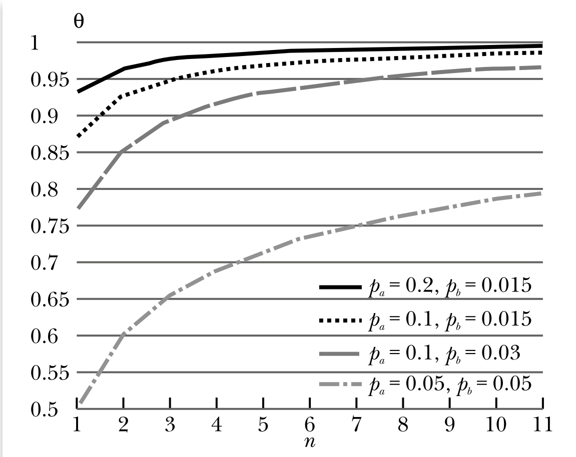

Figure 1.
Steady-state probability of employment in the complete network of size n

Lemma 1. *Under fine enough subdivision of periods, the steady-state probability of employment of each agent in a complete network of size n (formed by n agents) is equal to*

$$\theta(n)=\frac{1+\sum_{l=1}^{n-1}\prod_{k=1}^{l}\frac{p_b}{p_a}\left(1-\frac{k}{n}\right)}{1+\frac{p_b}{p_a}+\frac{p_b}{p_a}\sum_{l=1}^{n-1}\prod_{k=1}^{l}\frac{p_b}{p_a}\left(1-\frac{k}{n}\right)}. \tag{16}$$

It is strictly increasing in n.

The statement of Lemma 1 is illustrated with Figure 1. The strictly monotonic dependence of the steady-state probability on n is preserved for all combinations of parameters p_a, p_b. Higher p_a and lower p_b result in better employment prospects in the long run.

[19] In the complete network, this steady-state probability is fully determined by the total number of agents.

[20] Formally, by dividing p_a and p_b by some common factor T, we obtain an associated Markov process $M(g, p_a / T, p_b / T)$ for the employment state in the complete network g. In the terminology of (Calvó-Armengol, Jackson, 2004), this Markov process is called the *T-period subdivision* of Markov process $M(g, p_a, p_b)$. Lemma 1 addresses the situation when T is sufficiently large, so that the true steady-state probability of employment under $M(g, p_a, p_b)$ and $M(g, p_a / T, p_b / T)$ can be calculated using the approximate Markov process. Further details are provided in the Appendix.

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Thus, despite the short-run competition for jobs between unemployed agents, in the long run, having more agents in the network is good news for everyone as it effectively improves future employment prospects of any agent. In particular, this implies that in the complete network, migration has a long-lasting positive effect on the employment probability in (D) and is detrimental for the long-run employment probability in (H). As a consequence, if the weight assigned to the long-run expected income is high enough (β is sufficiently close to 1), the incentive of any agent to migrate is increasing as more of the other players migrate. Likewise, the greater the number of players who stay, the stronger the incentive for the others to stay. This leads to the following proposition.

Proposition 2. *Given the complete network G and fine enough subdivision of periods, there exists $\bar{\beta}$ such that for all $\beta \geq \bar{\beta}$, the following statements hold:*

1) decisions of players in H are strategic complements, that is, game Γ is supermodular;

2) there exists a unique maximal Nash equilibrium in pure strategies.

The existence of a maximal Nash equilibrium follows from the theory of supermodular games. It is an equilibrium where the set of players staying in (H) is maximal, that is, the set of players staying in (H) at any other equilibrium of the game is a subset of those staying in (H) at the maximal equilibrium.

4.2. Effects of links between countries on equilibrium migration

Strategic complementarity of players' decisions and interchangeability of players' positions in the complete network imply that only four outcomes are possible in equilibrium: initially unemployed players either all migrate or all stay and initially employed players either all migrate or all stay. Moreover, since irrespectively of players' initial employment status, their expected earnings in period 1 are negligible compared to those from period 2 onwards, not only the strategies of players with the identical initial status are the same but the strategies of *all players* are the same. This leads to the following proposition.

Proposition 3. *Given the complete network G and fine enough subdivision of periods, either no one or everyone migrates at the maximal Nash equilibrium. The situation when no one migrates is the maximal Nash equilibrium if and only if*

$$w_H\theta(a_H) \geq w_D\theta(a_D+1). \tag{17}$$

Condition (17) states that for any agent, the steady-state expected income in (H) is at least as high as in (D), provided that all other players stay. Thus, the situation when no one migrates is sustainable in the Nash equilibrium. Furthermore, the situation when everyone migrates is *always* a Nash equilibrium, although not necessarily maximal, since for any $w_D > w_H$, $w_H\theta(a_H) < w_D\theta(a_D + a_H)$.

It is easy to see that the larger the number a_D of players' contacts in D, the more likely it is that in the maximal equilibrium, all players migrate. Formally, given a_H, w_H and w_D, there exists a threshold value $\bar{a}_D(a_H, w_H, w_D)$ such that as soon as a_D exceeds this threshold, the inequality $w_H\theta(a_H) \geq w_D\theta(a_D+1)$ does not hold and the outcome with all players staying in (H) is *not an equilibrium*. Therefore, as a corollary of Proposition 3, we obtain.

Proposition 4. *The number of migrants in the maximal equilibrium is weakly increasing in the number of players' contacts in D. Moreover, if for the given parameters a_H, w_H and w_D,*

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no one migrating is an equilibrium for at least one value of $a_D \geq 0$, *then there exists such a threshold* $\bar{a}_D(a_H, w_H, w_D) \geq 0$ *that no one migrates in the maximal Nash equilibrium when the number of players' contacts in D is lower or equal to* $\bar{a}_D(a_H, w_H, w_D)$, *but everyone migrates if this number of contacts exceeds* $\bar{a}_D(a_H, w_H, w_D)$ *by at least 1. The threshold* $\bar{a}_D(a_H, w_H, w_D)$ *is defined by the equation:*

$$\frac{w_H}{w_D}\theta(a_H) = \theta(a_D + 1). \quad (18)$$

Thus, under certain conditions on the network structure and on the ratio of wages in (H) and (D), just a minor increase in the number of social connections with (D) leads to a strong increase in migration in the maximal Nash equilibrium.

The result of Proposition 4 is certainly very stylized. However, it still demonstrates the desired effects. In particular, for the case of the 19th century Italian emigration, it suggests that the striking difference in migration flows to North America from the south and from the north of Italy could have resulted from a small initial difference in the number of social links to North America from each of the two regions. More formally, suppose that H_N and H_S are two social groups in the south and in the north of Italy, respectively, and that D_N and D_S are two groups in North America; D_N has social connections with H_N and D_S has social connections with H_S. Suppose that communities in the south and in the north of Italy are "separated", i.e., there are no links between them, so they do not affect the long-run expected earnings of each other. For example, let the networks induced by H_N and H_S, $G[H_N]$ and $G[H_S]$, form separate components of the network in Italy, and the networks induced by D_N and D_S, $G[D_N]$ and $G[D_S]$, form separate components of the network in North America. Also, let both $G[H_N \cup D_N]$ and $G[H_S \cup D_S]$ be complete networks and the sizes of the Italian communities be the same, $|H_N| = |H_S| = a_H$. Furthermore, assume that $|D_S| > \bar{a}_D(a_H, w_H, w_D) \geq |D_N|$, that is, the number of the North American contacts of the Southern Italians is larger than the threshold $\bar{a}_D(a_H, w_H, w_D)$ defined above and the number of the North American contacts of the Northern Italians is lower or equal to this threshold. Then, according to Proposition 4, in the maximal Nash equilibrium of the migration decision game, everyone migrates from the group H_S of Southern Italians but no one migrates from the group H_N of the Northern Italians, provided that both, Northern and Southern Italians care mainly about their expected income in the long run.

For example, for the specific parameter values, $p_a = p_b = 0.05$, $a_H = 10$ and $w_H / w_D \in [0.6366,\ 0.7639)$, condition (17) suggests that in the maximal Nash equilibrium, no one migrates from H_N, if agents in H_N do not have any social connections in North America $(|D_N| = 0)$, but everyone migrates from H_S, if agents in H_S have just one acquaintance in North America $(|D_S| = 1)$[21].

4.3. Effects of links between countries on migration in non-complete networks

In this section we relax the restrictions that network G is complete and discount factor β is close to **1**. We show that basic insights from the previous analysis about the impact of social links between agents on the steady-state probability of employment and on the size of the migration flow continue to hold.

First, just as in case of the complete network, we find that the steady-state probability of employment of any agent in a non-complete network is increasing in the number of the agent's direct contacts. This result is demonstrated by the examples in

[21] This result is implied by the inequality $w_D\theta(1) \leq w_H\theta(a_H) < w_D\theta(2)$, where $\theta(1) \approx 0.5$, $\theta(2) \approx 0.6$, and $\theta(a_H) = \theta(10) \approx 0.7854$ according to Figure 1 (see the plot corresponding to $p_a = p_b = 0.05$).

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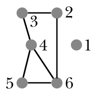
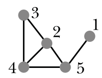
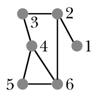
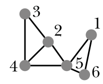
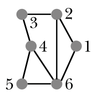
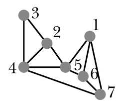
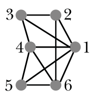
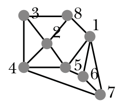
Table 1.

Steady-state probability of employment of agent 1 for different values of p_a and p_b

Network G (size of G is fixed)	$p_a = 0.2$, $p_b = 0.015$	$p_a = 0.1$, $p_b = 0.015$	$p_a = 0.1$, $p_b = 0.03$	$p_a = 0.05$, $p_b = 0.05$	Network G (size of G changes)	$p_a = 0.2$, $p_b = 0.015$	$p_a = 0.1$, $p_b = 0.015$	$p_a = 0.1$, $p_b = 0.03$	$p_a = 0.05$, $p_b = 0.05$
	0.9292	0.8678	0.7638	0.4872		0.9584	0.9221	0.8469	0.5760
	0.9583	0.9219	0.8463	0.5748		0.9686	0.9425	0.8818	0.6294
	0.9686	0.9426	0.8818	0.6269		0.9740	0.9544	0.9052	0.6800
	0.9770	0.9608	0.9163	0.6971		0.9772	0.9616	0.9196	0.7154

Remark. The probabilities are expressed in percentage points.

Table 1. Table 1 presents the values of the steady-state probability of employment of agent 1 for different numbers of his direct connections. The left part of Table 1 shows the change in the steady-state probability of employment of agent 1 when the number of his links with other agents increases but the size of the network remains fixed. The right part of the table continues the exercise for the case when an increase in the number of connections of agent 1 comes along with an increase in the size of a network. In either case, as the number of links between agent 1 and other agents increases, the steady-state probability of employment of agent 1 grows. Moreover, everything else being equal, a higher job information arrival rate, p_a, and a lower job breakup rate, p_b, results in a higher long-run probability of employment.

As before, the finding of a positive impact of direct social contacts on each agent's steady-state probability of employment suggests that as soon as the discount factor β is high enough, directly linked players tend to choose the same strategy. However, the strategic complementarity of *all players' decisions* and the existence of a (maximal) Nash equilibrium in the game are contingent on the network structure and the chosen parameter values.

If a Nash equilibrium exists, it can be defined by simple conditions. Below we state these conditions formally for a *general* network structure and *any* $0 < \beta < 1$. To do that, however, we need to introduce new notation. Let C_H^i and C_D^i be the sets of those players in H who are competitors or potential competitors of player i for the first-period job offers in (H) and in (D), respectively:

$$\forall i \in U_H \;\; C_H^i = \bigcup_{j \in E_H^i} C_{H,j}^i, \text{where} \;\; C_{H,j}^i = \left\{ l \in U_H \;\; \text{s.t.} \;\; l \neq i, j \in E_H^l \right\},$$

$$\forall i \in H \;\; C_D^i = \bigcup_{j \in E_D^i} C_{D,j}^i, \text{where} \;\; C_{D,j}^i = \left\{ l \in H \;\; \text{s.t.} \;\; l \neq i, \;\; j \in E_D^l \right\}.$$

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If player i is initially employed in (H), we assume that the set of his competitors in (H) is empty $\forall i \in E_H \; C_H^i = \varnothing$.

Using this notation, an equilibrium of game Γ can be defined as a strategy profile such that for any player i who migrates, $i \in \mathcal{M}^*$, the following inequality holds:

$$w_H\left[\left(1-h_0(i)\right)p^{i*}+h_0(i)\right]+\frac{\beta}{1-\beta}w_H p_{ss}^{i*} \le w_D q^{i*}-c+\frac{\beta}{1-\beta}w_D q_{ss}^{i*},$$

where

$$p^{i*}=1-\left(1-p_a\right)\left[\prod_{j\in E_H^i\setminus\mathcal{M}^*}\left(1-p_a/\left(u_H^j-c_{H,j}^i\right)\right)\right]^{\mathbf{1}_{E_H^i\setminus\mathcal{M}^*}},$$

$$q^{i*}=1-\left(1-p_a\right)\left[\prod_{j\in E_D^i}\left(1-p_a/\left(u_D^j+1+c_{D,j}^i\right)\right)\right]^{\mathbf{1}_{E_D^i}},$$

$c_{H,j}^i=\left|C_{H,j}^i\cap\mathcal{M}^*\right|$, $c_{D,j}^i=\left|C_{D,j}^i\cap\mathcal{M}^*\right|$, and p_{ss}^{i*}, q_{ss}^{i*} are the steady-state probabilities of employment of player i in networks $G\left[\left\{H\setminus\mathcal{M}^*\right\}\cup\{i\}\right]$ and $G\left[D\cup\mathcal{M}^*\right]$, respectively. At the same time, for any player k who does not migrate, $k\in H\setminus\mathcal{M}^*$, the opposite weak inequality holds.

Using this definition, we find equilibria of the game numerically for a range of network structures and particular parameter values. We focus on a change in equilibrium strategies of players caused by a single link increase in the number of connections between (H) and (D).

Table 2 presents the results for four examples of different network structures[22]. The values of parameters used are $w_H=5$, $w_D=7$, $c=1$, $p_a=0.1$, $p_b=0.015$, and $\beta=0.7$[23]. For these parameter values and for a large set of combinations of initial employment states in (H) and (D), we find that there exists a *unique maximal Nash equilibrium* of the migration decision game in each of the four examples. Moreover, for a subset of initial employment states in the two countries, a 1-link increase in the number of connections between (H) and (D) causes a substantial increase in the number of agents who choose to migrate in the maximal equilibrium. For instance, for certain employment conditions, not only the agent whose own number of links increases changes his strategy in favor of migrating but also some other agents in (H) do so. This is the case in examples 1, 3, and 4 of Table 2.

Results of Table 2 can be viewed as an illustration of the Italian emigration case. Indeed, let H represent a group of people in the *north* of Italy and D a group of people in North America. Suppose that a group of people in the *south* of Italy has the same structure of social relations with each other and the same initial employment state as the group of people in the north of Italy, so that local conditions in the north and in the south of Italy are the same.

Then the examples of Table 2 suggest that for a certain combination of initial employment states of Italians and North Americans, a substantially higher proportion of Southern Italians migrates to North America as soon as the number of their contacts with North Americans is just marginally higher than that of the Northern Italians.

[22] These network structures were chosen at random, with the only restriction that the four structures look sufficiently different. The initial employment states of the two countries (presented in the first column) are those for which we found a change in the equilibrium migration as the number of links between (H) and (D) increased.

[23] The same values of p_a and p_b are used in the numerical examples of (Calvó-Armengol, Jackson, 2004). The authors argue that “if we think about these numbers from the perspective of a time period being a week, then an agent looses a job roughly on average once in 67 weeks, and hears (directly) about a job on average once in every 10 weeks” (p. 430).

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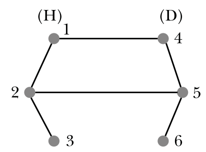
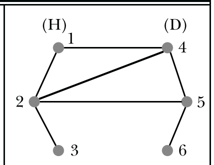
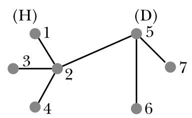
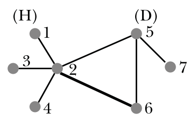
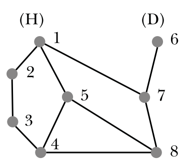
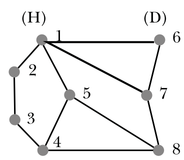
Table 2.

Equilibrium strategy profiles of players in H. Changes caused by adding a link

Example 1: $H = \{1, 2, 3\}$, $D = \{4, 5, 6\}$, link 2–4 is added		
Initial employment states in H and D		
$h_0 = (0, 1, 1)$, $d_0 \mid D = (1, 1, 0)$	(m, s, s)	(m, m, s)
$h_0 = (0, 1, 1)$, $d_0 \mid D = (1, 1, 1)$	(m, s, s)	(m, m, s)
$h_0 = (1, 1, 0)$, $d_0 \mid D = (1, 1, 1)$	(s, s, m)	(m, m, m)
$h_0 = (1, 1, 1)$, $d_0 \mid D = (1, 1, 0)$	(s, s, s)	(m, m, s)
$h_0 = (1, 1, 1)$, $d_0 \mid D = (1, 1, 1)$	(s, s, s)	(m, m, s)
Example 2: $H = \{1, 2, 3, 4\}$, $D = \{5, 6, 7\}$, link 2–6 is added		
Initial employment states in H and D		
$h_0 = (0,1,0,1)$, $d_0 \mid D = (1,1,0)$	(m, s, m, s)	(m, m, m, s)
$h_0 = (0,1,1,0)$, $d_0 \mid D = (1,1,0)$	(m, s, s, m)	(m, m, s, m)
$h_0 = (0,1,1,1)$, $d_0 \mid D = (1,1,0)$	(m, s, s, s)	(m, m, s, s)
$h_0 = (1,1,0,0)$, $d_0 \mid D = (1,1,0)$	(s, s, m, m)	(s, m, m, m)
$h_0 = (1,1,0,1)$, $d_0 \mid D = (1,1,0)$	(s, s, m, s)	(s, m, m, s)
$h_0 = (1,1,0,1)$, $d_0 \mid D = (1,1,1)$	(s, s, m, s)	(s, m, m, s)
$h_0 = (1,1,1,0)$, $d_0 \mid D = (1,1,0)$	(s, s, s, m)	(s, m, s, m)
Example 3: $H = \{1, 2, 3, 4, 5\}$, $D = \{6, 7, 8\}$, link 1–6 is added		
Initial employment states in H and D		
$h_0 = (1, 0, 0, 0, 1)$, $d0 \mid D = (1, 1, 0)$	(s, m, m, m, s)	(m, m, m, m, m)
$h_0 = (1,0,0,0,1)$, $d_0 \mid D = (1,1,1)$	(s, m, m, m, s)	(m, m, m, m, m)
$h_0 = (1,0,0,1,1)$, $d_0 \mid D = (1,1,0)$	(s, m, m, s, s)	(m, m, m, s, s)
$h_0 = (1,0,0,1,1)$, $d_0 \mid D = (1,1,1)$	(s, m, m, s, s)	(m, m, m, s, s)
$h_0 = (1,0,1,0,1)$, $d_0 \mid D = (1,1,0)$	(s, m, s, m, s)	(m, m, s, m, m)
$h_0 = (1,0,1,0,1)$, $d_0 \mid D = (1,1,1)$	(s, m, s, m, s)	(m, m, s, m, m)
$h_0 = (1,0,1,1,1)$, $d_0 \mid D = (1,1,0)$	(s, m, s, s, s)	(m, m, s, s, s)
$h_0 = (1,1,0,0,1)$, $d_0 \mid D = (1,1,0)$	(s, s, m, m, s)	(m, s, m, m, m)
$h_0 = (1,1,0,0,1)$, $d_0 \mid D = (1,1,1)$	(s, s, m, m, s)	(m, s, m, m, m)
$h_0 = (1,1,1,0,0)$, $d_0 \mid D = (1,1,1)$	(s, s, s, m, m)	(m, s, s, m, m)

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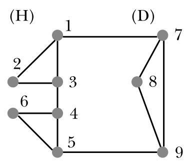
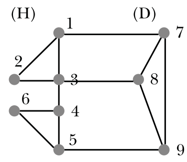
End of Table 2.

$h_0 = (1,1,1,0,1), d_0 \vert D = (1,1,0)$	(s, s, s, m, s)	(m, s, s, m, m)
$h_0 = (1,1,1,0,1), d_0 \vert D = (1,1,1)$	(s, s, s, m, s)	(m, s, s, m, m)
Example 4: $H = \{1, 2, 3, 4, 5, 6\}$, $D = \{7, 8, 9\}$, link 3–8 is added		
Initial employment states in H and D		
$h_0 = (0,1,1,0,0,1), d_0 \vert D = (0,1,1)$	(m, s, s, m, m, s)	(m, s, m, m, m, s)
$h_0 = (0,1,1,0,0,1), d_0 \vert D = (1,1,1)$	(m, s, s, m, m, s)	(m, s, m, m, m, s)
$h_0 = (0,1,0,0,1,0), d_0 \vert D = (1,1,1)$	(s, s, s, m, m, m)	(m, m, m, m, m, m)

5. Conclusion

The aim of this paper is to provide a microfoundation for the hypothesis in the chain migration literature that the job information provision by previous migrants to their social contacts at home plays an important role in determining migration decisions. To this end, we examine the effects of small changes in the number of links through which the information is transmitted from past migrants to their friends at home on the size of the migration flow.

We develop a theory, in which the role of social networks in diffusing information about available jobs is modelled explicitly. This not only allows us to address the main research question of the paper and study the effects of marginal changes in the structure of information provision, but also makes what seems to be an important theoretical contribution to the literature, since it proposes a new theoretical framework for studying the effects of social networks on migration.

The analytical results are obtained for the case when the network of social connections is complete and the discount factor is sufficiently close to 1. We find that in such a setting, the steady-state probability of employment of any agent is increasing in the size of the network. This implies that migration improves the long-run employment prospects in the destination country and worsens those in the home country. As a result, the migration decisions of the home country residents turn out to be strategic complements, which guarantees the existence of a unique maximal Nash equilibrium in the game. Moreover, this equilibrium displays a threshold property, in the sense that as soon as the number of links to the destination country is below (above) this threshold, nobody (everybody) migrates in the equilibrium.

The analytical results are then supplemented by the results of the numerical analysis of other network structures. They confirm that a higher number of social connections between countries leads to a higher migration flow, and even a minor increase in the number of these connections can produce a considerable increase in migration.

The findings of the paper demonstrate the importance of the structure of social relations in determining migration decisions. In particular, they support the argument that in the puzzling case of the 19th century Italian emigration, the lack of migration

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from the north of Italy to North America, despite the evident economic benefits of such move, and simultaneous intensive migration from the south of Italy could have indeed resulted from the *initial small difference* in the number of social connections to North America of the Northern and Southern Italians.

APPENDIX

A.1. *T*-period subdivision of Markov process for employment

Consider a network of size n and calculate the steady-state probabilities of employment in this network using the *subdivision of periods* procedure introduced in (Calvó-Armengol, Jackson, 2004). To start with, let us denote by s_t a vector of end-of-period t employment statuses of all agents at any $t \geq 1$, where $s_t(i)=1$ if agent i is employed, and $s_t(i)=0$ otherwise. So, $s_t \in \{0,\ 1\}^n$ for any $t \geq 1$. Let $s_t(-i)$ be the vector ef end-of-period t employment statuses of all agents except i, for any $i \in \{1, \ldots, n\}$. We call two employment states $s, s' \in \{0,\ 1\}^n$ *adjacent* if they are different for just one agent, i.e., there exists i such that $s(i) \neq s'(i)$, and $s(-i) = s'(-i)$.

Now, the *subdivided dynamics* of employment can be defined as follows. Consider a *T-period subdivision* $M^T(g, p_a/T, p_b/T)$ of the Markov process $M(g, p_a, p_b)$ for the arbitrary network structure g, where the probabilities of transition between states are defined as in section 3.4. Let P^T denote the matrix of transitions between different employment states under M^T. That is, $P^T(s_t = s' \mid s_{t-1} = s)$ is the probability that $s_t = s'$ conditional on $s_{t-1} = s$ for any $t \geq 2$. It is easy to see that for large T and any $t \geq 2$,

$$P^T(s_t = s' \mid s_{t-1} = s) = \begin{cases} p_b/T + o(1/T^2), & \text{if } s \text{ and } s' \text{ are adjacent, } s(i) > s'(i) \text{for some } i; \\ p_i(s)/T + o(1/T^2), & \text{if } s \text{ and } s' \text{ are adjacent, } s(i) < s'(i) \text{for some } i; \\ o(1/T^2), & \text{if } s \text{ and } s' \text{ are adjacent, } s(i) \neq s'(i); \\ 1 - \#s\dfrac{p_b}{T} - \sum\limits_{i \text{ s.t. } s(i)=0} (p_i(s)/T) + o(1/T^2), & \text{if } s = s', \end{cases}$$

where $\#s$ denotes the number of agents who are employed in state s, $\#s = \sum_k s(k)$, and $p_i(s)$ is the probability that agent i who is *unemployed* in state s hears about a new job offer and at most ones:

$$p_i(s) = p_a + p_a \sum_{j \text{ s.t. } s(j)=1, g_{ij}=1} \left(\sum\nolimits_{k \text{ s.t. } s(k)=0} g_{jk} \right)^{-1}.$$

The definition of $P^T(s_t = s' \mid s_{t-1} = s)$ suggests that Markov process $M^T(g, p_a/T, p_b/T)$ is a Poisson process. In particular, when T is high enough, the probability of even a single shock to employment state s at every subperiod is very low (of order $1/T$). The probability of two or more shocks is even lower (of order $1/T^2$ or lower). Therefore, instead of $M^T(g, p_a/T, p_b/T)$, we consider an *approximate Markov process* $\hat{M}^T(g, p_a/T, p_b/T)$ where only one-shock transitions are retained while the transitions involving two or more shocks are disregarded. Matrix $\hat{P}^T$ of transitions under $\hat{M}^T$ is defined as

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$$P^T(s_t = s' \mid s_{t-1} = s) = \begin{cases} p_b / T, & \text{if } s \text{ and } s' \text{ are adjacent, } s(i) > s'(i) \text{ for some } i; \\ p_i(s) / T, & \text{if } s \text{ and } s' \text{ are adjacent, } (i) < s'(i) \text{ for some } i; \\ 0, & \text{if } s \text{ and } s' \text{ are non-adjacent and } s \neq s'; \\ 1 - \#s \dfrac{p_b}{T} - \sum\limits_{i \text{ s.t. } s(i)=0} \dfrac{p_i(s)}{T}, & \text{if } s = s'. \end{cases} \tag{A1}$$

In the following, we calculate the stationary probability distribution of employment using the approximate Markov process $\hat{M}^T$ instead of Markov process M^T. This substitution is justified since for large enough values of T, transition probabilities of the approximate Markov process $\hat{M}^T$ are close to those of the true Markov process M^T. As a result, the stationary probability distributions under $\hat{M}^T$ and under M^T are also close, which is proved formally in (Calvó-Armengol, Jackson, 2004): $\lim\limits_{T\to\infty} \mu^T = \lim\limits_{T\to\infty} \hat{\mu}^T$, where μ^T is the steady-state distribution of employment under M^T and μ^T is the steady-state distribution of employment under $\hat{M}^T$.

A.2. Proofs

P r o o f of Lemma 1.

To simplify the notation, below we use a for p_a / T and b for p_b / T.

The steady-state probability of employment of any agent i in the complete network of size n can be defined as:

$$\theta(n) = \sum_{s \in \{0,1\}^n \, s.t. \, s(i)=1} \hat{\mu}^T(s) = \sum_{k=1}^{n} \binom{n-1}{k-1} \hat{\mu}^T(s : \#s = k), \tag{A2}$$

where $\hat{\mu}^T(s : \#s = k)$ denotes the steady-state probability of employment state s, such that exactly k agents are employed. To derive $\hat{\mu}^T(s : \#s = k)$ for any $k \in \{0, \ldots, n\}$ we use the definition of transition probabilities $\hat{P}^T(s_t = s' \mid s_{t-1} = s)$ in (A1) applied to the case of a complete network[24]:

$$\hat{P}^T(s_t = s' \mid s_{t-1} = s) = \begin{cases} b, & \text{if } s \text{ and } s' \text{ are adjacent, } s(i) > s'(i) \text{ for some } i; \\ a\left(1 + \dfrac{\#s}{n - \#s}\right), & \text{if } s \text{ and } s' \text{ are adjacent, } s(i) < s'(i) \text{ for some } i; \\ 0, & \text{if s and s}' \text{ are non-adjacent and } s \neq s'; \\ 1 - \#sb - an\mathbf{1}_{\{\#s \le n-1\}}, & \text{if } s = s'. \end{cases} \tag{A3}$$

Equation (A3) enables representation of $\hat{\mu}^T$ in the following form:

$$\begin{aligned} \hat{\mu}^T(s' : \#s' = k) = {} & ak\left(1 + \frac{k-1}{n-k+1}\right)\hat{\mu}^T\left(s : s(-i) = s'(-i) \;\&\; s(i) < s'(i)\mathbf{1}_{\{k \ge 1\}}\right) + \\ & + b(n-k)\hat{\mu}^T\left(s : s(-i) = s'(-i) \;\&\; s(i) > s'(i)\mathbf{1}_{\{k \le n-1\}}\right) + \\ & + \left(1 - bk - an\mathbf{1}_{\{k \le n-1\}}\right)\hat{\mu}^T(s' : \#s' = k), \quad k \in \{0, \ldots, n\}. \end{aligned} \tag{A4}$$

The first term in the sum on the right-hand side of (A4) corresponds to a change in the employment status of agent i from unemployment in s, $s(i) = 0$, to employment in s', $s'(i) = 1$. There are k such agents and each of them can find a job either directly, with probability a, or using the information about a job offer from one of his $k-1$

[24] The derivation of the expression for $\hat{\mu}^T$ in this proof is based on the notes by A. Calvó-Armengol.

employed friends, with probability $a(k-1)/(n-k+1)$ (since every friend chooses i as a job offer recipient randomly among $n-k+1$ unemployed candidates).

The second term on the right-hand side of (A4) corresponds to a change in the employment status of agent i from employment in s to unemployment in s'. There are $n-k$ such agents and each of them looses a job at the exogenous rate b.

Finally, the third term in the sum corresponds to the case when none of the agents changes his employment status.

Cancelling the term $\hat{\mu}^T(s':\#s'=k)$ on the left- and on the right-hand side (A4) results in the system of equations:

$$\left(a\mathbf{1}_{\{k\le n-1\}}n+bk\right)\hat{\mu}^T(s':\#s'=k)=ak\left(1+\frac{k-1}{n-k+1}\right)\hat{\mu}^T\left(s:s(-i)=s'(-i)\,\&\,s(i)<s'(i)\right)+ \\ +b(n-k)\hat{\mu}^T\left(s:s(-i)=s'(-i)\,\&\,s(i)>s'(i)\right),\quad k\in\{0,\dots,n\}. \tag{A5}$$

To solve this system, we first rewrite it in terms of probabilities μ_k that k out of n agents are employed at the steady state. Due to interchangeability of nodes in the complete network,

$$\mu_k=\binom{n}{k}\hat{\mu}^T(s:\#s=k),\quad k\in\{0,\dots,n\}. \tag{A6}$$

Then (A5) reduces to a system of $n+1$ equations with $n+1$ unknowns, $\mu_0,\dots,\mu_n$:

$$\left(an\mathbf{1}_{\{k\le n-1\}}+bk\right)\mu_k=\mathbf{1}_{\{k\ge1\}}an\mu_{k-1}+\mathbf{1}_{\{k\le n-1\}}b(k+1)\mu_{k+1},\quad k\in\{0,\dots,n\}.$$

The solution can be found recursively:

$$\mu_{n-1}=\frac{b}{a}\mu_n,\ \mu_{n-2}=\frac{b}{a}\times\frac{n-1}{n}\mu_{n-1},\ \mu_{n-3}=\frac{b}{a}\times\frac{n-2}{n}\mu_{n-2},\ \dots,\ \mu_1=\frac{b}{a}\times\frac{2}{n}\mu_2,\ \mu_0=\frac{b}{a}\times\frac{1}{n}\mu_1.$$

Hence,

$$\mu_{n-l}=\left[\frac{b}{a}\right]^l\frac{(l-1)!\binom{n-1}{l-1}}{n^{l-1}}\mu_n=\left[\frac{b}{a}\right]^l\frac{(n-1)!}{n^{l-1}(n-l)!}\mu_n,\quad 1\le l\le n. \tag{A7}$$

Using (A7), the probability μ_n can be found from the normalization condition, $\sum_{k=0}^{n}\mu_k=1$. We have:

$$1=\sum_{k=0}^{n}\mu_k=\sum_{l=0}^{n}\mu_{n-l}=\sum_{l=0}^{n}\left[\frac{b}{a}\right]^l\frac{(n-1)!}{n^{l-1}(n-l)!}\mu_n=\mu_n\left[1+\sum_{l=1}^{n}\left[\frac{b}{a}\right]^l\frac{(n-1)!}{n^{l-1}(n-l)!}\right]=$$

$$=\mu_n\left[1+\frac{b}{a}+\sum_{l=2}^{n}\left[\frac{b}{a}\right]^l\frac{(n-1)\cdots(n-(l-1))}{n^{l-1}}\right]=\mu_n\left[1+\frac{b}{a}+\sum_{l=2}^{n}\left[\left[\frac{b}{a}\right]^l\left(1-\frac{1}{n}\right)\right]\dots\left(1-\frac{p-1}{n}\right)\right]=$$

$$=\mu_n\left[1+\frac{b}{a}+\frac{b}{a}\sum_{l=2}^{n}\prod_{k=1}^{l-1}\frac{b}{a}\left(1-\frac{k}{n}\right)\right]=\mu_n\left[1+\frac{b}{a}+\frac{b}{a}\sum_{l=2}^{n-1}\prod_{k=1}^{l}\frac{b}{a}\left(1-\frac{k}{n}\right)\right].$$

So,

$$\mu_n=\left(1+\frac{b}{a}+\frac{b}{a}\sum_{l=1}^{n-1}\prod_{k=1}^{l}\frac{b}{a}\left(1-\frac{k}{n}\right)\right)^{-1},\quad n\ge1.$$

Now, the closed-form expressions for the remaining n probabilities, $\mu_0,\dots,\mu_{n-1}$ follow from (A7). At last, plugging μ_k, $k\in\{0,..,n\}$, into (A6) and using the obtained sequence of $\hat{\mu}^T(s:\#s=k)$, $k\in\{0,..,n\}$, in (A2), leads to the following expression for the steady-state probability of employment:

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$$\theta(n)=\sum_{k=1}^{n}\frac{k}{n}\mu_k=\sum_{l=0}^{n-1}\frac{n-l}{n}\mu_{n-l}=\sum_{l=0}^{n-1}\left[\frac{b}{a}\right]^l\frac{(n-1)!}{n^l(n-l-1)!}\mu_n=$$

$$=\mu_n\left[1+\sum_{l=1}^{n-1}\left\{\left[\frac{b}{a}\right]^l\frac{(n-1)\cdots(n-l)}{n^l}\right\}\right]=$$

$$=\mu_n\left[1+\sum_{l=1}^{n-1}\left\{\left[\frac{b}{a}\right]^l\left(1-\frac{1}{n}\right)\cdots\left(1-\frac{l}{n}\right)\right\}\right]=\mu_n\left[1+\sum_{l=1}^{n-1}\prod_{k=1}^{l}\left\{\frac{b}{a}\left(1-\frac{k}{n}\right)\right\}\right]=$$

$$=\left[1+\sum_{l=1}^{n-1}\prod_{k=1}^{l}\left\{\frac{b}{a}\left(1-\frac{k}{n}\right)\right\}\right]\Big/\left[1+\frac{b}{a}+\frac{b}{a}\sum_{l=1}^{n-1}\prod_{k=1}^{l}\left\{\frac{b}{a}\left(1-\frac{k}{n}\right)\right\}\right]=$$

$$=\left[1+\sum_{l=1}^{n-1}\prod_{k=1}^{l}\frac{p_b}{p_a}\left(1-\frac{k}{n}\right)\right]\Big/\left[1+\frac{p_b}{p_a}+\frac{p_b}{p_a}\sum_{l=1}^{n-1}\prod_{k=1}^{l}\left\{\frac{p_b}{p_a}\left(1-\frac{k}{n}\right)\right\}\right],\quad n\geq 1.$$

Given $\theta(n)$, it is now straightforward to show that $\theta(n)$ is strictly increasing in n for any $n\geq 1$. Reducing $\theta(n)$ and $\theta(n+1)$ to a common denominator and subtracting $\theta(n)$ from $\theta(n+1)$, we obtain a ratio where denominator is unambiguously positive and the nominator is equal to

$$\left(1+\sum_{l=1}^{n}\prod_{k=1}^{l}\left\{\frac{p_b}{p_a}\left(1-\frac{k}{n+1}\right)\right\}\right)\left(1+\frac{p_b}{p_a}+\frac{p_b}{p_a}\sum_{l=1}^{n-1}\prod_{k=1}^{l}\left\{\frac{p_b}{p_a}\left(1-\frac{k}{n}\right)\right\}\right)-$$

$$-\left(1+\sum_{l=1}^{n-1}\prod_{k=1}^{l}\left\{\frac{p_b}{p_a}\left(\left(1-\frac{k}{n}\right)\right)\right\}\right)\left(1+\frac{p_b}{p_a}+\frac{p_b}{p_a}\sum_{l=1}^{n}\prod_{k=1}^{l}\left\{\frac{p_b}{p_a}\left(1-\frac{k}{n+1}\right)\right\}\right).$$

Simple algebra transforms this expression into

$$\prod_{k=1}^{n}\left\{\frac{p_b}{p_a}\left(1-\frac{k}{n+1}\right)\right\}+\sum_{l=1}^{n-1}\left\{\left[\frac{p_b}{p_a}\right]^l\left[\prod_{k=1}^{l}\left(1-\frac{k}{n+1}\right)-\prod_{k=1}^{l}\left(1-\frac{k}{n}\right)\right]\right\}>0.$$

Hence, $\theta(n+1)-\theta(n)>0$ for any $n\geq 1$. In particular, as the size of the network, n, becomes arbitrarily large, the steady-state probability of employment approaches 1. ■

P r o o f of Proposition 2

1. When β is sufficiently close to 1, the migration decisions are determined by the long-run probabilities of employment. Namely, any player i prefers to migrate when

$$w_H\theta(a_H-m)<w_D\theta(a_D+m+1),$$

where m is the number of other players who migrate. Since by Lemma 1, the steady-state probability of employment $\theta(\cdot)$ is a strictly monotonically increasing function, as m increases, the left-hand side of this inequality decreases, while the right-hand side rises. Thus, for any given player, incentives to migrate weakly increase as more of the other players migrate. This means that players' migration decisions are strategic complements, that is, game Γ is supermodular.

2. The existence and uniqueness of a maximal Nash equilibrium in pure strategies in a supermodular game is established by a famous result in (Topkis, 1998, Theorem 3.1). ■

P r o o f of Proposition 3

Suppose that there exists an equilibrium in which m players migrate and a_H-m players stay for $0<m<a_H$. This means that for any player who migrates:

$$w_H\theta(a_H-(m-1))<w_D\theta(a_D+m), \tag{A8}$$

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while for any player who stays:

$$w_H\theta(a_H - m) \geq w_D\theta(a_D + m + 1). \tag{A9}$$

Recall that by Lemma 1, $\theta(\cdot)$ is strictly increasing. Then the left-hand side of (A8) is greater than the left-hand side of (A9), while the right-hand side of (A8) is smaller than the right-hand side of (A9). This means that either (A8) or (A9) cannot be true, which is a contradiction. Thus, the only possibility in equilibrium is that $m = 0$ or $m = a_H$. No one migrates, i.e., $m = 0$ is the maximal Nash equilibrium iff incentives to stay, given that the others stay, are at least as high as the incentives to migrate for any player $w_H\theta(a_H) \geq w_D\theta(a_D + 1)$. ■

Proof of Proposition 4

Let m be the number of migrants in equilibrium. By Proposition 3, in the maximal equilibrium, either $m = 0$ if inequality (17) holds or $m = a_H$ otherwise. Since the left-hand side of (17) does not depend on a_D but the right-hand side is strictly increasing in a_D (by Lemma 1), condition (17) may hold at low enough values of a_D, but does not hold when a_D exceeds a certain threshold $\bar{a}_D$. This means that the number of migrants in the maximal equilibrium, m, either does not change and is equal to a_H for any $a_D \geq 0$ (if (17) does not hold even at $a_D = 0$), or it increases from $m = 0$ to $m = a_H$ as a_D increases and passes the threshold $\bar{a}_D$. The threshold is defined by the equality in condition (17): $(w_H / w_D)\theta(a_H) = \theta(a_D + 1)$. If no one migrating is an equilibrium at least for $a_D = 0$, this threshold exists and is non-negative. Indeed, assume that for $a_D = 0$ inequality (17) holds, i.e., $(w_H / w_D)\theta(a_H) \geq \theta(a_D + 1)$. As a_D increases, the left-hand side in this inequality remains constant, while the right-hand side strictly increases. Thus, the equality is reached at some $\bar{a}_D = \bar{a}_D(a_H, w_H, w_D) \geq 0$. ■

REFERENCES / ЛИТЕРАТУРА

Abrahamson M. (1996). Urban enclaves: Identity and place in America. Review by: David M. Hummon. Contemporary Sociology. *American Sociological Association*, 25 (6), 781–782.

Aguilera M.B. (2005). The impact of social capital on the earnings of Puerto Rican migrants. *Sociological Quarterly*, 46 (4), 569–592.

Baily S.L. (1983). Italian immigrants in Buenos Aires and New York. *American Historical Review*, 88, 281–305.

Bewley T.F. (1999). *Why wages don't fall during a recession.* Cambridge: Harvard Univ. Press.

Boorman S.A. (1975). A combinatorial optimization model for transmission of job information through contact networks. *Bell Journal of Economics*, 6 (1), 216–249.

Boyd M. (1989). Family and personal networks in international migration: Recent developments and New Agendas. *International Migration Review*, 23 (3), 638–670.

Calvó-Armengol A. (2004). Job contact networks. *Journal of Economic Theory*, 115, 191–206.

Calvó-Armengol A., Jackson M.O. (2004). The effects of social networks on employment and inequality. *American Economic Review*, 94 (3), 426–454.

Calvó-Armengol A., Jackson M.O. (2007). Networks in labor markets: Wage and employment dynamics and inequality. *Journal of Economic Theory*, 132 (1), 27–46.

Carrington W.J., Detragiache E., Vishwanath T. (1996). Migration with endogenous moving costs. *American Economic Review*, 86 (4), 909–930.

Chernov O.V., Basinskaya E.A. (2009). Driving forces of international population migration. *Aktualnye Voprosy Ekonomicheskikh Nauk*, 4–2, 40–43 (in Russian).

Журнал НЭА, № 1 (70), 2026, с. 47–72

[**Чернов О.В., Басинская Е.А.** (2009). Движущие силы международной миграции населения. *Актуальные вопросы экономических наук*. № 4–2. С. 40–43.]

Drever A.I., Hoffmeister O. (2008). Immigrants and social networks in a job-scarce environment: The case of Germany. *International Migration Review*, 42 (2), 425–448.

Faist T. (2000). *The volume and dynamics of international migration and transnational social spaces*. Oxford: Oxford University Press.

Gabbay S. (1997). *Social capital in the creation of financial capital*. Champaign: Stipes.

Gilani I., Khan F.M., Iqbal M. (1981). Labor migration from Pakistan to the Middle East and its impact on the domestic economy. *Research Report Series*, no. 126–127. Islamabad: Pakistan Institute of Development Economics.

Gottlieb P. (1987). *Making their own way: Southern blacks' migration to Pittsburgh 1916–30*. Urbana: University of Illinois Press.

Granovetter M. (1973). The strength of weak ties. *American Journal of Sociology*, 78 (6), 1360–1380.

Granovetter M. (1995). *Getting a job: A study of contacts and careers*. 2nd. ed. Chicago: University of Chicago Press. Originally published in 1974.

Grossman J.R. (1989). *Land of hope: Chicago, black southerners, and the great migration*. Chicago: University of Chicago Press.

Gurak D.T., Caces F. (1992). Migration networks and the shaping of migration systems. In: "*International Migration Systems: A Global Approach*". M.M. Kritz, L.L. Lim, H. Zlotnik (eds.). Oxford: Clarendon Press, 150–176.

Gurgand M., Lambert S., Rapoport H., Zenou Y. (2012). Migration and development: Insights from the 3rd AFD-World Bank Migration and Development Conference. *Regional Science and Urban Economics*, 42 (5), 761–764.

Harris J.R., Todaro M.P. (1970). Migration, unemployment, and development: A two-sector analysis. *American Economic Review*, 60, 126–142.

Hatton T.J., Williamson J.G. (1998). *The age of mass migration: Causes and economic impact*. N.Y.: Oxford University Press.

Hily M.A., Poinard M. (1987). *Portuguese associations in France*. In: "*Immigrant Associations in Europe*". J. Rex, D. Joly, C. Wilpert (eds.). Aldershot: Gower, 126–165.

Joly D. (1987). Associations amongst the pakistani population in Britain. In: "*Immigrant Associations in Europe*". J. Rex, D. Joly, C. Wilpert (eds.). Aldershot: Gower, 62–85.

Josephides S., Rex J. (1987). Asian and Greek Cypriot associations and identity. In: "*Immigrant Associations in Europe*". J. Rex, D. Joly, C. Wilpert (eds.). Aldershot: Gower, 11–41.

Levy M.B., Wadycki W.J. (1973). The influence of family and friends on geographic mobility: An international comparison. *Review of Economics and Statistics*, 55 (2), 198–203.

Lin N. (1999). Social networks and status attainment. *Annual Review of Sociology*, 25, 467–487.

MacDonald J.S., MacDonald B.D. (1964). Chain migration, ethnic neighborhood formation and social networks. *Milbank Memorial Fund Quarterly*, 42, 82–97.

Mahmood R.A. (1991). Bangladesh return migrants from the Middle East: Process, achievement, and adjustment. In: *Migration to the Arab world, experience of returning migrants*. G. Gunatilleke (ed.). Tokyo: The United Nations University Japan.

Marks C. (1989). *Farewell – we're good and gone: The great black migration*. Bloomington: Indiana University Press.

Massey D.S. (1986). The settlement process of Mexican migrants to the United States. *American Sociological Review*, 51 (5), 670–684.

Журнал НЭА, № 1 (70), 2026, с. 47–72

Massey D.S. (1987). Understanding Mexican migration to the United States. *American Journal of Sociology*, 92 (6), 1372–1403.

Massey D.S., Alarcon R., Durand J., Humberto G. (1987). *Return to Aztlan: The Social Process of International Migration from Western Mexico.* Berkeley: University of California Press.

Massey D.S., Arango J., Hugo G., Kouaouci A., Pellegrino A., Taylor J.E. (1993). Theories of international migration: A review and appraisal. *Population and Development Review*, 19 (3), 431–466.

Massey D.S., Espinosa K. (1997). What is driving Mexico–U.S. migration? A theoretical, empirical and policy analysis. *American Journal of Sociology*, 102 (4), 939–999.

Mazzucato V. (2009). Informal insurance arrangements in ghanaian migrants' transnational networks: The role of reverse remittances and geographic proximity. *World Development*, 37 (6), 1105–1115.

Menjívar C. (2002). The ties that heal: Guatemalan immigrant women's networks and medical treatment. *International Migration Review*, 36 (2), 437–466.

Munshi K. (2003). Networks in the modern economy: Mexican migrants in the U.S. labor market. *The Quarterly Journal of Economics*, 118 (2), 549–599.

Nair E.R.G. (1991). Asian migration to the Arab world: Kerala (India). In: "*Migration to the Arab world, experience of returning migrants*". G. Gunatilleke (ed.). Tokyo: The United Nations University, Japan.

Podolny J., Baron J. (1997). Relationships and resources: Social networks and mobility in the workplace. *American Sociological Review,* 62, 673–693.

Portes A., Jensen L. (1992). Disproving the enclave hypothesis: Reply. *American Sociological Review*, 57 (3), 418–420.

Rybakovsky L.L. (2017). Factors and reasons of population migration, mechanism of their interaction. *Population*, 2, 51–61 (in Russian). [**Рыбаковский Л.Л.** (2017). Факторы и причины миграции населения, механизм их взаимосвязи // *Народонаселение.* № 2. С. 51–61.]

Sjaastad L.A. (1962). The costs and returns of human migration. *Journal of Political Economy*, 70S, 80–93.

Taylor J.E. (1987). Undocumented Mexico-U.S. migration and the returns to households in rural Mexico. *American Journal of Agricidtural Economics*, 69 (3), 626–638.

Todaro M.P. (1969). A model of labor migration and urban unemployment in less developed countries. *American Economic Review*, 59, 138–148.

Todaro M.P. (1976). *Internal migration in developing countries.* Geneva: International Labor Office.

Todaro M.P. (1989). *Economic development in the third world.* N.Y.: Longman.

Topkis D.M. (1998). *Supermodularity and complementarity.* Princeton: Princeton University Press.

Trushkova E.A. (2018). The phenomenon of ethnic enclave and its reflection in scientific research. *Vestnik of St. Petersburg University. Sociology*, 11 (3), 377–392 (in Russian). [**Трушкова Е.А.** (2018). Феномен этнических анклавов и его отражение в научных исследованиях // *Вестник Санкт-Петербургского университета. Социология*, 11(3), 377–392.]

Walker M. (1964). *Germany and the emigration, 1816–1885.* Cambridge: Harvard University Press.

Wilpert E.C. (1988). Work and the second generation: The descendants of migrant workers in the Federal Republic of Germany. In: "*Entering the working world*". E.C. Wilpert (ed.). Aldershot: Gower, 111–149.

Журнал НЭА, № 1 (70), 2026, с. 47–72

Yugai Yu.V. (2022). Labor migration from Central Asian countries to Russia. *Post-Soviet Studies*, 2(5), 206–219 (in Russian). [**Югай Ю.В.** (2022). Трудовая миграция из стран Центральной Азии в Россию // *Постсоветские исследования*. № 2 (5). С. 206–219.]

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М.А. Тетерятникова
НИУ «Высшая школа экономики», Москва

Модель миграционных решений в социальных сетях

Аннотация. Данное исследование мотивировано обширными эмпирическими данными о значимости социальных связей в принятии решений потенциальными мигрантами. Модель предоставляет собой микроэкономическое обоснование устоявшейся в литературе гипотезы, согласно которой на миграционные решения существенно влияет информация о вакансиях на зарубежном рынке труда, получаемая на основе социальных связей. В предлагаемой модели рассматриваются две страны — страна происхождения и страна назначения, — и в каждой стране агенты обмениваются информацией о возможностях трудоустройства посредством сети социальных связей. Информация о вакансиях влияет на перспективы занятости агентов и ожидаемый доход в каждой стране, что, в свою очередь, определяет миграционные решения жителей страны. В модели эти решения являются равновесием по Нэшу соответствующей игры. Мы изучаем влияние социальных сетей на равновесные миграционные решения и, в частности, воздействие незначительного изменения числа социальных связей за рубежом на объем миграционного потока. Используя результаты аналитического анализа и численного моделирования, мы устанавливаем, что даже минимальное увеличение числа социальных связей между странами может привести к существенному росту миграции.

Ключевые слова: *миграционное решение, социальные сети.*

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