Internal migration: a review of the literature

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Abstract

The interest of interregional migration flows in economics covers two important aspects. The first aspect concerns the role played by the main macroeconomic variables in determining the intensity and the directions of the migration flows. The second aspect focuses on migration as an important variable that might affect the growth rate. This study reviews and discusses the main literature on migration with respect to these two branches of study.

1. Introduction

Internal migration is recognized to be an important mechanism through which the spatial distribution of people changes over time (Greenwood, 1997). Since the first scientific work of Ravenstein (1885), the movement of people across different areas has been studied as a complex phenomenon involving mainly demographic and economic aspects. This paper will provide a review of both the theoretical and empirical literature on migration. From the theoretical side, particular attention will be paid on the different migration modelling approaches, which in turn provide a different view of the migration phenomenon. The micro perspective focuses on the migration unit, that is the single individual or the family, and on the migration decision making process. Conversely, the macro perspective focuses on migration with respect to the spatial context and the related aggregate variables. From the empirical side, migration studies can be classified depending on whether their aim is to find the determinants of migration or to study the consequences of migration. However, while there is a large number of empirical studies on the determinants of migration, different surveys on migration stress the need for more works on the consequences of migration (Cushing and Poot, 2004; Levine *et al.*, 2003; Greenwood, 1985,1997).
A further important issue that will be discussed in this paper refers to the distinction between those individual characteristics that influence the propensity to migrate and those spatial characteristics that determine the migration flows.

The first type of characteristics refers to individual factors like age, gender and educational attainments, which define homogeneous groups of migrants. The second type of characteristics refers to the attractiveness level of the places where migrants go or from where they leave.

2. A classification of the literature

Migration is a complex phenomenon that involves different sciences like sociology, demography, geography and economics. Since the earliest scientific paper of Ravenstein in 1880s[1], an extensive literature has grown up.
A preliminary classification scheme is thus needed and is based on three distinct aspects. The first aspect concerns the spatial context of migration flows and distinguishes studies between international and internal migration. International migration studies focus on the movement of people across different countries, whilst internal migration involves the reallocation of people within the national borders. The second important aspect involves migration modelling, a key distinction here is between micro and macro approaches (Cadwallader, 1992; Stiwell and Congdon, 1991). The micro approach focuses on individuals' behaviour, whilst the macro approach focuses on places or location (e.g., countries, regions, municipalities). The third aspect refers to the aim of the study, which can be directed to identify the determinants of migration or to explore the consequences of migration.

3. Internal migration modelling

3.1 Micro versus Macro models

Among the questions addressed by the research on the determinants and consequences of migration (Greenwood, 1997), two pertains to migration modelling, that is:

- Why do people migrate?
- Where are the migrants coming from and where are they going?

The first question calls for *micro* theory models, which focus on the migration decision process. The object of the analysis is the single individual (or potential migrant unit) behaviour and the factors that influence the decision of whether to migrate or not. In contrast, the second question calls for *macro* theory models,

[1] Ravenstein published two papers, the first in 1885 and the second in 1889, both entitled "The laws of migration". The first celebrated paper lists the seven "laws of migration".

which refers to "places" rather than "people", aggregate flows of migrants rather than the single individual. Even though the distinction between micro and macro models reflects two different literature strands, there are significant relationships between the two approaches. In particular, Cadwallader (1992) draws attention to the subjective perceptions of individuals with respect to the aggregate regional indicators (e.g., differences in per capita GPD or unemployment rates). The decision-making process of the single individual affects the aggregate utility function, which in turn determines the aggregate migration flows. In addition, Champion and Fotheringam (1998) argue that very often the distinction between micro and macro approach is quite blurred because some models that use aggregate data are derived from micro theoretical principles.

3.2 The micro approach: why do people migrate?

The aggregate migration flows represent the outcome of the underlying individual decision-making process. Modelling migration as a human behaviour is, therefore, a complementary more than an alternative approach. Rational individuals maximise their expected utility function, consequently, the decision of whether to migrate or not depends on the cost-benefit calculation.

The maximising behaviour was first addressed by Hicks (1932) who argued that "differences in net economic advantages, (….), are the main causes of migration". Sjaastad (1962) developed a micro model where migration decision is modelled as an investment in human capital, heterogeneity among individuals is also emphasized. A large part of the migration literature evolved following the work of Sjaastad (1962). The migration decision in the interregional migration context is represented by the following expression:

$$NPVM_{i,j,0} = \sum_{t=1}^{T} \frac{(B_j - B_i)}{(1+r)^t} - \sum_{t=1}^{T} \frac{(C_j - C_i)}{(1+r)^t} \qquad (1)$$

where, i denotes the region of origin and j the destination region, B denotes the total benefits, C the total cost related to the respective region, r is the discount rate and T is the lifetime period. In this framework, each individual (i.e., person or family) decides to move to region j if the present value of the total benefits to move is higher than the present value of the cost of moving. In its attempt to determine the return to investment in migration Sjaastad (1962) points out to the non monetary nature of some migration costs like the psychic costs of leaving the place of origin. The benefits are represented by the income earned by the migrant in the two alternative places, which in turns is a function of the personal skill level.

Harris and Todaro (1970) introduce imperfections in the labour market in the context of internal migration from rural to urban areas. Unemployment rate and wage differentials between the rural and the urban sectors are the key elements of

migration. The employment rate in the urban sector represents the probability to find a job and individuals maximise the *expected* utility function. Thus the individual, that is assumed to be risk neutral, decides to migrate from the rural to the urban sector if and only if :

$$\sum_{t=1}^{T} p_u(t) \cdot \frac{w_u}{(1+r)^t} - c > \sum_{t=1}^{T} \frac{w_r}{(1+r)^t} \tag{2}$$

where p_u is the employment rate in the urban sector, namely, the probability to earn the wage w_u, the term c denotes the migration costs and w_r is the wage in the rural sector. In contrast with the classical two sectors model (Lewis, 1954) Harris-Todaro model does not assume full employment and is thus able to explain the continuation of rural-to-urban migration even in presence of rising urban unemployment. More generally, a higher wage in a different place may not be enough to encourage migration if it is not coupled with a low unemployment rate.
However, a key question that the Harris-Todaro model was not able to answer is why, even when the condition in (2) is satisfied, only some individuals migrate while others do not. The assumption that only the expected income is important and the consequent omission of any other form of influence appears very restrictive. In this sense, the migration literature evolved merging the Harris-Todaro expected utility maximisation approach with the human capital model (e.g., Sjaastad, 1962) in order to account for the role of personal characteristics. In fact, as the same Todaro (1980) pointed out, migrants "tend to be disproportionately young, better educated, less risk averse…". Different surveys in migration research emphasise the important role of personal characteristics in migration research (Greenwood, 1975, 1985, 1997; Cadwallader, 1992; Plane and Bitter, 1997; Cushing and Poot, 2004). Another significant development in the migration behavioural literature points to the observed unit, which is the decision maker. Mincer (1978) argues that migration decisions are taken by families rather than by the single individual. Later on, Stark and Bloom (1985) present the "new economics of labour migration". The making-decision process of migration involves groups of individuals with different preferences (e.g., families). Moreover, the collective decision-making not only maximizes the expected income but also minimizes risks related to different market imperfections. A recent development in micro theory model is the dynamic approach of networks models (Carrington, 1996; Bauer and Zimmermann, 1995, 1997). The idea is that migrants create networks in the destination places, which reduce the migration costs for new migrants and therefore favour future migration[2].
In essence, micro modelling theory emphasizes the role of heterogeneity of migrants, that is, the human capital aspect, and the complexity underlying the decision-making process.

[2] Mckenzie and Hillel Rapoport (2006) study the effect of networks in reducing the costs for international migration.

3.3 The macro approach: the role of space

In macro modelling approach aggregate migration flows are studied with respect to the whole economic system of defined geographical areas (i.e., regions, provinces, municipalities). Therefore, the focus is on the relationship between migration and the macro variables that characterise the different destinations. In this sense, the classical models look at migration as an equilibrating mechanism that reduces differences in unemployment and per capita income, particularly within the national borders[3]. Differences between different locations may thus act as important factors pushing people to migrate from one place and attracting them to move in another one. Nevertheless, from the macro perspective there is a mutual interaction between migration and the spatial economic system. Heterogeneity between different locations induces a population redistribution process, which in turn can affect the structural characteristics of each location.
The literature on aggregate migration flows includes more empirical than theoretical studies. The main reason is that, contrary to micro data, macro aggregate data are more accessible and often (especially for developing countries) the only data source available[4] (Cushing and Poot, 2004). Less attention has been devolved, instead, to the development of new theoretical models. Indeed, the gravity model (Lowry, 1966; Lee, 1966), which is one of the first formal model of migration, remains the most common theoretical framework in empirical migration analysis (Greenwood and Hunt, 2003). The spatial interaction structure is certainly the powerful characteristic of this class of models, which has a long history in migration studies. As pointed out by Greenwood and Hunt (2003) the "countours of the gravity model of spatial interaction are present" in three of the Ravenstein's laws of migration. In particular, the first law of Ravenstein (1885) states that " the great number of migrants only proceed a short distance" and that "population, (…), produces currents of migration", clearly referring to the two gravity variables, that is, distance and population size, as the main determinants of migration. Further, the role of spatial differentials in relative economic opportunities is also emphasized by Ravenstein (Greenwood and Hunt, 2003; Ravenstein, 1885). The gravity model was thus extended to include the economic and other explanatory variables (Lowry, 1966; Lee, 1966)[5]. The modified gravity model widely used in the empirical investigations on migration determinants takes the following form:

[3] The convergence process through international migration implies a homogeneity degree between countries (e.g., government, currency, institutions and tastes) which is often hard to achieve in reality (Barro and Sala-i-Martin, 2004).
[4] However, the access on microdata increased considerable during the past two decades, thanks to rapid advances in computer technologies. The increased availability is encouraging the empirical micro analysis in migration, in particular logit and probit analysis (Cushing and Poot, 2004).
[5] The gravity model and the extended version will be reviewed and discussed in detail in chapter 2.

$$M_{ij} = \beta_0 + \beta_1 \cdot D_{ij} + \beta_2 \cdot P_i + \beta_3 \cdot P_j + \beta_4 \cdot Y_i + \beta_5 \cdot Y_j + \beta_6 \cdot U_i + \beta_7 \cdot U_j + \varepsilon_{ij} \quad (3)$$

where $M_{i,j}$ indicates the migration flows from place i to place j, D refers to distance, P is the population size, Y is the income and U is the unemployment rate. The regression in (3) is commonly expressed in log-log form in order to obtain estimates for the parameters which can be interpreted as elasticities[6].

A further development in macro migration modelling is represented by the systemic approach (Alonso, 1978). In contrast with gravity models, systemic models take into account the overall geographical system and not only the characteristics of the origin and destination places. The systemic model presented by Alonso in the "Theory of Movement" (1978, 1986) is a generalization of the modified gravity model in (3). The Alonso's model takes the following form:

$$M_{ij} = v_i D_i^{\alpha_i - 1} w_i C_j^{\beta_i - 1} t_{ij} \quad (4)$$

where $M_{i,j}$ is migration from origin i to destination j, D represents the opportunities of i and C represents the competition in j, a high degree of competition makes the destination j more attractive for all the system; α and β are the elasticity of response to D and C, respectively; v_i and w_i refers to population size of the origin and destination place, respectively; t measures the ease of movement between i and j. Notice that when considering t as the inverse of distance, the gravity model in equation (3) is a special case of the systemic model in (4) with $D_i=C_i=1$. The interpretation of the systemic variables D and C, however, is not easy[7] in that they are mutually influenced and cannot be directly related with observable variables (Vries *et al.*, 2000). Despite the important theoretical insights, thus, the empirical specification of the systemic model appears quite difficult and the gravity model remains the preferred one.

4. Internal migration determinants

4.1 Migrant selectivity: who migrates?

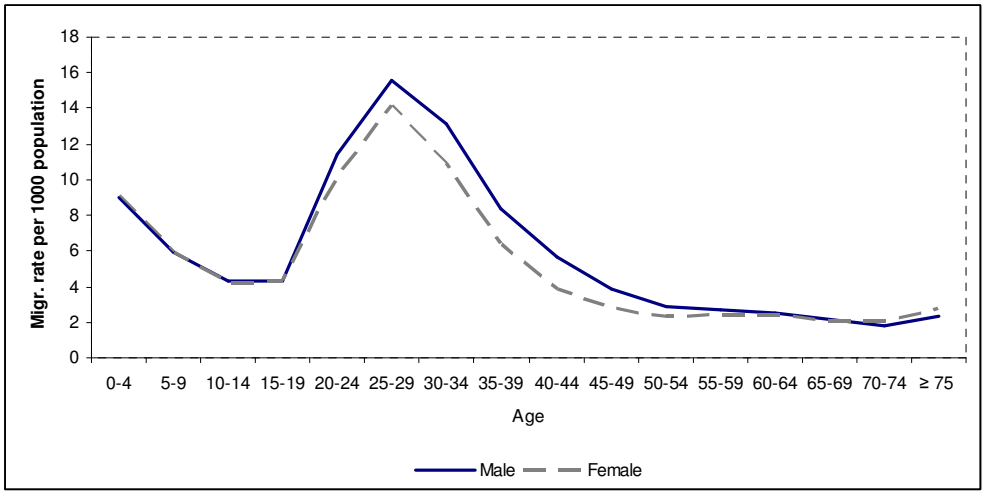
The human capital theory of migration has emphasized the distinction between the determinants of migration (in a strict sense) and other individual characteristics which, indeed, *select* migrants. More specifically, migration may be viewed as a phenomenon involving a selective process. That is, some characteristics have been widely recognized to affect migration as a whole phenomenon rather than

[6] Despite the modified gravity model in (3) is undoubtedly the most used functional form in migration empirical studies, many authors call for more work in finding alternative functional forms (Goss and Chang, 1983; Greenwood, 1985 ; Cushing and Poot, 2004).

[7] The same Alonso defined them as "rather abstract variables" (Alonso, 1978).

determining variation in trends. This selectivity process, thus, involves changes in propensity to migrate and, consequently, a stratification of people.

Fig. 1. Interregional migration rates in Italy by gender and age, 2002 (ISTAT)



Demographic factors, like age and sex, have the major *selective influence* in migration propensities (Champion and Fotheringam, 1998). Age, in particular, affects internal migration in a regular way, specially in developed countries. Fig. 1 plots Italian interregional migration rates, for males and females, against age classes (year: 2002). The migration rates are high for children (0-4 years old) and for people who are between 20 and 34 years old, while the people who migrate more are 25-29 years old. Males migrate more than females during the working age (16-60), whilst there are no differences in migration rates and gender during the childhood, when children movement depends on family, and after retirement age. The relationship between life course[8] and migration has a strong support in migration literature, both theoretical (Rogers *et al.*, 1978; Rogers and Castro, 1981; Warnes, 1992) and empirical (Polachek and Horvath, 1977; Plane and Heins, 2003). Education is also an important individual characteristic affecting migration propensity[9].High skilled people, other things being equal, have more difficulties to find a suitable job than low skilled people. Da Vanzo (1983) concludes that the high educated people are likely to move quickly, probably due to an efficient use of information. Nowadays, the selective influence of education on migration is confirmed by the majority of national statistics and surveys. As for Italy, Piras (2005) estimates the regional migration rates for migrants with

[8] The concept of life course is wider than the biological age and relates some particular common life-events (e.g., work, household type, retirement etc.) with the ability to migrate (Champion and Fotheringam, 1998).

[9] In a survey conducted among ex students of 40 rural Kansas high schools, Gist and Clark (1938) found that "the superior persons in the sample are tending to migrate more frequently to the city", wondering whether education is a "qualitative selection characteristic of rural-urban migration".

different educational attainments, showing that migration increases considerably with the educational attainment. Other factors that affect the propensity to migrate have been identified in the marital status (Graves and Linneman, 1979), family ties (Mincer, 1978) and employment status (Da Vanzo, 1978).

4.2 The determinants of migration

The previous section reviewed the main individual characteristics that influence the propensity to migrate. However, migration is also affected by spatial characteristics of origin and destination places. The study of these spatial determinants of migration, which are aggregate measure (i.e., macro variables), pertains to a large body of research. The different factors that determine migration flows can be classified in four main categories (Van der Gaag and Wissen, 2003):

- gravity variables
- economic variables
- labour market variables
- environmental variables.

Gravity variables
The standard gravity variables are the population size and distance. These two variables form the basic gravity model introduced earlier. When population size is not included as regressor, is used to standardize the dependent variable (i.e., net or gross migration). Empirical evidence of the positive effect of population size on internal migration is relevant and consistent with the gravity model (Adrienko and Guriev, 2004; Hanson and Spilimbergo, 1996; Larson and Mundlack, 1995). Population density may provide an alternative specification (Van der Gaag and Wissen, 2003), however, this measure turns often to be a push factor than an attractive determinant (Anjomani, 2002; Shen, 1999). Distance is considered a fundamental explanatory variable which proxies the migration costs (Greenwood, 1985, 1997; Greenwood and Hunt, 2003), moreover the availability of information about the destination places decreases with distance (Anjomani, 2002). However, as also pointed out by Cushing and Poot (2004), the omission of distance may seriously bias many empirical results[10].

Economic variables
The economic activity level was already recognized to be an important determinant by Ravenstein (1885)[11]. The majority of empirical works tries to investigate the impact of some economic variables on internal migration (Greenwood, 1997). A high economic prosperity means also more activities,

[10] They also argue that there is still a significant number of empirical studies that omit any spatial aspect (Cushing and Poot, 2004)
[11] The first law of migration states that "the great centres of commerce and industry (…) absorb the migrants" (Ravenstein, 1885).

services and opportunities for people living in that area. Moreover, dynamic centres attract mostly young people, who are widely recognized to be highly mobile. The most representative (and common) economic variable is the per capita gross domestic product (GDP). Empirical literature provides strong and robust evidence of the impact of per capita income on internal migration (Greenwood, 1997). Empirical studies on internal migration in Italy report a positive impact of per capita income on net migration in the sending region (Basile and Causi, 2005; Furceri, 2006). Daveri and Faini (1999) find that real income per employee in the sending southern regions of Italy has a negative impact of out flow migration, both internal and international. Fachin (2007) shows that income growth in the sending regions of South Italy discouraged internal migration flows during the eighties.
Other variables are used to measure the impact of the cost of living on internal migration. Basile and Causi (2005) include the index price, but its impact turns to be statistically not significant. Other studies use variables to measure the impact of the house market, such as the rental price (Parikh and Van Leuvensteijn, 2003; Cseres-Gergely, 2004; Angulo and Mur, 2005).

Labour market variables
Another variable that is often included as explanatory variable in migration analysis is the unemployment rate. Salvatore (1977) estimated the impact of unemployment rates, of the origin and destination regions, on interregional migration in Italy. The results showed that unemployment rates were pushing people to migrate from the southern regions to the northern regions[12]. Recent studies, however, do not find clear evidence for the unemployment rate. Basile and Causi (2005) use the net migration rate for the 95 Italian provinces. They find that the unemployment rate affected migration during the period 1996-2000 but not during the period 1991-1995[13]. They argue that the unemployment rates in the second period were higher than the first period and that during the period 1991-1995 internal migration flows were still decreasing (Basile and Causi, 2005). Furceri (2006) finds that unemployment rate did not affect interregional migration in Italy during the period 1985-2001[14]. Daveri and Faini (1999) find similar results, they show that the employment rate in the southern regions did not affect migration during the time period 1970-1989. Fachin (2007) studies the long-run determinants of internal migration, finding a weak impact of unemployment

[12] He used time series analyzed the (gross and net) flows of labour migration from the southern to the northern regions of Italy during the period 1958-1974. Only the unemployment rates and the wages in the origin and destination regions are included as regressors (Salvatore, 1977).
[13] The same result is found for the per capita income. The model is estimated by the seemingly unrelated regression technique (SUR) and includes regional dummies to control for the unobserved heterogeneity (Basile and Causi, 2005).
[14] The results are robust to three estimation techniques, that is OLS, Panel Data Fixed Effects and the Arellano-Bond (Furieri, 2006).

differential on migration during the period 1973-1996[15]. However, these studies use different econometric techniques and the time span is not exactly the same. Nevertheless, two general considerations can be drawn by comparing all the previous results. First, when considering only the period characterized by falling migration flows, the impact of unemployment is never significant (Basile and Causi, 2005; Daveri and Faini, 1999). The second consideration refers to the unemployment rate as determinant of migration in general. In fact, contrary to the per capita income, the empirical literature suggests that the impact of unemployment on internal migration is not clear. Pissarides and Wadsworth (1987) find that in UK "at higher overall unemployment rates, migration propensities are reduced". Juarez (2000) finds similar result for Spain and identify a threshold level above which the push effect of unemployment is reduced. Hatton and Tani (2005) find that unemployment rate differentials did not affect the net interregional migration in the UK during the period 1982-2000. Finally, a meta-analysis of migration studies regarding the European countries conducted by Ederveen and Bardsley (2003) shows a weak reaction of net migration rates to differential in unemployment rates[16].

Environmental variables

The reason why people decide to move from one region to another one may be related not only to economic factors. The last group of variables that can affect internal migration flows is quite broad and is related with the quality of life. In this sense, these kinds of variables reflect all those factors that can affect the quality of life. All these factors concern the public safety, social services, environmental quality, political and many other aspects. Porel (1982) studied the relative importance of these factors versus the economic variables, finding empirical support both for the former and the latter. Basile and Lim (2006) argue that there might be some endogeneity problems with these amenities variables and the per capita income[17]. Graves (1979) noticed that income becomes statistically not significant when amenities variables are included in the same regression. Adrienko and Guriev (2004) include a wide set of environmental variables, they find significant results for different infrastructural variables, for variables related to the public safety and to climate[18]. The empirical studies on Italian migration reviewed in this paper, however, do not include any environmental variable.

[15] The analysis is carried out using a boot strap test for panel cointegration. Data are divided by gender and age, including only males pertaining to the labour force (thus excluding the youngest and the oldest cohorts). In addition, the Italian regions are grouped in seven macro areas (Fachin, 2007).

[16] They conclude that particularly in Italy and Spain migration does not react as sharply to wage and unemployment differentials as in other European countries (Ederveen and Bardsley, 2003).

[17] This might explain why these variables are often not included as covariates in empirical regressions.

[18] The variables included are the number of buses, hospital beds, number of doctors, telephones per capita , highway density, and the temperature in summer and winter. They apply fixed effect

5. Consequences of internal migration

5.1 The different impacts of migration

Another important strand of literature addresses the different consequences of migration. However, influential surveys call for more work on this issue (Cushing and Poot, 2004; Levine *et al.*, 2003; Greenwood, 1985, 1997). Migration impact can be addressed at two levels: the first involves people (micro level) and the second involves places (macro level). This section will focus only on the impact of migration on places[19]. In particular, the impact on the labour market and the impact on growth will be discussed.

5.2 Migration and the labour market

Immigration of workers can affect the labour markets both in the sending and in the hosting regions. Borjas (1995) develops a simple model to describe how natives benefit from immigration through labour market adjustments.
The model assumes two regions, perfect wage flexibility and homogeneous labour force within a competitive, market clearing framework. Full employment is also assumed in both regions. The regions use capital *(K)* and labour *(L)* to produce the same composite output *(Q)*, that is $Q = f(K, L)$[20]. The production function exhibits constant returns to scale, thus the output is entirely distributed to capitalists and workers. The total labour force includes native *(N)* and immigrant *(M)* workers, that is, $L=N+M$, all workers are perfect substitute. Fig. 2 shows the equilibrium in the host economy prior and after migration. Initially, there is no migration so $L = N$ and the native workers earn the wage W_0, which equals the marginal product of labour[21] (point B in fig. 2). The entire national income (Q_N) pertains to natives and is equal to $Q_N = r_0 K + w_0 N$, where r_0 is the price of capital . In fig. 2 the national income is given by the area *ABN0*. When migration occurs, immigrants increase the labour force and the (inelastic) labour supply curve shifts to $L = N + M$, the new equilibrium is now the point *C*. As a result, the wage for all (homogenous) workers falls to w_1 and the new national income is $Q_N = r_0 K + w_1 L$, which is given by the area *ACL0* in fig. 2. The additional product (*BCLN*), which Borjas calls *immigration surplus*, is shared by immigrants (who take *CLND*) and natives capitalists (who take *BCD*)[22]. Note that the distribution of the additional national income caused by migration depends on the assumption that

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and between effect panel estimation on gross region to region migration flows in Russia during 1992-1999 (Adrienko and Guriev, 2004)

[19] See Greenwood (1997) for a survey of the consequences of migration on people.

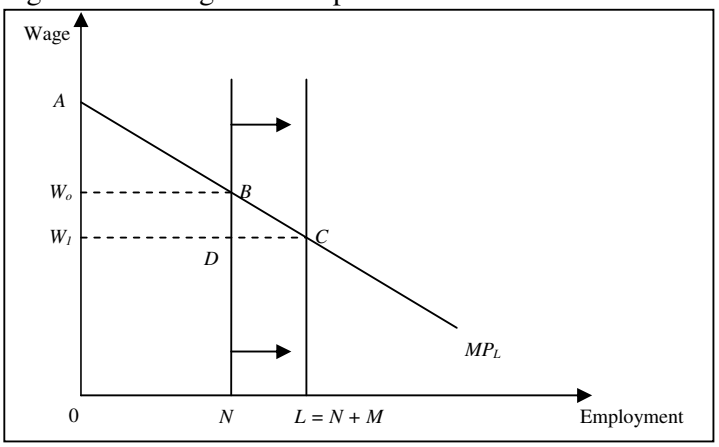
[20] Moreover, both capital supply and labour supply are assumed to be perfect inelastic.

[21] The price of the output is assumed to be equal to one.

[22] Borjas (1995) provides also rough of the immigration surplus for the US.

the demand of labour is perfectly inelastic[23]. Borjas shows also that the immigration surplus arises because immigrants and capital (which is owned by natives) are complementary.

Fig. 2 The Immigration Surplus



Another version of the model presented in the same paper (Borjas, 1995) releases the assumption that all workers are homogeneous and considers the case where there are two skill classes, skilled workers (L_S) and unskilled workers (L_U). In this case, the immigration surplus does exist as long as skilled (unskilled) immigrants reduce the wage of skilled (unskilled) workers. Furthermore, the benefits of immigrants will depend on the elasticity of factor price for skilled and unskilled workers and on the share of skilled and unskilled of immigrants. As a result, Borjas suggests that policies should encourage immigrants pertaining to the skill class for which the elasticity of factor price is higher[24]. This model, though simple, is useful to understand the mechanism through which migration in general can affect the host regions.

5.3 The role of human capital

Migration can affect the average level of human capital in the sending and in the destination regions. A common subject is whether emigration of high skilled workers, the so called *brain drain*, lowers the growth in the source region or not. Some authors suggest that the brain drain can be good for the sending economy. The present amount of human capital depends, in fact, on the past decision of households to invest in education. The possibility to migrate and to earn higher wages in another region might provide an incentive to acquire human capital and

[23] If the labour demand were perfectly elastic the immigrants would receive all the immigration surplus.

[24] Borjas quotes Hamermesh (1993) whose study suggests that the elasticity of factor price is greater for skilled than for unskilled workers.

therefore enhances growth (Mounfort, 1996; Stark *et al.*, 1997). Bein *et. al.* (2001) distinguish between two growth effects: an ex ante gain effect and an ex post drain effect. The first positive effect is due to the increased investments in education fostered by the chance to migrate and earn more. However, when high skilled people migrate the consequently loss of human capital has a negative impact on growth. The net effect can be beneficial only if the first effect dominates the second. Hemmi (2005) extends the model developed by Bein *et. al.* (2001) introducing fixed cost of migration and shows that the beneficial brain drain (BBD) cannot exist under their setup. In addition Hemmi (2005) analyzes the transition path and finds the condition under which a BBD is possible. Stark and Wang (2001) consider the effect of externalities from the average level of human capital that increase the individual productivity. As a result each individual will underinvest in human capital formation and the economy will not reach the social optimum. A combination of subsidies and taxes is therefore needed to correct the inefficiencies that arise from the human capital externalities (Stark and Wang, 2001). Large part of the empirical and theoretical literature focuses on the problem with regards to migration from developing to developed countries (see Docquier, 2006, for a survey).

5.4 Migration and endogenous growth

Another strand of the literature focuses on the impact of migration on economic growth both in the source and in the destination region. This section will review that family of models which pertain to the endogenous growth theory. These models allow the consumption and savings decisions of households, the investment decisions of firms and public policy to determine (endogenously) the long-run growth[25].

The endogenous growth literature can be divided into three broad strands. The first strand follows the model of Romer (1986) where the diminishing returns of capital are eliminated by the knowledge spillovers that result from investment. The first assumption of the model is that knowledge stock increases with investment through the learning-by-doing process. The second crucial assumption is that the knowledge created by each firm is accessible to all other firm, that is, knowledge is a public good. As a result, the knowledge stock of the overall economy increases with firms' investments and is therefore proportional to the aggregate capital stock.

The second strand of endogenous growth literature follows the human capital model of Lucas (1988). In this model there are two sectors, one produces the physical capital and the other produces the human capital. The production of human capital can improve the technology and offset the diminishing returns of physical capital. The third broad strand of literature refers to the models

[25] The endogenous growth theory contrasts with the neoclassical theory based on the Solow's model (1956) where the long-run growth is determined by the exogenous technical change.

developed by Romer (1990) and Grossman and Helpman (1991), where the technology progress (exogenous in the neoclassical models) is endogenously determined by the new ideas produced in the R&D sector.
Within this broad framework of endogenous growth models, some authors have studied the impact of migration. Following Romer (1986), Reichlin and Rustichini (1998) assume that technology is an increasing function of the aggregate capital stock, through the learning by doing process. They develop a two periods overlapping generation model of consumers with free trade and perfect capital mobility. Migrants move from low wage to high wage regions, where the wage gap is the consequence of differences in workforce size. Heterogeneous labour may offset the size effect through the change in the ratio between skilled and unskilled workers. If the flow of unskilled workers is relatively larger in the unskilled sector, then the composite effect of migration may offset the positive size effect and net effect on the receiving region will be negative. Walz (1995) uses a model with two types of agents with different ability in education that choose whether to invest in education or to work in the unskilled sector. The agent with grater ability in education will have also a higher incentive to invest in human capital and to migrate, since the migration costs are the same for both types of agents. The model predicts two solutions depending on whether only agents with high ability in education become skilled or also agents from the second type decide to invest in education. In the latter case migration is beneficial for both the source and the hosting region. Lundborg, P. and Segerstrom (1999, 2002) use a two regions version of the quality ladders model of Grossman and Helpman (1991). The North region produces the high quality product whilst the South region produces the low quality one. In each region firms hire R&D workers in order to become the leader and consequently the only producer for that period. Consumers spend a fixed part of their income in both products produced in the North and in the South. The productivity of a R&D worker is higher in the North than in the South thus there is always the incentive to migrate. However when migration occurs there are different winners and losers so that the net effect of migration is not clear.

5.5 Empirical evidence on migration and growth

Despite different theoretical studies show the different effects that migration can have on growth, a few number of works includes migration as an explanatory variable in empirical growth analysis. Barro and Sala-i-Martin (1995) include the net migration rates in the growth (*absolute*)[26] convergence regression for different developed countries (United States, Japan, Germany, United Kingdom, Italy, France and Spain). They estimate the convergence regression with and without migration and then compare the estimates of the two parameters β (i.e., the speed

[26] The absolute convergence implies that all regions are homogeneous in institutions, technology and tastes and therefore share the same steady state level (for a detailed discussion see chapter 3).

of convergence). Net migration should speed up the convergence process, therefore the estimated parameter β should be smaller when migration is included as a regressor in the estimate. That is, the effect of migration on the growth rate is absorbed by β when migration is excluded. The results show that the impact of net migration is positive for US (period 1920-1990) and for Japan (period 1955-1990). For the five European countries, that is Germany (period 1950-1990), UK (period 1960-1980), Italy (period 1950-1990), France (period 1950-1980) and Spain (period 1950-1990) the coefficient is not significant. Moreover, the speed of convergence does not substantially change in the two estimates with and without migration. Thus, the authors infer that migration did not play an important role in the convergence story (Barro and Sala-i-Martin, 1995).

During the last decade a more relevant number of empirical studies emerged, the large majority of which uses the same convergence equation introduced by Barro and Sala-i-Martin (1991, 1992b, 1995)[27]. Persson (1997) finds robust evidence of absolute convergence in per capita income across the twenty-four Swedish counties and a positive small effect of migration on the speed of convergence. The analysis covers the period 1906-1990 and is carried out with two different approaches. The first approach is based on an overlapping-generation neoclassical model with labour-augmenting technological progress. The method adopted provides the estimate for a coefficient "*b*" which relates the net migration rate with the speed of convergence. The estimates for the speed of convergence are then computed from the coefficient "*b*". The second approach is the direct estimation of the convergence equation using the nonlinear least square technique (NLS). Despite both approach support the thesis that migration speed up the convergence process, the coefficients of net migration directly estimated with NLS technique are not statistically significant[28].

Pekkala and Kangasharju (1998) study the impact of net migration on growth using data on 85 Finnish sub-regions during the period 1975-1995. In the light of the criticism around the use of cross-section regression in convergence analysis[29], they compare the results obtained from the cross-section regression with those obtained from panel data technique. They conclude that the former are indeed not reliable, in that they appear to be clearly different from the latter. Cross-section results report an increase in the β coefficient rather than a decrease when migration is included in the regression[30], implying that migration is a divergent factor. On the contrary, the results from panel data fixed effects model show that the β coefficient becomes lower when net migration is included, even thought the

[27] See chapter 3 for a discussion on the convergence equation.

[28] The results for the absolute convergence parameter (β) are similar to those found by Barro and Sala-i-Martin (1995).

[29] Different authors have raised some doubts concerning the consistency of the results using cross section regressions due to the heterogeneity bias, suggesting the use of panel data models (Islam, 1995; Caselli *et al*., 1996; Lee *et al.*, 1997).

[30] The impact of migration on the growth rate appears to be quite small.

effect of migration on the growth rate is very small[31]. In addition Pekkala and Kangasharju (1998) provide an alternative analysis on how migration affected the convergence in income dispersion between the leader (highest income region) and the follower (lowest income region)[32], the results are similar to those obtained in the case of *β-convergence*.

Maza (2006) finds evidence of absolute convergence among regions in Spain during the period 1995-2002 and a decrease in the β coefficient occurs when migration is included[33]. However, when conditional variables are included to control for structural differences the results are not statistically significant, whilst including migration the β coefficient diminishes. Therefore, the author concludes that the reduction of disparities between Spanish regions is due to differences in economic structures rather than to interregional migration[34].

Shioji (2000) studies the "migration puzzle", namely the contrast between what theory predicts for the impact of migration on growth and what empirical literature effectively shows. In fact, as shown by many empirical studies, the impact of a net gain in migration on regional growth is often not significant or not robust. Taking into account the heterogeneity of regional population the author identifies two opposite effects: the *quantity effect* and the *composition effect*. The former refers to the increase in population size and is negative, the latter refers to the human capital composition of migrants and may increase the growth rate of the hosting region. If the composition effect is strong enough it may offset the quantity effect and a net gain in migration can affect positively the growth rate. In order to separate the two effects the author introduces both the initial level and growth rate of human capital in the convergence regression[35]. In this way the net migration rate should measure only the quantity effect and the estimated coefficient should appear with negative sign. In that the composition effect is controlled for by the human capital variables. The results including only the net migration rate show the presence of convergence and a positive impact of migration, which may be due to the composition effect. However, even including the human capital regressors the net migration rate does not turn to negative.

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[31] The authors point out that the estimates for the rate of convergence β are lower for the panel data estimation than for the cross-section analysis (Pekkala and Kangasharju, 1998).

[32] This alternative concept of convergence is called *σ-convergence* and occurs if the income dispersion declines over time. The β-convergence, which in contrast refers to the speed of growth, tends to generate the *σ-convergence* but new disturbances offset this process and tend to increase dispersion (see Barro and Sala-i-Martin for a further discussion of this issue).

[33] The author uses cross-sectional regression and two-stage ordinary least square (2SLS) estimation.

[34] The study includes also an analysis on the determinants of interregional migration for the period 1995-2002. The results using net interregional migration rates points to the relative per capita GDP level as the main determinant. On the contrary, the relative unemployment rates do not exert any influence on the net migration rate.

[35] Two different index for human capital are alternatively used as regressors, one is based solely on educational attainment and the other is based on the age structure.

Therefore, the author concludes that the composition effect is not able to explain the "migration puzzle"[36].

Toya *et al.* (2004) study both the determinants and the consequences of migration in the Philippines using regional data over the period 1980-2000 and analyse the role of human capital. They compute the average schooling years based on Barro and Lee (1993) to obtain a measure for the net inflow of human capital. They obtain that net migration (also net inflow of human capital) is positively affected by the income in the sending region, thus all people tend to move from poor to rich regions. The results for conditional convergence show that the net migration rate does not have a significant impact on regional growth. They carry out a further estimate to assess the impact of migration on human capital formation; finding that net inflow of population is negatively correlated with the growth in primary and secondary schooling years and positively correlated with the growth in higher schooling years. Therefore, they conclude that migration has two opposite effects on the growth of regions (i.e., quantity and composition effect) and that this may explain the insignificant effect of migration on regional growth.

Kirdar and Saracoglu (2007) provide empirical evidence for the negative causal impact of internal migration for Turkey. They test the presence of convergence across Turkish provinces during the period 1975-2000. Following Barro and Sala-i-Martin (1995), they test the presence of the absolute convergence, finding divergence rather than convergence. On the contrary, after controlling for regional characteristics and structural features specific to each province, the results show the presence of (conditional) convergence[37]. The impact of migration on the speed of convergence is then examined, finding a significant negative effect. The authors point out two important characteristics of internal migration in Turkey that can support the results. The first is that internal migration flows are very high compared to internal migration in developed countries. The second refers to the composition of migration, which is mainly characterized by low skilled workers moving from rural to urban area. They conclude that the composition effect is very weak and that explains why the results turn out to be those predicted by the neoclassical theory.

Østbye and Westerlund (2007) carry out a comparative analysis of regional growth and migration for Norway and Sweden during the period 1980-2000. They address an important issue involving the use of the appropriate measure for migration in convergence studies. In particular, they point out that using net migration rate assumes that the effects of immigration and emigration flows on growth are symmetric. This assumption turns to be very restrictive when people are heterogeneous with respect to their human capital level. They test two model specifications, the first with net migration rate and the second with gross

[36] In addition, Shioji (2000) compute the maximum size of composition effect showing that in order for this effect to offset the opposite quantity effect the impact on productivity should be very high.

[37] They use two-stage least square estimate, using the population density and the state of emergency status as instruments.

migration rates[38]. When adding net migration rate in the convergence regression the speed of convergence goes down in both countries, suggesting that migration has a negative impact on convergence (i.e., the quantity effect dominated the composition effect). However, when gross migration rates are used the results from Norway and Sweden are completely different. In fact, while in Sweden the convergence rate goes down (as with net migration rate), in Norway the convergence rate increases suggesting that the impact of migration on growth is now positive. The estimates for coefficients of the gross migration variables show, in fact, that while immigration and emigration rates have opposite signs in Sweden (i.e., they are symmetric), the two variables have the same (positive) sign in Norway. Thus for the latter, the assumption implied by the net migration rate is too restrictive and leads to wrong results. Furthermore, they add a variable which measures the initial human capital level, as suggested by Shioji (2000). The immigration rate for Norway now turns negative, suggesting that gross migration flows work symmetrically[39], whilst the results for Sweden do not change.

6. Conclusions

The migration literature is very extensive and can be classified in different ways. This paper followed a classification scheme taking into account three main issues of migration analysis. Firstly, migration can occur within the country borders or across countries. Consequently, internal migration and international migration represent two distinct strands of migration literature. Secondly, migration can be studied with respect to the single individual or to the places affected by the movement of people. Micro modelling approach focuses on the individual decision making process, whilst the macro modelling approach focuses on the aggregate variables and places. The last issue refers to the main aim of the migration analysis, which can be the study of the migration determinants or the study of the migration consequences.

Micro models answer to the question of why people migrate. As noted by Hicks (1932), the decision of whether to migrate or not depends on the costs and benefits of migration. A large part of migration studies are based on the model proposed by Sjaastad (1962). According with these models, the potential migrant decides to migrate if the net present value of the related total costs and benefits is positive. Migrants take into account the benefits and costs related to the two alternatives, that is, to stay or to move. Moreover also non monetary costs, like psychic costs of moving, are considered by the individual.

Another influential model is the one proposed by Harris and Todaro (1970). Internal migration from rural to urban areas is studied with respect to the labour

38 The econometric technique used for the estimate is the GMM system estimator for dynamic panel data.

39 Note that controlling for human capital level the migration rate (net or gross) measures only the quantity effect, implying that the symmetric assumption should be always satisfied (Shioji, 2000).

market imperfections. In this framework, risk neutral individuals maximize their expected utility function considering the higher wage in the possible destination region and the probability to find a job. The latter is measured by the employment rate. The model does not assume the existence of full employment and is thus able to explain the migration flows in presence of rising unemployment rates in the destination region.

Further developments on micro modelling focus on family as the agent that maximize the utility function (Mincer, 1978) and on the network created by migrants in the destination region, which reduce the migration costs and favour new migration flows (Carrington, 1996; Bauer and Zimmermann, 1995, 1997).

The macro modelling approach studies the relationship between aggregate migration flows and the geographical areas. The presence of spatial heterogeneity among the different locations is the main determinant of migration. However, not all people react in the same way to differences between places. The selectivity influence of migration characterizes the different propensity to migrate for different categories of people. Young people in the working age have a higher propensity to migrate than the other age classes of people. Moreover, education is also an important selective factor. High skilled people tend to migrate more than low skilled people (Greenwood, 1997).

The gravity model is the most common theoretical framework used in empirical analysis to study the spatial determinants of migrations. The model emphasizes the spatial aspect of migration flows. According with the gravity model, migration is directly correlated with population size and inversely correlated with the distance between the origin and the destination region. Distance is a key variable, it represents a proxy for all the migration costs, both psychological and monetary, that are spatially related with the sending and destination region. Information costs about the destination region are also likely to rise with physical distance (Anjomani, 2002). Population and distance represent the standard gravity variables. The gravity model has been extended in empirical literature to include also other potential determinants (Lowry, 1966; Lee, 1966). Particular attention is devoted to investigate the impact of the main macroeconomic variables, such as the unemployment rate and the per capita GDP. There is strong empirical evidence of the impact of per capita GDP on migration, whilst the effect of unemployment reported in different studies is not significant. The empirical evidence for Italy, for instance, is robust concerning the importance of the per capita GDP but less evidence is provided for the impact of the unemployment rate on migration.

As for the consequences of migration, this paper has reviewed the main empirical works that studied the impact of migration on the regional growth. The neoclassical theory predicts a positive role of migration in the convergence process. People migrate from low capital intensity to high capital intensity regions, reducing the capital intensity in the destination region and increasing it in the sending region. The latter will grow faster than the former and migration flows will continue till the convergence process finishes. However, very often the

empirical evidence does not support the neoclassical prediction, showing a not significant impact of net migration rates on growth or even a positive effect (Barro and Sala-i-Martin, 1991, 1992b, 1995). This contrast, which is known as "migration puzzle" has been explained by considering that people might be heterogeneous with respect to their human capital content. In fact, if a net migration rate represents also a net gain in human capital stock, then the impact on growth can be positive (Friedberg and Hunt, 1995; Shioji; 2000). Østbye and Westerlund (2007) point out that the vast majority of the empirical analysis uses only the net migration rate to study the effect of migration on growth convergence. They argue that in order for the net migration rate to provide correct results the impact of in and out migration rates on growth must be symmetric. However, this is not always truth, especially when migrants and non-migrants differ in human capital level. They show that using the net migration rate instead of gross in and out migration rates yields misleading results for Norway.

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