DETERMINANTS OF INTERREGIONAL MIGRATION IN ITALY: 1991-2000

by

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Determinants of Interregional Migration in Italy: 1991-2000*

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Abstract:

After the reduction of public transfers to the South of Italy that occurred during the early 1990s, Southern residents experienced a decrease in their permanent income. During the same period, the devaluation of the lira in 1992 allowed the highly specialized industrial areas in the North-East-Centre to dominate the expansion of economic activity that culminated in 2000. These two events contributed to determine a rise in interregional migration flows in the second half of the 1990s, especially from the South to the North. In light of this evidence, this study examines the effect of traditional determinants of net migration rates in Italian provinces during the period 1991-1995 (when the migration flows still followed a slowing path) and the period 1996-2000 (characterized by an increase in interregional migration flows). The estimation results of a SUR model suggest that during the first period the net migration rates were weakly or not significantly affected by traditional economic variables such as the unemployment rate, level of disposable income and a province's industrial base. In the period 1996-2000, the migration behavior seems to have responded more faithfully to the traditional signals, as shown by higher and statistically significant coefficients of economic variables in the equation for the second period. For both periods a significant role of the age structure of the population was found.

Keywords: labor migration, SUR and spatial SUR models, Italy

1. Introduction

During the mid-1990s the interregional migration behavior in Italy changed considerably. A phase of decreasing migration flows, that started in the mid-1970s, continued until 1994, in contradiction with the increase (or the maintenance) of regional economic disparities within the country (measured in terms of per-capita income and unemployment rate differentials). The second half of the decade marked an inversion of this tendency with the start of a 'new' interregional migration movement from the South to the North. Thanks to these dynamics, the gap between the South and the rest of Italy decreased noticeably: in 2004 the per-capita GDP

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(Gross Domestic Product) in the South was 59.1 per cent of that of the Centre-North; in 1995, it was 55.7 per cent.[1]

What probably influenced the renewed propensity of Southern people towards out-migration was the change in the policy for the economic development in the South that occurred during the first part of the 1990s. Following the crisis of the extraordinary intervention *('intervento straordinario')* and the need for a strong fiscal consolidation in connection with the process of European integration, between 1992 and 1997 public spending in favor of the South was significantly reduced. This was reflected in a reduction of the area's net import of goods and services and in a marked deterioration in consumer confidence and permanent income among Southern families (see, OECD, 2001). Under these conditions, families and unemployed workers in the South began to modify their perceptions regarding the option of migrating toward the wealthier and more industrialized areas of the country (i.e. the Northern and the Central regions).

During the same period, the Centre-Northern regions received the greatest benefits brought about in the real economy by the devaluation of the lira in 1992, namely the recovery of industry's international competitiveness and the growth of exports. This phase was followed by the cycle of recovery for the national economy that culminated in 2000. The expansion of the economic base in the Centre-North territories, and especially in those of the North-East-Centre, given the constraint of insufficient natural population growth, was made possible by the increase in net migration. This result was determined not only by extra-European immigration but also by the renewed migration from the South, encouraged by an increased probability of employment.

In light of the changes taking place in Italy in the 1990s, with the increased propensity of Southern people to out-migrate on the one hand, and the relative attractiveness of the various external regions on the other, this study proposes to conduct an analysis of the determinants of net migration rates in the Italian provinces in two different periods: the period 1991-1995, during which the migration flow still followed a diminishing trend, and the period 1996-2000, characterized by a renewed increase in the internal migration flow.

The determinants of net migration rates that are taken into consideration are the traditional ones: the unemployment rate, disposable income, economic structure, age structure of the population,

[1] It might be interesting to estimate how many people would have to out-migrate from the less prosperous regions to the more prosperous regions to generate a reduction in disparities. This kind of exercise has been done, for example, by Azzoni (1997).

population density, cost of living index. In view of the changes that took place in the 1990s in the dynamics of interregional migration flow, differences in the influence of the above mentioned variables (measured through changes in the coefficients) in the two periods are expected. In particular, for the migration flow registered during the second half of the 1990s, that is, in a context of reduced public transfers to the South along with increased attractiveness of the economic base of the Centre-North, we expect a greater correspondence with traditional models of migration.

In order to correctly estimate the two equations of migration flow (one for each period), we adopted a SUR (seemingly unrelated regression) econometric model. Moreover, to alleviate the problem of endogeneity, we measured the explicative variables at the beginning of each period (1991 and 1996). Finally, we take into account the possible existence of spatial dependence in the error term by properly estimating a spatial SUR model.

The study is structured as follows: section 2 provides a brief review of the literature on interregional migration; section 3 offers a descriptive analysis of the dynamics of migration flows in Italy over a very long period (1975-2000) in order to contextualize the specific historical phase of the econometric analysis. Section 4 presents a detailed specification of the estimated model; section 5 describes the data used in the analysis and section 6 discusses the econometric results. Section 7 presents a robustness check of the econometric results for the possible presence of spatial dependence, and, finally, section 8 reports the conclusions drawn from the analysis.

2. A brief review of the literature

In the standard neoclassical model, the direction and the intensity of interregional migration flows are determined primarily by the wage difference between origin and destination regions (Hicks, 1932). Under conditions of full employment, labor moves from places where it earns less to those where it earns more. Under the assumptions of decreasing marginal productivity and of equality of labor productivity and real (flexible) wages, regions with a lower labor/capital (L/K) ratio tend to have higher labor productivity levels and consequently higher wage levels. In turn, higher wage levels attract workers from regions where there is a higher level of labor

supply and therefore a low wage level. The migration of workers activates a mechanism of territorial rebalancing of productivity (and cost) of labor.[2]

The predictions of the standard neoclassical model however are often unconfirmed by empirical evidence. First of all, the tendency toward wage uniformity has not been found, given the presence of rigidity in the labor market (especially in Europe). Furthermore, studies of interregional labor mobility in the initial phase of industrial development and in developing countries suggest that migration from rural areas to urban centers interests primarily in the age group of young adults and that it can even generate unemployment in the destination areas. Finally, the recent experience of European countries with strong interregional dualism (like Italy) reveals that migration flows do not respond to the simple wage differential scheme (Cannari, *et al*., 1997).

The existence of these puzzles has stimulated the development of a vast literature attempting to explain migration phenomena more comprehensively. One point of departure for the modern analysis of the interregional mobility of workers is represented by the Harris and Todaro (1970) model that follows the line of thought introduced by Sjaastad (1962). In these models, risk-neutral individuals with complete information make the decision to migrate based on the calculation of the net present value of the benefits from the move. The costs of migration are related to the time it takes for living conditions to improve following transfer. In Harris and Todaro (1970), the decision to migrate depends in particular on the differential of expected income calculated on the basis of a cost-benefits analysis that includes the probability of finding a job in the current location and in that of a potential destination. Originally, this model was oriented to explain the phenomenon of '*over-crowding*' and increasing unemployment in urban areas of the less developed countries, that is the movement of a large share of the work force (mainly young people) from rural low-wage areas towards urban and industrialized high-wage areas.

[2] The Lerner-Samuelson corollary of the Hecksher-Ohlin theory suggests that the rebalancing of labour costs is also attainable in conditions of immobility of the labour and of goods trade openness, thanks to the effects of the demand for goods on local labour markets. In an economy open to interregional and international trade, the comparative advantage increases the demand for goods produced with a greater intensity of the abundant factor (and therefore less costly) and, in turn, this increases the demand of that factor, increasing productivity. Consequently, the productivity of the labour increases where (being abundant) it was initially lower and decreases where (being scarce and therefore more costly) it undergoes a reduction in the demand for it.

In the Harris and Todaro model, nominal wages in the urban industrial sectors are not completely flexible, rather they are rigid on the downside. The existence of a minimum wage influences the expectations on income of out-migrants. However, the existence of wage rigidity also generates unemployment in the urban areas. In fact, a worker may experience a period of unemployment or underemployment before he or she starts to earn the urban wage. Rational workers take into account this possibility in the calculation of their permanent income, intended as the average of received earnings during the course of a lifetime. Therefore, younger workers are more likely to migrate from rural to urban areas, as they have a life horizon long enough to discount the waiting time during which they might be unemployed or underemployed. The expected (or permanent) income of workers, and thus their incentive to migrate from rural areas to urban areas, is therefore an inverse function of the rural areas (or origin places) population age.

More recently, models have been developed with predictions partly in line with and partly different from those postulated by Harris and Todaro (1970). In these models, individuals or households maximize their expected utility function, comparing the gross benefit to migrate with the cost of leaving the origin places. Pissarides and McMaster (1990) have suggested, for example, a modified Harris-Todaro framework to explain net migration rates, defined as the difference between in-flows and out-flows, normalized by the population in the place of origin. In this framework, households calculate the gross benefit of staying in the origin places and compare it with the gross benefit of migrating to another region. Migration takes place if the gross benefit to move exceeds the cost to move. This cost is affected by the observed and unobserved characteristics of households randomly distributed among the population. The gross benefit to migrate depends, on the other hand, on a variety of other factors: wage differentials, unemployment rate differentials and the characteristics of households (age and skill levels). If the wage level in a region increases more than elsewhere, the gross benefit to in-migrate to that region increases, while the gross benefit to out-migrate from the region decreases. The net migration rate of that region therefore increases. The unemployment rate also influences migration flows. Unemployed workers have indeed higher mobility since they have less to give up compared to employed workers. If the unemployment rate in a region increases, then the net migration rate of the region would decrease.

As noted earlier, in the Harris-Todaro model, risk neutral individuals calculate the expected income conditional on the probability of finding a job that can be approximated by the

unemployment rate in the destination place. Therefore, in the Harris-Todaro model, the wage level and the unemployment rate tend to be combined in a single variable, called 'expected income.' However, the wage level and the unemployment rate may enter the model specification separately as suggested by Pissarides and McMaster (1990).

Nonetheless, it has been suggested that if the unemployment rate increases everywhere, workers employed in any paid activity will deem it safer not to move (Gordon, 1985). In the same way, if employed workers have matured benefits over the years in their current employment, their migration benefit will be reduced.

Other authors (for example Decressin, 1994) introduce in the utility function of households the so-called "*amenities,*" generally approximated by climate conditions, availability of houses, hospitals and other public infrastructures that influence the quality of life. Oswald (1990), for example, demonstrates that home owners have less incentive to emigrate in the presence of negative shocks in the demand for labor in their origin place. In such cases, they tend toward commuting to a neighboring region. For this reason, home ownership makes the response to a low regional labor demand less flexible. Even unemployed homeowners would be less likely to emigrate compared to unemployed home renters.

3. Interregional migration flows in italy in the period 1975-2000

During the 1990s, the debate over regional development policy in Italy often focused on one evident contradiction: the coexistence of increasing interregional differentials in unemployment rates and in the levels of per-capita GDP with decreasing interregional migration flows. This phenomenon emerged in the mid-1970s and continued throughout the 1980s and into the first half of the 1990s (Faini *et al.*, 1997; Cannari, *et al*., 1997).

The Italian situation, like that of other European countries, seemed therefore to contradict the theoretical prediction according to which labor should move from regions with high unemployment and low income towards those with low unemployment and high income where there is a greater probability to find a job until regional differentials in employment rates and in per-capita income levels are partially or completely cancelled out.

The reasons for the reduction in North-South migration flows in the period between the mid-1970s and the early 1990s were sought in a variety of socio-economic factors. Concerning labor supply, the following were indicated: the progressive reduction in wage differentials between regions, state support for the Southern population through non-efficient forms of subsidy, such as disability pensions; the creation of jobs in the public service sector,[3] demographic factors such as the reduction of the birth rate and aging among the population, where mobility seems to be a prerogative of young adults; transaction costs connected with transfer, primarily those related to finding and paying for lodgings,[4] the failed or imperfect functioning of channels for hiring that, especially at the interregional level, would not have allowed for an adequate matching of labor supply and demand (Attanasio and Padoa-Schioppa, 1991). Others focus on factors that influence the labor demand: the transition from standardized production methods to flexible production systems during the 1970s and 1980s decreased the demand for 'generic' labor, which was abundantly available in the preceding decades in the South, and increased the demand for qualified laborers (Murat and Paba, 2001). This change is further connected with that of the territorial geography of the country's new economic base, with a shift from the traditional 'industrial triangle' to areas in the Centre-North-East.

Around the mid-1990s, however, something seems to have changed. The per-capita GDP in the South began to grow slightly faster than that in the Centre-North and the unemployment rate in the South, between 1999 and 2003, registered a decrease of approximately 5%. At the same time there was a revival of interregional migration flows especially from the South to the Centre-North (beginning precisely in 1994). It seems that the renewal of a convergence process, however slow, should also be put in relation to the emergence of a new phenomenon of movement of segments of the population from poor regions to rich ones. It is therefore relevant to analyze the characteristics of the 'new' interregional migration movement underlying the

[3] The existence of subsidies makes it less necessary for families to emigrate. For the Italian situation, it has been suggested that public transfers through the *Cassa per il Mezzogiorno* up to the early 1990s and more in general the weight of the public sector on economic activity in the South contributed to unifying lifestyles within the country but also generated several 'perverse' effects such as waiting unemployment and disincentive towards migration.

[4] Transaction costs also derive from the need to maintain in effect social, affective and family ties with the place of origin that induce the emigrant to include periodic return visits in his cost function. In this sense, the transaction cost is no longer a fixed initial cost, but a recurring cost that influences the consumption_function of individuals. Furthermore, changes in social habits, relational styles, cultural references and the fear of difficulty of insertion in an unfamiliar social setting, increase disproportionately the fixed component of the transaction cost, which is thus no longer measurable in objective terms but determined subjectively according to the preferences and aptitude for risk of each individual (Signorino, 2003).

recent partial reduction of differences in development. ISTAT statistics covering the period 1975 to 2000 were employed.

The analysis of interregional migration rates (figure 1), calculated as the balance between the number of those registered and those deregistered for transfer of residence from one region to another, divided by the resident population, reveals an alternation of periods of contraction and renewal of migration flows which interest primarily the South and the North-West.

<<Insert Figure 1 here>>

In particular, between 1975 and 1983, the decrease in transfers of residence from the South appeared to be quite marked: the migration balance in the South approached zero, while in the North-West it was below zero (the number of those deregistered was greater than that of those registered). Between 1984 and 1989, migration flows from the South began to increase again, though at a modest rate, to slow down again between 1989 and 1994. Beginning in 1994, as already mentioned, out-migration from the South began to increase again with greater intensity than in the previous decade, while positive and increasing migration balances over time were registered in the North-East and in the Centre.

This evidence becomes clearer if we analyze the number of those deregistered for transfer of residence rather than the balance (figure 2). Thus, in the early 1980s we can observe a reduction of out-migration flows from the South to the Centre-North (from 148,000 units per year in 1975 to slightly more than 102,000 units in 1983). In 1983, a great movement of people from Piedmont, Lombardy and Liguria towards the South was also observed. The year 1994 clearly marked the beginning of a new out-migration phase from the South; over a six-year period (up to 2000), about 850,000 people out-migrated from the South to a Central-North region; the annual flow in 2000 dropped to the levels of 1975 (nearly 150,000), while the flow from the Centre-North toward the South was relatively stable.

<<Insert Figure 2 here>>

The analysis by region of destination reveals other interesting characteristics of out-migration from the South (figure 3). The North-Western regions remain the main destination of Southern out-migrants but with a noticeably different incidence in time. The contraction in the first period is due to a strong reduction in out-migration flows to the North-West, whereas in the new out-

migration phase, the preferred destinations are the North-Eastern regions, characterized by the presence of a greater labor demand than that generated in the South. The Central regions also registered increased migration from the South with increasing annual flows from 30,000 to approximately 50,000. It would seem therefore that the renewed tendency towards migration of Southern people found an attractive outlet in small and medium enterprises at the district level as well as in services in the North-East and Centre.

<<Insert Figure 3 here>>

A further aspect of interregional mobility to be analyzed concerns internal movements within the territorial divisions, that is the transfer of residents from one region to another, but always within the same territorial division (figure 4). The trend in the Centre-North which was quite similar in magnitude to the movements from the South to that division is characterized by a strong deceleration which lasted in the beginning of the 1990s and by an equally strong acceleration beginning in 1996. On the other hand, Southern regions were substantially stable for the entire period which can be interpreted as a sign of the weakness of the pulling factors (for example, salary differential or probability of finding a job), making destinations in the division less attractive.

<<Insert Figure 4 here>>

4. Specification of the model

We use $migr_{is}$ to indicate the net migration balance of each province i (NUTS-3 level in the official Eurostat classification of standard territorial units) in each year s and $pop_{i,t-T}$ to indicate the population at the time t-T. The net migration rate (annual average) between t-T and t is equal to $\ln m_i = \ln\left(1 + \left(\frac{\sum_{s=t-T}^{t} migr_{i,s}}{T}\right) \Big/ pop_{i,t-T}\right)$. We therefore define the equation of the provincial net migration rate as:

$$\ln m_i = \beta_0 + \beta_1 \cdot \ln\left(u_{i,t-T}\right) + \beta_2 \cdot \ln\left(inc_{i,t-T}\right) + \beta_3 \cdot \ln\left(ind_{i,t-T}\right) + \beta_4 \cdot \ln\left(15 < pop < 65_{i,t-T}\right) + \beta_5 \cdot \ln\left(dens_{i,t-T}\right) + \beta_5 \cdot \ln\left(cpi_{i,t-T}\right) + \sum_{i=1}^{L} \gamma_i \cdot loc_i + \varepsilon_i \quad (1)$$

where $u_{i,t-T}$ is the provincial unemployment rate, $inc_{i,t-T}$ is the disposable per-capita income of households in each province *i,* $ind_{i,t-T}$ is the share of industry, $dens_{i,t-T}$ is the population density, $15 < pop < 65_{i,t-T}$ is the share of working age population, $cpi_{i,t-T}$ is the consumer price index for families of laborers and employees and loc_i is a dummy variable that indicates the territorial division (North-West, North-East, Centre and South; NUTS1 level) or the region (NUTS-2 level) to which each province belongs to.

Model (1) is estimated for two different periods in order to capture possible variations in migration behavior in the 1990s. The residuals of the 2 equations (one for each period) might however be correlated, creating problems in the inference phase. The non-diagonality of the co-variance matrix of residuals requires the use of GLS (*generalized least squares*) estimators, as in the *SUR* (*seemingly unrelated regression*) model proposed by Zellner (1962).

Generally, the *SUR* model consists of *T* equations of linear regression, each of which satisfies the hypothesis of the model of standard linear regression:

$$y_t = X_t \beta_t + \varepsilon_t \qquad t = 1, 2, \ldots, T \quad (2)$$

where $y_t(N \times 1)$, $X_t(N \times k_t)$, $\varepsilon_t(N \times 1)$, $\beta_t(k_t \times 1)$.

If ε_{it} is the i^{th} element of ε_t, we can assume that $(\varepsilon_{i1}, \varepsilon_{i2})$ is independently and identically distributed (*iid)* with $E(\varepsilon_{it}) = 0$ and $E(\varepsilon_{it}\varepsilon_{js}) = \sigma_{ts}$ if *i=j* (hypothesis of cross-section correlation) and $E(\varepsilon_{it}\varepsilon_{js}) = 0$ if $i \neq j$.

We can write model (2) as follows:

$$\begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_1 \end{bmatrix}_{(NT,1)} = \begin{bmatrix} X_1 & 0 & \cdots & 0 \\ 0 & X_2 & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \vdots & X_T \end{bmatrix}_{(NT, \sum_{t=1}^{T} k_t)} \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_1 \end{bmatrix}_{(\sum_{t=1}^{T} k_t, 1)} + \begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_1 \end{bmatrix}_{(NT,1)} \quad (3)$$

or

$$y = X\beta + \varepsilon \tag{4}$$

$$E(\varepsilon) = 0 \tag{5}$$

$$E(\varepsilon\varepsilon') = V = \sum \otimes I_N = \begin{bmatrix} \sigma_{11} I_N & \sigma_{12} I_N & \sigma_{1T} I_N \\ \sigma_{21} I_N & \sigma_{22} I_N & \sigma_{2T} I_N \\ \\ \sigma_{T1} I_N & \sigma_{T2} I_N & \sigma_{TT} I_N \end{bmatrix} \tag{6}$$

The coefficients of the regression equations can be estimated through different methods among which the best known are: 1) *ordinary least squares* (OLS), 2) *two-step feasible generalized least squares* (FGLS), 3) *iterative FGLS*, 4) *maximum likelihood* (ML). In the *SUR* model the estimates obtained through *iterative FGLS* converge asymptotically to those obtained with the ML estimates.

The OLS estimator of β is

$$\hat{\beta}_{OLS} = \left(X'X\right)^{-1} X'y \tag{7}$$

The two step FGLS estimator of β is based on the use of a consistent S of Σ:

$$\hat{\beta}_{FGLS} = \left[X'\left(S^{-1} \otimes I_N\right)X\right]^{-1} X'\left(S^{-1} \otimes I_N\right)y \tag{8}$$

If the error terms are normally distributed, we obtain the ML estimates by optimizing the maximum likelihood function:

$$l = -\frac{NT}{2}\ln(2\pi) - \frac{N}{2}\ln(|\Sigma|) - \frac{1}{2}\left(y - X\beta\right)'\left(\Sigma^{-1} \otimes I_N\right)\left(y - X\beta\right). \tag{9}$$

Iterative procedures are generally used to obtain maximum likelihood estimates.

If the errors in the two equations are not correlated ($\sigma_{ts} = 0$ for $t \neq s$), or if $X_1=X_2=\ldots=X_T$, then $\hat{\beta}_{GLS} = \hat{\beta}_{OLS}$. The hypothesis of independence among the errors in the equations can be verified through a Lagrange multiplier (LM) test proposed by Breusch and Pagan (1980).

5. Data

Tables 1 and 2 show simple descriptive statistics of the variables introduced in the econometric model, distinguishing between Centre-North and South and between the two different periods

1991-1995 and 1996-2000. For the estimation, all variables have been transformed in logarithmic terms in order to attribute a value of elasticity to the estimated parameters. The precise definitions of each variable and the statistical sources used are provided in the Appendix.

<<Insert Table 1 here>>

As in most empirical studies of migration flows, in this paper we use data on population migration to analyze the phenomenon of worker migration. The main consequence of using data on population migration is the overestimation of labor migration following the inclusion of people (such as retired people and students) who out-migrate for reasons other than those associated with job search or securing higher wages. The use of data on population migration can therefore generate an underestimate of the effect of economic base variables, such as disposable income and rate of unemployment. However, analyses carried out in other countries have demonstrated that, in practice, the use of data on population migration or on worker migration does not produce significantly different results (see, for example, Leuvensteijn and Parikh, 2001).

<<Insert Table 2 here>>

In section 3 we showed how migration from the South increased during the second half of the 1990s. The average values of the net provincial migration rates confirm this evidence along with the increased average value of the net migration rate of the Central-Northern provinces. An increase in the unemployment rate both in the North and South was also registered. The average rate of unemployment in the Southern provinces remains nonetheless approximately three times that in the Central-Northern provinces. The table also shows the average values and the standard deviations of disposable per-capita income at constant price levels in the Central-Northern and Southern provinces. We can calculate an average value of disposable per-capita income in the Southern provinces at slightly more than 60% of the average value in the Central-Northern provinces.

6. Econometric Results

The objective of the econometric analysis is to examine the determinants of net migration rates in Italian provinces in two different periods: 1991-1995, during which migration flows still

followed a decreasing path, and 1996-2000, characterized by a renewed acceleration of interregional migration especially from the South to the North. The most important working hypothesis is that from the mid-1990s the relative attractiveness between the North and South improved in favor of the North due to the pulling effect of the increased labor demand in the North and the pushing effect of the reduction of the reservation wage and of 'wait unemployment' in the South, induced in part by the reduction in public subsidies to the South.

The structural changes in macroeconomic and regional policies may thus have generated such a shock that it influenced the behavior of the Southern population, especially of young adult workers. One would therefore expect a greater response of net migration rates to provincial macroeconomic conditions (unemployment rate, disposable income and presence of industrial base) in the second period than in the first.

Table 3 presents the results of the SUR model. The Breusch-Pagan's Lagrange Multiplier test for the diagonality of the error covariance matrix does not allow for rejection of the null hypothesis of no correlation between the errors of the two equations. Thus, estimations were carried out using iterative FGLS.

<<Insert Table 3 here>>

In order to partially control for the effect of unobserved hererogeneity, dummy variables were introduced into the model that indicate the membership of each of the 95 provinces to one of the 4 Italian macroregions (model 1; the reference category is the South), or to one of the 19 Italian regions (model 2; the reference category is Basilicata).[5] In the first specification, the dummy relative to the Center was always significant. In the second specification, for the first period, many regional dummies were significant while for the second period significant coefficients were observed only for dummies relative to the Central regions (except for the Marche).

These results offer a preliminary indication that the model introduced in equation (1) tends to better represent the situation observed in the second period, while for the first period heterogeneity was not adequately captured by traditional variables. The better fit of the model for the second period is also shown by the value of the adjusted R^2.

[5] The Valle d'Aosta , comprised of only one province, was grouped together with Piedmont.

The coefficient of the unemployment rate has the expected negative sign, but its value and its level of statistical significance greatly increase in the equation for the second period. In the second specification of the model, that includes more finely defined fixed territorial effects, the coefficient for the unemployment rate is at the limit of commonly accepted statistical significance. We might therefore consider that in the period 1996-2000, the existence of a high unemployment rate in Southern provinces encouraged people to out-migrate to a greater degree than in the preceding period. The value of the coefficient suggests that a positive variation of 10% in the provincial unemployment rate determined on average in the period 1991-1995 a negative variation of 1.5% per year in the net migration rate, while in the period 1996-2000 it generated a negative variation of the net migration rate of 2% per year. The F test on the temporal stability of the parameters (table 4) further indicates that the difference in the coefficient of the estimated unemployment rate for the two periods is statistically significant.

The model also includes a measure of the disposable per-capita income of resident families, calculated at constant prices by using a regional deflator of consumption. A positive sign was always registered, as expected, but even the coefficient of this variable was greater and more significant in the second period (in the second specification of the model, the coefficient estimated for the first period was not statistically significant). The estimates indicate that a positive variation of 10% in the disposable income for the period 1996-2000 is associated with a positive variation of the net provincial migration rate between 6.2 (excluding the possible territorial effects measured by model 2) and 8.7% (in model 1, where specific regional effects are not present). Table 4 indicates that even in this case, there are significant differences for the estimated coefficients for the two periods.

<<Insert Table 4 here>>

The share of the industrial sector on the total economy seems to significantly influence the net provincial migration rate only in the second period. The coefficient of the variable that measures the share of the industrial local units on the whole number of local units in the province was, as expected, positive and significant only for the period 1996-2000. The value of the coefficient indicates that a variation of 10% in the share of industry created a positive variation between 1.7 and 2.1% in the net provincial migration rate.

The effect of the age structure of the population on the net migration rate has the expected negative sign, both in the first and the second period. This result indicates that the age structure of the population is important in conditioning net provincial migration rates. The elasticity values were also very high. Population density does not, on the other hand, seem to influence migration rates. Finally, the estimated model further includes a measure of the consumer price index for families of workers and employees, in order to catch the effect of the cost of living on provincial migration flows. The coefficient of this variable is never significant.

7. Robustness analysis: spatial autocorrelation

In this section, we perform a robustness check of econometric results discussed above for the possible presence of spatial dependence. Net migration rates in each province can indeed be affected, not only by the characteristics of the province itself (unemployment rate, wage level, economic structure and so on), but also by net migration rates and the characteristics of neighboring provinces (see, for example, Lundberg, 2003; Ibarra and Soloaga, 2005).

More specifically, integrating spatial autocorrelation into a regional migration model is useful for two reasons. First, the underlying hypothesis in FGLS or ML SUR estimates is based on the cross-section independence of the errors, which may be very restrictive and should be tested since, if it is rejected, the statistical inference based on it is not reliable. Secondly, spatial autocorrelation may allow us to account for variations in the dependent variable arising from latent or unobservable variables (such as, for example, the availability of housing) which have a spatial pattern. Spatial autocorrelation may therefore act as a proxy to omitted variables and capture their effects In this case we can talk about *nuisance spatial dependence*.

Spatial autocorrelation can be introduced in the SUR model either in the form of a spatial lag or in that of a spatial error (Anselin, 1988a, 1988b). In the former case, a spatial lag of the form ρWy is introduced in each equation, ρ indicating the extent of spatial correlation in the dependent variable in each equation and W indicating the row-standardized spatial weights matrix:[6]

[6] In the empirical analysis we used a simple first-order contiguity weights matrix.

$$y = X\beta + \rho Wy + \varepsilon \quad (10)$$

In the latter case, the error terms are written for each equation in the system as follows:

$$\varepsilon = \lambda W\varepsilon + u \quad (11)$$

with $E\left[uu'\right] = \sigma I_N$

where λ is a coefficient indicating the extent of spatial correlation between the residuals.

<<Insert Table 5 here>>

The maximum likelihood estimations of SUR models with spatial lag autocorrelation and with spatial error dependence in each equation are displayed in table 5. Surprisingly, the Wald tests on spatial dependence are never significant; there is no significant spatial autocorrelation in any equation. The coefficient of spatial lag autocorrelation is slightly significant and positive only for the first period (*p* value = 0.080), while it is not significant for the second period. The coefficient of spatial error dependence is also slightly significant and negative only for the second period (*p* value = 0.072), while it is not significant for the first period.

Estimations have also been carried out without including regional dummy variables in the model specification. In this case, the results (not reported) show the presence of significant spatial dependence. Thus, we can interpret this evidence as absence of substantive spatial dependence and presence of unobservable latent variables that are spatially correlated (for example, housing prices and many kinds of amenities). By augmenting the regression model with georaphical dichotomous variables, we properly capture the effects of these unobservables and, thus, we are able to 'filtering out' spatial dependence.

Given the absence of (substantive) spatial autocorrelation, it is not surprising that the coefficients associated with the main variables have maintained their sign and significance level discussed in the previous section. The LR test of diagonality still rejects the null assumption of independence of the two equations, thus the SUR specification still appears to be the best specification; the hypothesis of temporal stability of the coefficients can also be rejected (table 6).

<<Insert Table 6 here>>

8 Conclusions

This study has proposed an analysis of the traditional determinants of the net migration rates in Italian provinces – defined as the difference between in-flows and out-flows of migrants from one province, in relation to the resident population – in the period 1991-1995 (when interregional migration flows were still decreasing) and in the period 1996-2000 (when interregional migration flows were increasing).

The results of the econometric analysis carried out through the application of a SUR model showed that in the first period the net migration rates were only weakly or non-significantly influenced by traditional variables such as unemployment rate, level of disposable income and provincial economic base. In the period 1996-2000, the pattern of migration flows seems, on the other hand, to have responded more faithfully to the schemes foreseen by traditional theories in which economic variables have a major role in explaining migration movements. For the second period, a negative and statistically significant effect of the unemployment rate and a positive and significant effect of disposable income and of the provincial industrial economic base were estimated. In both periods, the age structure of the population seems to have played a determinant role.

Certain future developments of this study have to do not only with the econometric methodology but also with the use of more adequate data for analyzing the migration phenomenon. As for the first aspect, it would seem important to verify the role of temporal autocorrelation in conditioning provincial migration flows. Developments in the theoretical literature on migration suggest indeed the use of a dynamic model to verify the hypothesis of persistence of migration flows (see, Nahuis and Parikh, 2002).

The data on net migration rates as a dependent variable do not allow us to isolate the effect of pulling factors from that of pushing factors, especially in the presence of correlation between out-migration and in-migration flows. In the future, it would be useful to verify, through the use of data on gross migration rates, possible distortions generated by the use of data on net migration rates. It would further be useful to gather information on bilateral inter-regional migration flows and use gravitational models, following certain developments in the empirical literature on labor migration (see, for example, Ibarra and Soloaga, 2005).

The distinction of gross migration flows by place of origin, as well as a finer specification of variables of the territorial economic base, will allow us in a future phase of the research, to face a further issue that cannot be analyzed through the model used in this study. We have to be aware indeed that, while the renewal of South-North migration begun in the mid-1990s set in motion a mechanism that improved the data on the economic gap over the short term since it reduced the denominator of Southern per-capita income. Over the long term, the process of out-migration from the South might cause an increase in the development gap between the two geographical areas, as a consequence of the phenomenon of brain drain (i.e. out-migration of more qualified components of the work force).[7]

[7] Reichlin and Rustichini (1998), for example, propose an Arrow-Romer type model to show how the long term effects of migration on wages and productivity differentials between countries (regions) depend crucially on the skill composition of the labour migrants.

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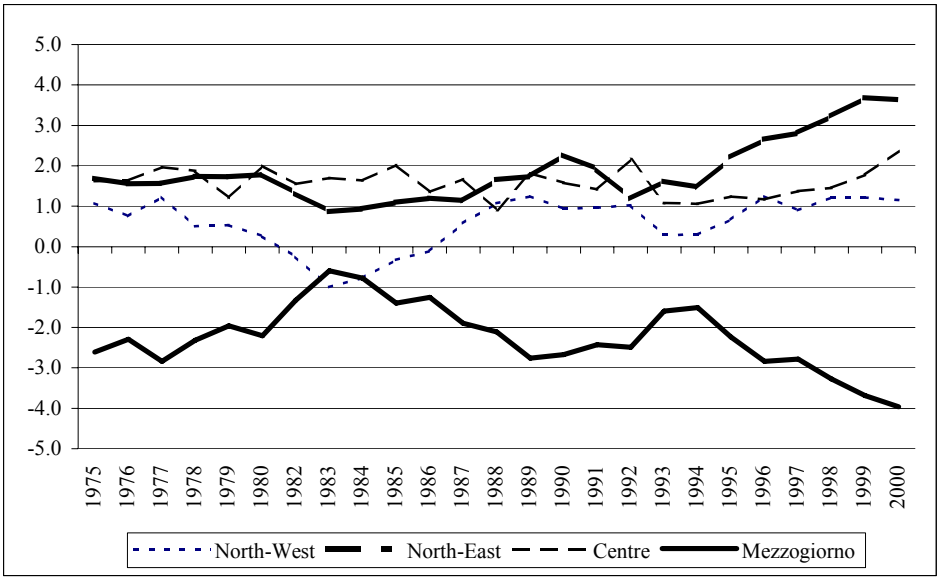

Figure 1 – Interregional migration rates by territorial division: 1975-2000

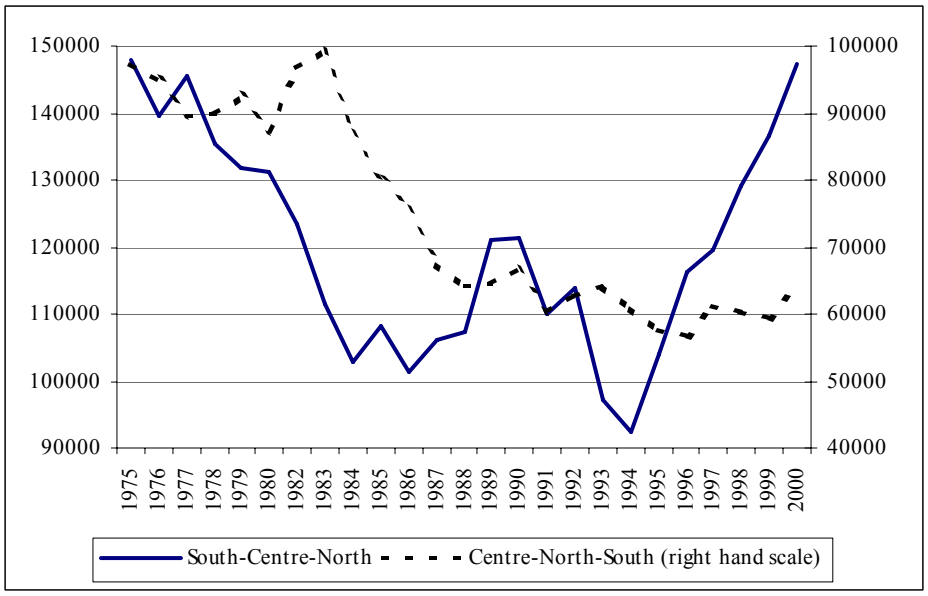

Figure 2 – Number of deregistered for transfer of residence from the South to the Centre-North

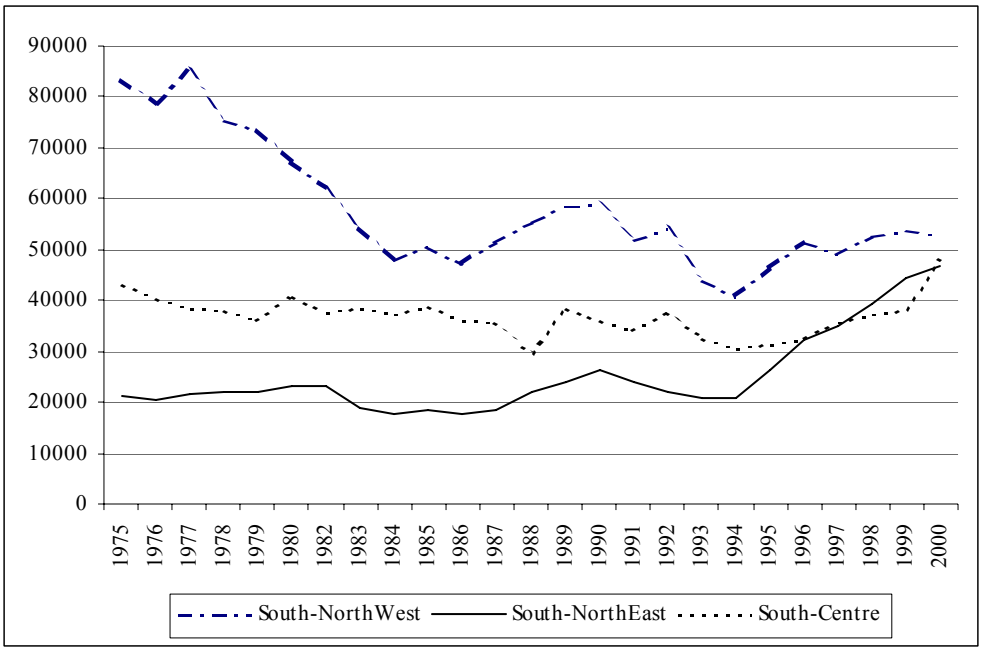

Figure 3 – Number of deregistered for transfer of residence from the South to the North-West, the North East and the Centre

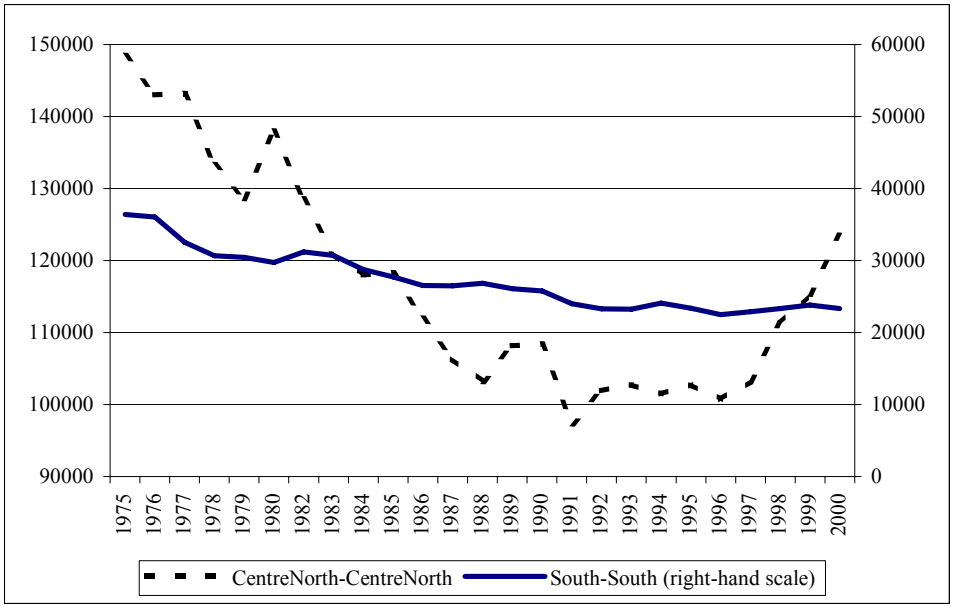

Figure 4 – Number of deregistered for transfer of residence from regions belonging to the same territorial division

Table 1 – Descriptive statistics for the Central-Northern provinces (61)

Variabile	Periodo	Media	Dev. Standard	Min	Max
Migr	1991-1995	0.476	0.227	-0.030	1.030
	1996-2000	0.537	0.244	0.030	1.390
u	1991-1995	6.354	2.862	1.950	15.090
	1996-2000	7.263	3.125	2.60	14.290
inc	1991-1995	14.336	1.492	10.935	18.558
	1996-2000	14.068	1.560	10.384	18.05
ind	1991-1995	18.000	4.880	10.305	27.278
	1996-2000	16.792	4.350	9.443	25.686
15<pop<65	1991-1995	70.170	1.601	66.8	74.2
	1996-2000	69.370	1.643	66.2	73.1
dens	1991-1995	237.323	244.974	35.72	1444.13
	1996-2000	236.709	240.864	36.55	1419.04
cpi	1991-1995	113.163	1.157	111	115
	1996-2000	141.918	3.110	136	153

Table 2 – Descriptive statistics of provinces in the South (34)

Variabile	Periodo	Media	Dev. Standard	Min	Max
Migr	1991-1995	0.016	0.338	-0.500	1.020
	1996-2000	-0.174	0.269	-0.690	0.450
u	1991-1995	18.785	5.860	8.470	32.690
	1996-2000	19.748	6.192	8.770	32.790
inc	1991-1995	9.194	1.047	7.303	12.022
	1996-2000	9.152	0.988	7.486	11.316
ind	1991-1995	13.421	1.874	10.34	19.716
	1996-2000	13.050	1.639	11.049	18.687
15<pop<65	1991-1995	68.055	1.201	65.7	71.2
	1996-2000	67.964	1.504	65.2	72.1
dens	1991-1995	237.069	449.617	39.14	2739.67
	1996-2000	232.918	435.922	38.69	2656.51
cpi	1991-1995	112.205	1.591	109	115
	1996-2000	137.117	4.065	129	143

Table 3

Tabel 3 - SUR model of regression

(p-value in parentesis)

	Modello 1		Modello 2	
	1991-1995	1996-2000	1991-1995	1996-2000
Ln u	**-0.154** **(0.054)**	**-0.199** **(0.001)**	-0.137 (0.101)	**-0.214** **(0.001)**
Ln inc	**0.585** **(0.032)**	**0.870** **(0.000)**	0.536 (0.112)	**0.615** **(0.020)**
Ln ind	-0.108 (0.354)	**0.173** **(0.076)**	-0.066 (0.599)	**0.210** **(0.053)**
Ln 15<pop<65	**-4.210** **(0.002)**	**-2.157** **(0.020)**	**-5.122** **(0.001)**	**-2.264** **(0.069)**
Ln dens	-0.027 (0.465)	-0.002 (0.949)	-0.020 (0.623)	0.004 (0.911)
Ln cpi	1.857 (0.325)	0.568 (0.417)	2.170 (0.263)	0.464 (0.540)
North West	0.164 (0.270)	0.036 (0.750)		
North East	0.073 (0.630)	0.082 (0.475)		
Centre	**0.272** **(0.016)**	**0.230** **(0.009)**		
Piedmont-Valle d'Aosta			**0.523** **(0.030)**	0.189 (0.297)
Lombardy			**0.554** **(0.023)**	0.208 (0.263)
Trentino A:A.			0.228 (0.433)	0.001 (0.997)
Veneto			**0.446** **(0.059)**	0.166 (0.350)
Friuli V.G.			**0.450** **(0.058)**	0.296 (0.099)
Liguria			**0.509** **(0.031)**	0.206 (0.260)
Emilia Romagna			**0.486** **(0.048)**	**0.356** **(0.064)**
Toscany			**0.534** **(0.009)**	**0.331** **(0.040)**
Umbria			**0.725** **(0.002)**	**0.475** **(0.010)**
Marche			**0.486** **(0.030)**	0.284 (0.102)
Lazio			**0.788** **(0.000)**	**0.454** **(0.004)**

Abruzzo			**0.574**	0.259
			(0.003)	(0.090)
Molise			0.283	0.113
			(0.173)	(0.507)
Campania			0.259	0.091
			(0.154)	(0.567)
Puglia			0.125	-0.041
			(0.473)	(0.772)
Calabria			-0.049	-0.083
			(0.793)	(0.592)
Sicily			**0.410**	0.033
			(0.014)	(0.809)
Sardinia			**0.491**	0.166
			(0.006)	(0.263)
Constant	8.585	4.352	10.566	5.736
	(0.413)	(0.401)	(0.368)	(0.377)
Correlation among residuals of the two equations	0.653		0.611	
Independence test of Breuch-Pagan (χ_1)	40.5		35.4	
	(0.000)		(0.000)	
R^2	0.536	0.810	0.678	0.850

Table 4 - F-Test on the temporal stability of SUR model coefficients

(p-values in parenthesis)

Ln u	**5.42 (0.000)**
Ln inc	**4.73 (0.000)**
Ln ind	**5.12 (0.000)**
Ln 15<pop<65	**2.24 (0.085)**
Ln dens	0.68 (0.509)
Ln cpi	0.61 (0.435)

Table 5 - SUR Spatial lag and Spatial error models

(p-values in parenthesis)

	Spatial lag model		Spatial error model	
	1991-1995	1996-2000	1991-1995	1996-2000
ρ	0.220 (0.085)	0.004 (0.967)		
λ			0.244 (0.148)	-0.350 (0.070)
Ln u	**-0.142** **(0.077)**	**-0.201** **(0.001)**	**-0.168** **(0.040)**	**-0.242** **(0.000)**
Ln inc	**0.456** **(0.092)**	**0.877** **(0.000)**	**0.621** **(0.024)**	**0.875** **(0.000)**
Ln ind	-0.086 (0.459)	**0.172** **(0.079)**	-0.129 (0.271)	0.109 (0.250)
Ln 15<pop<65	**-4.160** **(0.002)**	**-2.239** **(0.016)**	**-4.527** **(0.001)**	**-3.378** **(0.001)**
Ln dens	-0.026 (0.470)	-0.001 (0.977)	-0.021 (0.571)	0.013 (0.592)
Ln cpi	2.334 (0.215)	0.500 (0.478)	2.067 (0.271)	0.626 (0.365)
North West	0.131 (0.374)	0.035 (0.753)	0.143 (0.340)	0.009 (0.943)
North East	0.058 (0.704)	0.082 (0.478)	0.051 (0.740)	0.068 (0.618)
Centre	**0.200** **(0.073)**	**0.229** **(0.009)**	**0.259** **(0.023)**	**0.209** **(0.005)**
Constant	6.287 (0.547)	5.028 (0.334)	8.913 (0.393)	-2.968 (0.539)
Correlation among residuals of the two equations	0.642		0.643	
Independence test of Breuch-Pagan (χ_1)	39.1 (0.000)		39.2 (0.000)	
Wald test on spatial dependence	3.270 (0.195)		2.125 (0.180)	
R^2	0.439	0.811	0.536	0.876

Table 6 - F-Test on the temporal stability of the coefficients in the SUR Spatial lag and Spatial error models

(p-values in parenthesis)

	Spatial lag	**Spatial error**
Ln u	**5.77 (0.000)**	**6.86 (0.000)**
Ln inc	**4.75 (0.004)**	**6.41 (0.000)**
Ln ind	**4.56 (0.001)**	**6.93 (0.000)**
Ln 15<pop<65	**2.23 (0.087)**	**5.57 (0.001)**
Ln dens	1.00 (0.370)	1.06 (0.348)
Ln cpi	1.24 (0.267)	0.75 (0.378)

Appendix: definition of variables

1) m_i Migration balance (registrations - deregistrations) / resident population (Source: ISTAT). 1991-1995 and 1996-2000.

2) $u_{i,t-T}$ unemployment rate (Source: ISTAT, Labor force survey). 1991 and 1996.

3) $inc_{i,t-T}$ Per capita disposable income (Source: Istituto Guglielmo Tagliacarne). 1991 and 1996.

4) $ind_{i,t-T}$ Industry share in the whole provincial economy (local units) (Source: ISTAT). 1991 and 1996.

5) $dens_{i,t-T}$ Population density (resident population/km^2). 1991 and 1996.

6) $(15 < pop < 65)_{i,t-T}$ Working age population share (Source: ISTAT). 1991 and 1996.

7) $cpi_{i,t-T}$ Consumer price index of workers' and employees' families (Source: ISTAT). 1991 and 1996.