

Italians' and Foreigners' Internal Mobility in Italy: an Application of Gravitational Models

Un'applicazione dei modelli gravitazionali alla mobilità interna degli stranieri e degli italiani

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Abstract: In Italy, between 1995 and 2005, the changes of residence between Italian municipalities increased of nearly 19%. Simultaneously, the contribution of the foreign population to internal migrations reached the level of 14%. Structural factors and a greater propensity to mobility may partly explain the foreign population's contribution to internal mobility. This work aims at assessing the structural characteristics of internal migrations of the foreign and the Italian population. Besides the classical measures, we adopt a gravitational model which allows to quantify the effects on internal mobility due to the dimension of the populations in the areas of origin and destination and the distance between macro-areas. The estimates obtained for the years 1995, 2000 and 2005, clearly highlights the different behaviours of Italians and foreigners and a different evolution of phenomenon.

Keywords: migration, internal mobility, gravitational model, foreigners

1 Introduction

Internal mobility in Italy, after periods of both stagnation and of intense growth, and of different directions and actors showed a marked increase also thanks to the contribution of the foreigners residing in Italy (Bonifazi, 2009). In the last years, in fact, international immigration seems to have affected greatly the nature and features of internal mobility. The increase of the number of foreign residents, their greater propensity to move within the country, and structural factors such as the greater incidence of foreigners within the younger age-groups, may only partly explain these changes. In the nineties, an upturn of internal mobility in Italy is observed, following the phase of stagnation characterizing the previous decade; particularly, since 1995 it may be noticed that the number of registered changes of residence has been increased consistently, notwithstanding the abrupt drop in 2001 (fig. 1).

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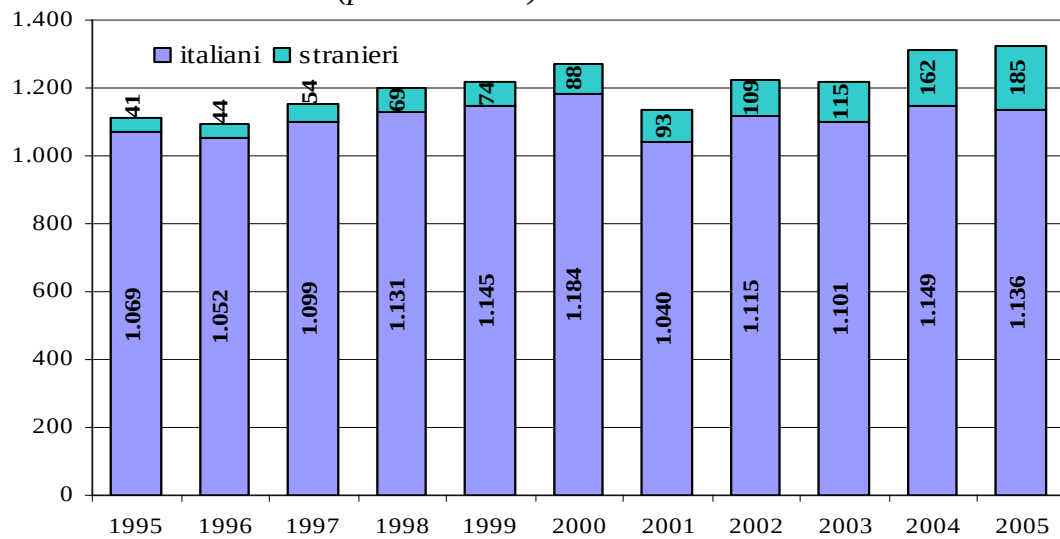
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Figure 1: Changes of residence between Italian Municipalities, by citizenship. Italy 1995-2005. Absolute values (per thousands).



Source: ISTAT

Thus, and as already stated, the foreign component is acquiring an always greater role: the changes of residence between Italian municipalities of foreign citizens were 41 thousands in 1995, nearly 88 thousands in 2000, to reach 185 thousands in 2005. The contribution is so relevant that in the last year, the increase is almost entirely attributable to the foreign component.

The behaviour of the foreign population differs from that of the Italian population: foreigners show a greater propensity to move within the country and different migratory routes. The aim of this study is to analyse similarities and differences in the internal mobility of Italians and foreigners, focusing on the intensity of the flows, the concentration level of enrolments and cancellations, respectively by area of origin and destination (par. 3), and lastly on the role played by populations and distances (par. 4).

2 Data and methods

The mostly used source to study internal mobility is the data from the population register on changes of residence, which allows the knowledge of individual movements. Besides the municipality of provenience and that of destination, the *anagrafe* collects some other individual features (f.e. date and place of birth, sex and citizenship). The data source is nearly exhaustive, although not immune from errors (Cassata, 2005).

In the study of internal mobility, the territorial unit of reference gains relevance: the flows are those between (and not within) the territorial areas, whose definition is thus a necessary premise for defining and quantifying the phenomenon. The need is achieving a compromise between the loss of information and the easiness of interpreting results (beside that of applying the method).

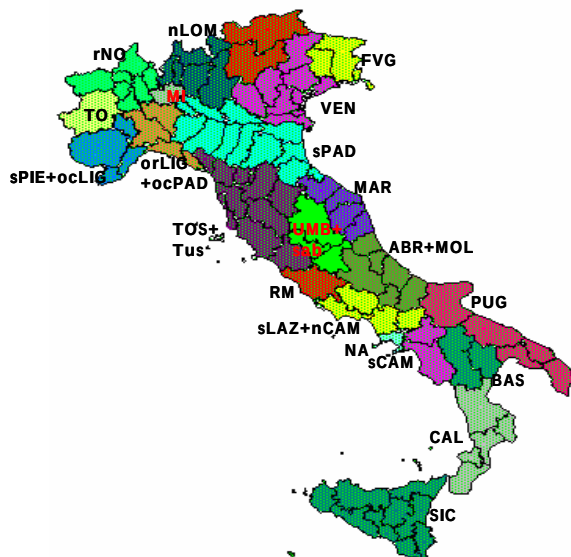
For this purpose, the Italian territory has been divided in 22 areas (excluding Sardinia, due to its particular features with respect to mobility phenomena) which represent a synthesis between the will of considering the 4 provinces with more than 1 million of inhabitants

and that of defining area which are significant from a geographical point of view and often, but not always, coinciding with the regions (tab. 1 and fig. 2).

Table 1: *Provinces and regions by macro-areas*

Abbreviation	Macro Area	Provinces/regions included
TO	Torino	Provincia di Torino
rNO	Resto Nord Ovest	Aosta, Verbano, Biella, Vercelli, Novara, Varese
sPIE+ocLIG	Piemonte meridionale e Liguria occidentale	Imperia, Cuneo, Savona, Asti
orLIG+ocPAD	Liguria orientale e Padania Occidentale	Genova, La Spezia, Alessandria, Pavia
MI	Milano	Provincia di Milano
nLOM	Lombardia Settentrionale	Sondrio, Como, Lecco, Bergamo, Brescia
TAA	Trentino Alto Adige	Regione Trentino
VEN	Veneto	Regione Veneto
FVG	Friuli Venezia Giulia	Regione Friuli
sPAD	Padania meridionale	Lodi, Cremona, Mantova, Regione EmiliaRomagna
TOS+Tus	Toscana e Tuscia	Regione Toscana, provincia di Viterbo
UMB+sab	Umbria e Sabina	Regione Umbria e provincia di Rieti
MAR	Marche	Regione Marche
RM	Roma	Provincia di Roma
ABR+MOL	Abruzzo e Molise	Regione Abruzzo e Regione Molise
sLAZ +nCAM	Lazio meridionale e Campania settentrionale	Frosinone, Latina, Caserta, Benevento
NA	Napoli	Provincia di Napoli
sCAM	Campania meridionale	Salerno, Avellino
BAS	Basilicata	Regione Basilicata
PUG	Puglia	Regione Puglia
CAL	Calabria	Regione Calabria
SIC	Sicilia	Regione Sicilia

Figure 2: Macroareas for the analysis of internal migrations



Firstly we present a descriptive analysis of internal mobility among the macro-areas, distinguishing between the behaviour of Italian and foreign population, highlighting their similarities and differences. We estimated the immigration (total number of enrolments in the macro-area over the total amount of resident population of reference)

and emigration (total number of cancellations in the macro-area over the total amount of resident population of reference) rates. We computed rates separately for Italians and Foreigners. We made a simultaneous analysis of the rates, for the years considered – 1995, 2000, 2005 using a scatter chart diagram. The analysis allowed the distinction between areas with prevailing attractive or repulsive potential and the distinct role played by the macro-areas for the Italian and the foreign population; this interpretation was also supported by the analysis of net migratory rates (net migratory balance in absolute value of the macro-area divided by the total amount of resident population of reference).

Subsequently, we used a gravitational model to the migratory flows among macro-areas, always considering separately Italians and foreigners and again with respect to the three mentioned years to account for the phenomenon's temporal evolution. The model is inspired by the Newtonian principle of universal gravitation: according to the physical theory of gravity it considers the migratory flows between two zones, as directly proportional to the product of the masses (attractive or repulsive) and inversely proportional to the distance (or to a function of the distance) between the two areas. The 'gravitational model', widely used in the empirical analyses of the flows of goods and services, particularly within the field of international trade, provided satisfying results even in studies concerning migratory flows (see for instance: Casacchia and Tagliarini, 2000; Lamonica and Zagaglia, 2008).

The classic formulation of the gravitational model is as follows:

$$F_{ij} = \beta_0 \frac{P_i^{\beta_1} \cdot P_j^{\beta_2}}{d_{ij}^{\beta_3}} \quad (1)$$

where F_{ij} is the migratory flow between the macro-areas i and j , P_i e P_j are the population masses respectively in the two macro-areas i and j of origin and destination, whereas d_{ij} is a measure of the distance between them.

The gravitational model with *multiplicative errors* is then specified as follow:

$$F_{ij} = \beta_0 \frac{P_i^{\beta_1} \cdot P_j^{\beta_2}}{d_{ij}^{\beta_3}} \varepsilon_{ij} \quad (2)$$

Considering the natural logarithm of both members of the equation, a linear model is:

$$\ln F_{ij} = \ln \beta_0 + \beta_1 \ln P_i + \beta_2 \ln P_j - \beta_3 \ln d_{ij} + \ln \varepsilon_{ij} \quad \text{or}$$

$$\ln F_{ij} = \ln \beta_0 + \beta_1 \ln P_i + \beta_2 \ln P_j - \beta_3 \ln d_{ij} + \varepsilon_{ij} \quad (3)$$

which may be easily estimated with ordinary least squares method (OLS). It is well known that the estimate of the parameter of a linearized model present several disadvantages widely debated within the existing literature: one among the most relevant – the impossibility of the logarithmic transformation when flows are null – did not represent a major problem in this work. We computed the distance between macro-areas as distance between their barycentre, adopting two different definition of centre

for each area (geographical centre and median centre weighted with the population) and two distinct definitions of distance (triangular and spherical).

3 Mobility between macro-areas: descriptive findings

The mobility between the considered macro-areas concerned in 1995 more than 320 thousands movements as for the Italians, and around 15 thousands for the foreign population. The mobility increased in absolute value to reach in 2000 the value of 378 and 31 thousands movements respectively for the Italian and foreign population; also the relative incidence of this typology of internal movements increased slightly (+1.8 for Italians and +0.7 for foreigners). Comparing the figures of 2005 and 2000, it may be observed that the movements between macro areas decrease both in absolute and relative terms among the Italian population, whereas the only decrease in relative terms among the foreigners. The decrease observed in the percentages of this typology of movements over the entire considered period is more consistent within the foreign population: -7.1 percent between 1995 and 2005 compared to the -0.3 percent for the Italian population (tab. 2). In this respect, it should be considered that part of the foreign population has been now resident in Italy for a long time, thus it is highly likely that, as the process of stabilization goes on, the foreign population is assuming mobility behaviours which resemble to those of the autochthones, characterized by the tendency to shorter distance movements (Istat, 2009).

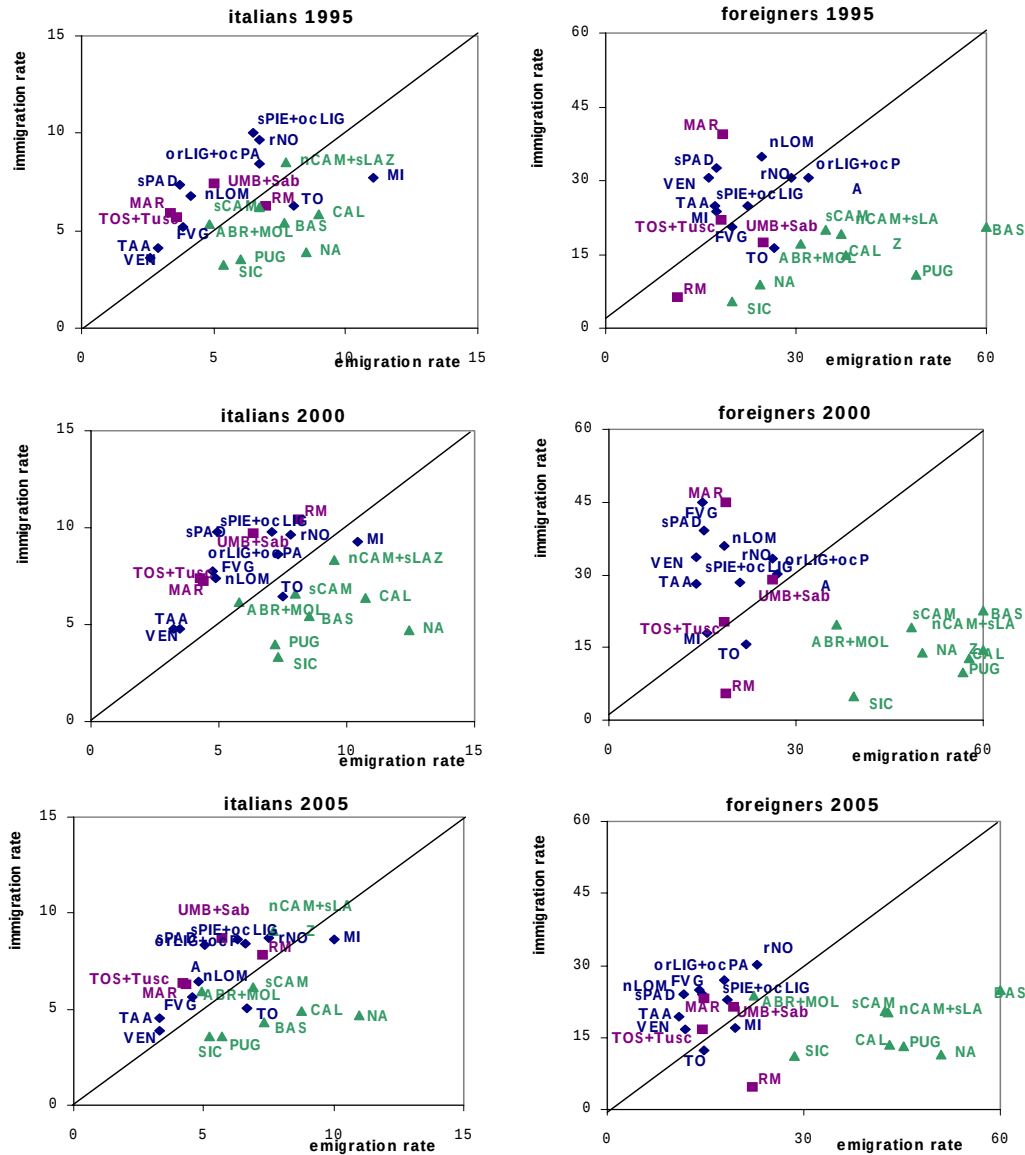
Table 2: *Population movement between macro-areas, by citizenship. Absolute values and percentages over total number of movements.*

<i>year</i>	<i>Italians</i>		<i>Foreigners</i>	
	<i>a.v.</i>	<i>%</i>	<i>a.v.</i>	<i>%</i>
1995	320.761	30,0	14.494	35,0
2000	377.009	31,8	31.436	35,7
2005	337.560	29,7	51.743	27,9

The foreign populations, as it could have been easily hypothesised, register higher mobility rates compared to those of the Italians: these populations are definitely more mobile, not only since Italians – excluding the time of the great emigration – are characterized by a generally low mobility, deeply tied to their families, homes and territories, but also because the foreigners are conversely less constrained and show structural characteristics favouring mobility, such as the prevalence of younger generations more frequently inclined to movements. Emigration rates are for the Italians at levels below 10‰, with the only exception of Milan, in the three years considered, of Calabria since 2000, e of Naples only in the last year; with regards to the foreign population values around 10‰ are observed in 2005 for some attractive areas in the North, whereas generally levels are higher reaching up to 60‰. In 2000, the Southern areas lost more foreign population compared to 1995, but the tendency does not seem to accentuate between 2000 and 2005. Analogous considerations may be pronounced on levels and trends of immigration rates. The scatter diagram of the two indicators, as shown in figure 3, highlights a marked Centre-North/South divide for both populations for the three years considered: the Central and northern areas show in fact features of attractiveness, with immigration rates higher than emigration rates (above the diagonal),

whereas the Southern areas lose population, above all of foreign citizenship, and are not able to attract (in this respect, be aware that we are always talking about internal movements).

Figure 3: Immigration and emigration rates by macroarea. Italian and foreign population. Years 1995, 2000, 2005



The provinces with more than 1 million of inhabitants, hereby considered as separate areas, deserve a particular attention. The province of Torino, historically characterized by features of attractiveness because of its industrial development, is no longer destination of Italian internal mobility, showing, in fact, low immigration and emigration rates with regard to both the Italian and - even to a greater extent - the foreign population. The province of Milan presents higher rates compared to Torino and, although not representing an attractive pole for the Italian population, still constitutes an area able to provide occupational and social chances for the foreign population, as shown by the immigration rates, close to 15%, and higher than the emigration rate, up to 2000, with only a moderate inversion of tendency in 2005. The

Rome province, which always played a major role as to internal mobility and immigration, faces in 1995 a loss of population, to a great extent of foreign citizenship, but also italians, and this feature of repulsiveness is confirmed for the following years only with regrads to the foreign population. The province of Naples, as expected, is characterized as one of the most repulsive areas, with emigration rates consistently higher also for the foreign population and particularly in the last two considered years (2000 e 2005); in 1995 the rate had lower values (below 30‰ and 10‰, respectively for foreigners and italians) and, above all, lower than the Campania region and the other southern zones (fig. 3).

4 Application of the gravitational model: the results

The application of the gravitational model consents to verify whether the flows between two macro-areas are directly proportional to the population “masses” of the areas of origin and destination and inversely proportional to the distance between the two areas in exam. The assumption is thus that the migration flows are more intense if the distance between the two areas is shorter and the two populations have larger size. The gravitational model was estimated after applying the logarithmic transformation (see formula 3) separately for Italians and foreigners per each considered year, using the specific resident population. The results from the models application, presented in table 3, show that the hypotheses well correspond to the mobility between macro-areas for both Italians and foreigners, particularly for 2005: the index of determination nearly reaches 70%. The value of β_0 , representing an estimate of the mean number of movements per head, is much higher for foreigners, confirming their higher propensity to mobility highlighted by the descriptive analysis. The attractive and repulsive potential of the two populations (that of the zone of destination and origin) are substantially similar and positive, thus verifying the assumption that the larger the population (absolute number of residents) the greater the flow between the two areas, whereas the effect of distance is slightly more moderate and of opposite sign – the larger the distance, the smaller the flow – because a lager distance imply more difficulties in moving.

Table 3: *Coefficient estimates and index of determination R^2 for the explanatory variables of the log-normal gravitational model, by citizenship (Italians and foreigners). Years 1995, 2000, 2005*

YEAR	POP.	$\ln \beta_0$	β_1	β_2	β_3	R^2
1995	ITALIAN	-21,5	1,09	1,02	-0,45	0,62
1995	FOREIGN	-7,8	0,57	0,91	-0,71	0,61
2000	ITALIAN	-22,4	1,10	1,07	-0,41	0,61
2000	FOREIGN	-9,1	0,54	0,96	-0,57	0,58
2005	ITALIAN	-24,0	1,12	1,12	-0,46	0,66
2005	FOREIGN	- 9,1	0,49	0,96	-0,59	0,68

The effect of distance does not vary, the effect of the other parameters being equal, depending on the adoption of the two distinct definitions (triangular or spherical), in accordance with the existing literature (Poulain, 1981). Comparing the results from the various models, we observe that the effect of the two populations seems more important

for the Italians than for the foreign population, whereas the distance effect results more pronounced for foreigners, although the difference narrows in the most recent year; conversely, in the same year, the difference due to the size of the population in the area of origin becomes more relevant.

5 Conclusions and final considerations

The descriptive analysis and the application of the model clearly show that the mobility of the Italian and the foreign population present remarkable differences, whose features and peculiarities deserve to be thoroughly examined. The gravitational model in its most elementary formulation allowed to highlight that the three macro variables constitute an important not negligible component in the study of the migratory phenomenon; on the other hand, however, it also proved the importance of adding further elements to achieve a better and more complete interpretation of the phenomenon itself. Specifically, the evolution of the phenomenon over time, too difficult to be caught by an observation based upon three years only, although of great relevance; thus, it stresses the need to extend the analysis to a greater number of years. Furthermore, future developments of the research will aim on the one hand at considering variables which express the sizes of the population of the areas of attraction and expulsion differing from the sole population of reference (the Italian one for the flows of the Italian population, the foreign one for the foreigners' flows) such as the total population (without distinction by citizenship); on the other hand at performing analysis of the model's residuals, which is of great relevance as it may reveal the existence of attraction -or barrier- effects between the macro-areas composing the specific territorial level adopted by the research.

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