Determinants of different internal migration trends: the Italian experience

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January 2010

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December 2009

Abstract

This paper investigates the determinants of interregional migration in Italy for the period 1985-2006, during which different migration trends took place. In so doing, in addition to the traditional variables of Harris and Todaro model, the impact of housing prices and externalities variables were studied. Our results, using a dynamic panel GMM, show that the H-T model, due to the complexity of the internal migration process, omits some important economic and non-economic variables and may not be representative of migration flow in Italy. Furthermore, our analysis confirms our intuition that for different periods we have to take into account different determinants.

1. Introduction

Since the end of the Second World War interregional migration flows in Italy have been characterized by three main trends. The 1950s and 1960s experienced very intense, persistent migration flows, mainly from rural to urban areas and from South to North. From the early 1970s internal migration markedly declined, a trend which persisted till the mid 1990s. Internal migration flows started to grow again after the mid 1990s, with a significant flow of migrants form southern to northern regions.

The pioneering contributions to the economic literature of Todaro (1969) and Harris and Todaro (1970), considered one of the starting points of classical migration theory, identified the major factors behind migration in the real wage differentials and the probability of finding a job. Indeed, during the 1990s, the debate about regional development disparities focused on an evident contradiction: falling migration in the presence of a substantial increase in regional differentials in terms of unemployment rates and real per capita income, the so-called "empirical puzzle" (Faini *et al.*, 1997).

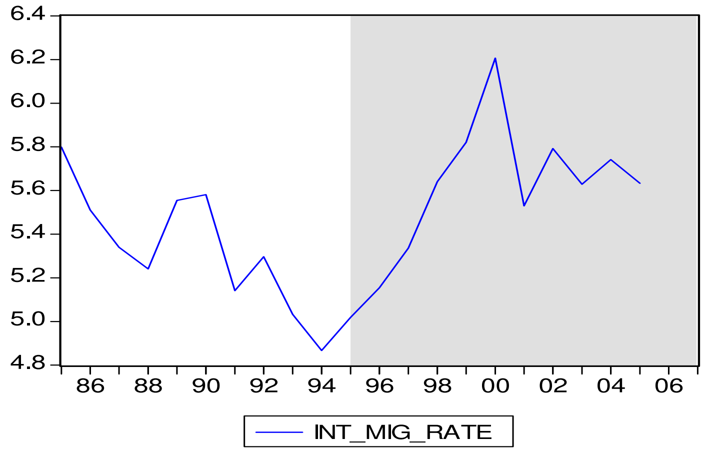
In view of the above changes in the traditional patterns of interregional migration, the aim of this paper is to investigate the role of other important factors ignored by traditional economic models in explaining the different trends experienced by Italy in the last two decades. A simple description of Italian internal migration flow during the period under analysis (1985-2006) is shown in Figure 1, which presents interregional migration rates for the whole sample[1]. The rate in question falls in the first decade (1985-1995) and then starts to grow again.

In this study, we modify the standard H-T model to include monetary and non-monetary costs involved when people move from one region to another. First, we argue that the regional differences in housing prices could play a very important role in explaining the falling trend of migration. As suggested by Cannari *et al.* (2000) "the cost of housing is likely to represent an important disincentive to move and to a considerable extent it accounts for the puzzling evidence of falling mobility levels in Italy. … Therefore, in order to avoid that a substantial cost of living effect is omitted, house price differentials should be explicitly considered"[2].

[1] $\textit{Internal Migration Rate} = \dfrac{\sum \text{Inflows}_t = \sum \textit{Outflows}_t}{\textit{Total Population}_t} * 1000$

[2] Cannari et al. (2000) (pp. 1899-1900)

Figure 1



In this paper we use a new indicator of house prices in Italy characterized by broad geographical and temporal coverage. It is calculated by Zollino, Muzzicato and Sabbatini (2008) from the Bank of Italy. They use data taken from the *Il Consulente immobiliare* (CI) which reports highly detailed data for Italy, carrying out twice-yearly surveys of the average prices of sales made in a set of cities that includes all the provincial capitals and approximately 1,400 other municipalities. The new index is based on a method that has been amply revised compared with previous formulations and covers a period from 1980 to 2007. The same data from the CI were used by Cannari, Nucci and Sestito (2000) who construct a time-varying measure of housing price differentials between the two macro-areas of Italy (South and North) for a large time span (1965-1995).

In a second step, as Greenwood (1985) suggests, we take into account non-economic variables that may be partially reflected in the migration choice: population density, environmental conditions and crimes.

We address these issues using a dynamic panel "diff. GMM" estimation by Arellano and Bond (1991)[3], with data originating from the Italian National Institute of Statistics (ISTAT) and Istituto Guglielmo Tagliacarne from 1985 to 2006. In order to explain the different migration trends within Italy in the last two decades, in the estimation we first use the complete sample periods and then we estimate the same model for two sub-periods from 1985 to 1995 and from 1995 to 2006 in order to compare the two periods and seek an answer to our main question: have there been substantially different responses of the determinants of internal migration in Italy during the past two decades?

First of all, our results show that traditional H-T model is unable to explain the complexity of the internal migration process in Italy. Omission of some major economic and non-economic variables does not allow the traditional model to be representative of migration flow. Secondly, our analysis confirms our intuition that for different periods we have to take different determinants into account.
This work is organized as follows: section two gives a synopsis of the research that has been conducted on the impacts of different determinants on interregional migration in Italy and in other countries. Section three illustrates the theoretical framework of internal migration. Furthermore, we also modify the standard H-T model to include monetary and non-monetary *cost* involved in moving from one region to another. Section four presents the empirical analysis. We recall the main data sources available in Italy. We also describe the method used for our analysis and the empirical results. Section five points out the implications of our findings and suggests a possible agenda for future research.

2. Literature review

Migration in general can be defined as the movement (temporary or permanent) of individuals or groups of people, both internal and international, from one area to another for various reasons ranging from better expectations of finding a job to persecution. Despite the fact that migration is an intrinsically human process, theories about migration are quite new. For the sake of simplicity we consider briefly the macro migration theories that explain migration as part of economic development, as well as some contributions related to the aim of this study.
The first migration models used the physical concept of gravity and explained migration as a function of the size of the origin and destination population, predicting it to be inversely related to distance. In the 1950s migration theory moved on to more sophisticated theories. Lewis (1954) introduced analysis of migration flows in dual-economy models in which migration occurs as a result of difference in the supply and demand of labour between the rural and urban sector. The new orthodoxy is due mainly to Todaro (1969) and Harris-Todaro (1970) (hereafter H-T) whose models provided a widely accepted theoretical framework for explaining internal and international migration as well as urban unemployment in many less developed countries. They showed that it can be perfectly rational to migrate, despite urban unemployment, due to a positive expected income differential. This model is based on perfect expectations and while the implication of

[3] Dynamic panel GMM techniques were developed to offer instrumental-variable estimates in settings featuring

income differentials is undisputable in labour migration decisions, it is probably not as extreme as Harris and Todaro depict it.

Stark *et al.* (1991) showed that when the migration choice is made by agents with asymmetric information, it could lead to the opposite migration flow to that based on wages differentials.

The subsequent H-T models of the 1970/80s augment these models to account for some empirical observations and to make the models specific to migration. Hence migration is not completely risk-free, because the migrant does not necessarily get a job upon arrival in the destination area. Therefore migration takes place on condition that the expected real income differential is positive. Expected income is a function of rigid wages and the destination employment rate.

Since in this work we focus on internal migration in Italy, it is worth pointing out the main contributions to the empirical literature. Italian migration can be analysed as intercontinental outflows until the end of the second world war; continental outflows, from the 1950s till the end of the '70s; for most of the previous period migration in Italy was also characterized by internal South-North flows; the 1980s and the '90s showed an inflow trend mostly from north African countries with a relative slowdown of internal migration; finally, data from the late 1990s until now have shown a recovery of interregional migration[4].

The slow-down in internal migration in Italy during the 1980s along with its demographic and socio-economic characteristics has been amply analysed by Bonifazi (1992, 1999), Bonifazi and Heins (1999, 2000 and 2001), Bonifazi and Cantalini (1998) and Termote *et al* (1992). Faini *et al.* (1997) studied why, despite the increasing regional unemployment differentials, internal migration in Italy failed to start, the so-called "empirical puzzle". Their analysis concluded that the weak drive of migration in the presence of large and increasing differentials in unemployment was mainly due to the ineffective Italian labour market and high mobility costs.

Daveri and Faini (1999) studied migration decisions taken by risk-averse households using aggregate data from the regions of southern Italy. They found that risk is a significant determinant of the decision to migrate. It also emerged from their results that real wages had a negative effect on internal migration while unemployment rate did not affect it at all.

The determinants of net migration rates in the Italian provinces in the period when the internal migration flows were still in the declining phase (1991-1995) and the period when the internal migration flows increased (1996-2000) were analysed by Basile and Causi (2005) using an SUR model. The results showed that in the first period, net migration was only weakly or negligibly

endogenous regressors, based on relatively weak assumptions on the underlying data-generating process.

influenced by classical variables such as unemployment and income. In the second period, however, migration behaviour appears more consistent with the traditional theories in which economic variables play a crucial role in explaining internal migration. Indeed, the same authors found a statistically significant negative effect of the unemployment rate and a positive and significant effect of income. In both periods the age structure of the population seems to have played an important role.

Etzo (2008), using panel data analysis on gross migration flows between regions, investigated the role of macroeconomic determinants during the period 1996-2002. The study differentiated between origin and destination regions, investigating the role played by the same explanatory variable in the two groups of regions. The empirical results show that income is the main economic determinant and its strong effect is consistent when it performs both as a push and as an attractive factor.

Moreover, another important variable in explaining the determinants of internal migration is the unemployment rate. Indeed, despite the lack of unambiguous empirical results on the last migration trend in Italy, it seems quite reasonable to think that it was the persistence and strengthening of differentials in unemployment rates that determined the new internal migratory flows.

Despite the relatively scant literature on internal migration in Italy, this process and its pattern has been studied in some detail in the former USSR republics (the Czech Republic, Slovakia, Russia, Poland, Hungary, Slovenia, Romania, Estonia, Latvia and Lithuania)[5]. Fridmuc (2002) investigated the patterns of interregional migration in the Czech and Slovak Republics, showing that unemployment rates and average real wages have significant effects on net migration in Slovakia but not in the Czech Republic. According to Hazans (2003), Estonia, Latvia and Lithuania experience real and persistent regional disparities. Unemployment and wages differentials are found to be significant in explaining the pattern of gross and net migration. Using data for 41 counties on migration flows over a period from 1990-1995 in Romania, Kallai and Traistaru (1998) concluded that regional disparities remained stable in Romania during 1990 and 1995 and that inter-regional migration flows are not correlated with regional unemployment rates. Constantin, Parlog, Goschin (2003) provide a detailed analysis of Romanian counties over the period 1990-2000, showing that the economic disparities between richer and poorer regions increased during the transition.

[4] For a more detailed description of different migration trends in Italy see A. Venturini (2001).

[5] See Andrienko and Guriev (2004), Fidrmuc (2003), Fidrmuc and Huber (2002), Huber (2003), Kallai (2003) and Hazans (2003).

3. A theoretical framework of internal migration

The theoretical framework that we use to explain the motivations for people to move from one region to another follows Harris and Todaro (1970), whose work is considered one of the starting points of the classical migration theory. Being rational and risk-neutral, individuals will migrate if the expected income they would obtain by staying in their home region (*i*) is smaller than that to be earned in another region (*j*), taking into account the monetary and non-monetary cost of moving (Sjaastad,1962).

Follow H-T the main factors behind migration can be identified in real wage gaps and the probability of finding a job. Let Π be the probability of employment in the home region sector at the real wage W_j, let W_i be the real income received if the migrant is unemployed, *C* the direct cost of migration, and *r* the migrants' discount rate. Individuals decide to migrate by comparing the expected income from migration with the future income from remaining in the home (rural) region. Migration continues until the destination region expected income

$$E_{ij} = \int_0^\infty [\Pi W_j] e^{-rt} dt - C = \frac{1}{r}\Pi W_j - C \tag{3.1}$$

and home region expected income

$$E_{ij} = \int_0^\infty W_i e^{-rt} dt = \frac{1}{r} W_i \tag{3.2}$$

are equal:

$$\frac{1}{r}\Pi W_j - C = \frac{1}{r} W_i \tag{3.3}$$

Under conditions of uncertainty, the probability of finding a job in the destination region in all periods is defined as the ratio between employed workers in the host region and the active population size of the destination region after migration takes place, that is $L_j + MN_i$ where *M* represents the origin-destination migration rate and N_i represents the home region population size[6].

$$\Pi = \frac{L_j}{N_j} = \frac{\overline{L}_j}{\overline{L}_j + M\overline{N}_i} \qquad (3.4)$$

This assumes that migrants compete on equal terms with the current employed population of the destination region . Hence, when *M* rises, Π falls and migration goes on until (3.3) is satisfied. Taking into account Π, equation (3.4) gives us the equilibrium value of the migration rate.

$$M^* = [\frac{(W_j - W_i) - rC}{rC + W_i}]\frac{\overline{L}_j}{\overline{N}_i} \qquad (3.5)$$

From (3.5) we can derive the comparative static results:

$$\frac{\partial M^*}{\partial W_j} > 0\,;\; \frac{\partial M^*}{\partial W_i} < 0\,;\; \frac{\partial M^*}{\partial \overline{L}_j} > 0\,,\; \frac{\partial M^*}{\partial C} < 0 \qquad (3.6)$$

From equation (3.6) any marginal increase in the wage of the destination region (W_j) or a decrease in the home region's wage (W_i) will boost interregional migration; any policy that implements job opportunities, hence raising the number of employed workers, will increase migration[7]. Any increase in the cost of migration will decrease migration to the host regions.

Since the H-T model overlooks the role of some important factors in explaining current regional migration, we modified the standard H-T model to include monetary and non-monetary *cost* involved when moving from one region to another. In doing so, we focused first on the impact of housing price on the decision to migrate. Second, as suggested by Greenwood (1985), we took into account amenities that may be partially reflected in labour (income) and land (housing price)

[6] It may be stated that $N_i = \overline{N}_i$ and $L_j = \overline{L}_j$ if we assume that M is fairly small with respect to N_i and thus is not influenced by the origin region's population size, and L_j is determined by exogenous factors independent of migration.

[7] As predicted by the H-T model, a policy that creates more job opportunities in advanced regions, increasing migration, may increase urban unemployment.

market: population density[8], environmental conditions and crime.

Let $Ph_{i(j)}$ be the house price, $Pd_{i(j)}$ the population density, $Co2_{i(j)}$ the carbon dioxide emissions and $Cri_{i(j)}$ the juvenile delinquency. All the variables refer respectively to the origin and destination region. The cost of moving (C_{ij}) from the origin to the destination region depends on these variables:

$$C_{ij} = C(Ph_{i(j)}, Pd_{i(j)}, Co2_{i(j)}, Cri_{i(j)}) \tag{3.7}$$

Taking (3.7) into account we can rewrite (3.3) as follows:

$$\frac{1}{r}\Pi W_j - C_{ij} = \frac{1}{r}W_i \tag{3.8}$$

where Π is given by (3.4). The equilibrium migration rate is:

$$M^* = [\frac{(W_j - W_i) - rC(Ph_{i(j)}, Pd_{i(j)}, Co2_{i(j)}, Cri_{i(j)})}{rC(Ph_{i(j)}, Pd_{i(j)}, Co2_{i(j)}, Cri_{i(j)}) + W_i}]\frac{\overline{L}_j}{\overline{\overline{N}}_i} \tag{3.9}$$

The cost of moving from one region *i* to another *j* has a negative impact on the migration rate. As the housing price in the destination region is undoubtedly one such cost, an increase in this cost should have a negative impact on the decision to move. The effect of esternalities like population density and carbon dioxide emissions is, instead, ambiguous because both could be a consequence of agglomeration and economic growth, attracting people. From this point of view, they could have a positive impact on migration rate, being considered as a benefit and not as a cost of moving. Crime should have a negative impact on the decision to move.

In order to test the validity of this model for the Italian case, various specifications of equation (3.9) are estimated in the next section.

4. Empirical analysis

[8] Population density can be used as a particularly effective proxy of agglomeration in cities. Agglomeration creates

The study of the determinants of internal migration presents several challenges. First, in addition to income and unemployment, variables that could be considered may well be omitted. For example, expectations of future economic growth, employment opportunities and positive externalities might attract migrants to specific areas.

We start from the baseline model that tests the H-T (1972) hypothesis of net internal migration flow depending on wages differentials and unemployment variables. We treat the interregional migration baseline model as follows:

$$M_{i,t} = f(W_{i,t}, U_{i,t}),\ f_W > 0,\ f_U < 0 \qquad (4.1)$$

According to the theoretical assumptions and the above-discussed model, migration will increase when the wages differential between two regions increases, $f_W \succ 0$, and will decrease when the unemployment rates differential increases, that is $f_U \prec 0$.

For our empirical study we extend the baseline model, including housing prices and externalities and specifying net internal migration flows with panel data as follows:

$$M_{i,t} = \alpha + \alpha_{1,i} M_{i,t-1} + \alpha_{2,i} W_{i,t} + \alpha_{3,i} U_{i,t} + \alpha_{4,i} H_{i,t} + \alpha_{5,i} D_{i,t} + \alpha_{6,i} A1_{i,t} + \alpha_{7,i} A2_{i,t} + \varepsilon_{i,t} \qquad (4.2)$$

where $M_{i,t}$ is the net migration flow (outflows – inflows) of region *i* with respect to the region's population. *W*, *U* and *H* are the relative wages, unemployment rate and house prices defined as the log of the ratio between each variable and the average of the same variable at the national level. $D_{i,t}$, $A1_{i,t}$ and $A2_{i,t}$ are population density, carbon dioxide emissions (C02) and juvenile delinquency, respectively.

In this work, due to difficulties in collecting consistent regional data on wages, we use per capita regional income as a proxy. $\varepsilon_{i,t}$ is the stationary error with zero mean and finite variance and $i = 1,....,N$ and $t=1,....,T$.

We use three sample periods:

- case 1: 1985-2006;

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technological and knowledge spillovers in generating economic growth, thus attracting people (Glaeser et al, 1992).

- case 2: 1985-1995;
- case 3: 1995-2006.

These three sample cases start and end in different years. We employ these cases to examine whether our empirical results are robust to the chosen sample periods and to previous empirical results concerning interregional migration in Italy.

Several econometric problems may arise from estimating equation (4.2). First of all, the explanatory variables are assumed to be endogenous. Because causality may run in both directions – from the determinant's variables to migration and vice versa – these regressors may be correlated with the error term. Second, time-invariant regional characteristics such as geography and demographics, may be correlated with the explanatory variables. Third, the presence of the lagged dependent variable $M_{i,t-1}$ gives rise to autocorrelation. Fourth, the panel dataset has the dimension ($N = T = 20$) when we consider the whole period, while with sub-samples it has a shorter time dimension ($T = 10$) and a larger region dimension ($N = 20$).

To overcome these problems, panel data analysis allows us to study the dynamic nature of the migration decisions at the regional level. We use the Arellano–Bond (1991) difference GMM estimator first proposed by Holtz-Eakin, Newey and Rosen (1988). For panels with a limited number of years and a greater number of observations, Arellano and Bond (1991) suggest estimating equation (4.2) in first differences[9] and using all lags of the level of variables from the second lag as instruments.

We apply the Arellano and Bond (1991) one-step GMM estimator for our dynamic model which allows for heteroskedasticity across regions[10]. Concerning the instruments, we report the Sargan statistic, which tests the over-identifying restrictions. In addition, we also report the Wald statistics.

4.1 Data description

This data set, mainly derived from the Italian Statistics Institute (ISTAT), covers the 20 regions of Italy spanning the period 1980–2007. The externalities are obtained from the Istituto Tagliacarne. Each explanatory variable is measured in logarithms.

In line with previous empirical work, our main focus is on wages and unemployment as traditional

[9] Using first differences eliminates the specific region effect, thus avoiding any correlation problem between unobservable region specific characteristics and explanatory variables.

variables. In addition, we consider the housing prices variable and three non-economic variables, namely population density, juvenile crime and carbon dioxide emissions. Housing prices and non-economic variables appear *a priori* as variables that could greatly influence the motivation of migration. It is thus useful to ascertain whether they have an influence on inter-regional migration.

Definitions of variables and descriptive statistics of the explanatory variables are provided respectively in Table 1 and 2.

[table 1 about here]

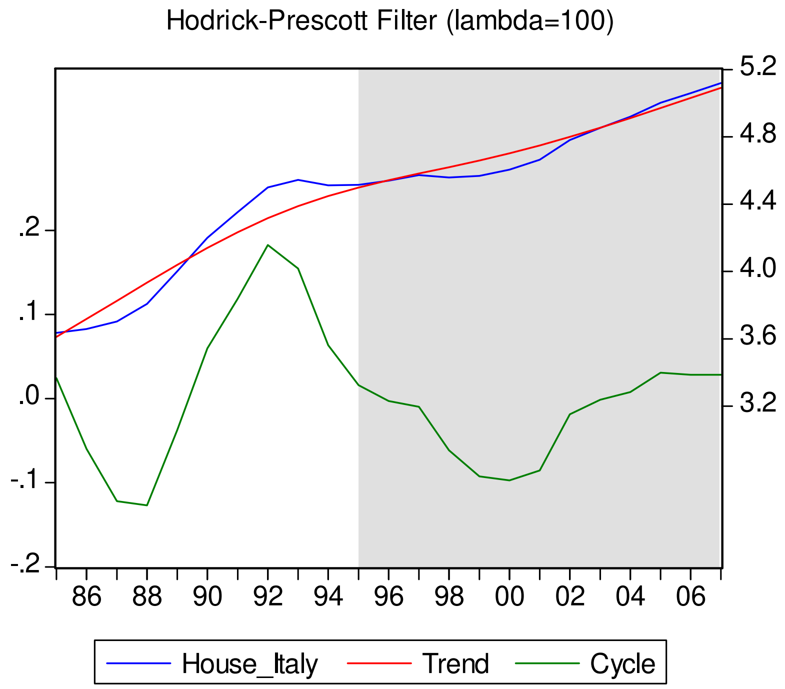
[table 2 about here]

Our sample regions contain 460 observations. It should be noted that the dispersion across regions is much higher for migration than for the other traditional and "social variables" (the coefficient of variation for migration is 9.25 while for all the other variables it is below one).

A simple graphical analysis of the performance of the new indicator of house prices obtained by Zollino *et al* (2008) allows us to identify two real estate market cycles in Italy as is shown in Figure 2. Looking at the first cycle it is clear that after a gradual downward trend of prices in 1985, prices then increased sharply, reaching their peak in 1992. The second cycle, beginning at the end of 1992, is still under way. House prices declined in Italy until the end of 1999 and the fall was considerably smaller than the drop recorded in the same phase of the first period. Zollino *et al* (2008) noted that the acceleration recorded around 2002 coincided with a sharp drop in share prices, which shifted investment into the housing market. This acceleration was more pronounced in cities and large towns.

Figure 2

[10] Several studies have reported that two-step (optional GMM) standard errors are biased downwards in small samples and recommend using a one-step estimator (Windmeijer, 1998)



4.2 Empirical results

In this section, we present the estimation results of equation (4.2) for our three cases. The first specification for the whole sample (1985-2006) (Table 3, model 1) does not take account of the housing market and externalities. The coefficients of the explanatory variables have the correct signs and are highly significant, confirming the traditional theory. Adding house prices and population density to model 1, the former is statistically not significant while all the other variables including population density are significant at different levels (Table 3, model 2).

[table 3 about here]

Since we assume that housing prices could be useful to explain migration, we regress model 2 adding lags of the three main explanatory variables. The results show that even with this specification, house prices do not seem to respond to the above assumption when we consider the entire sample.

However, recent empirical literature has shown (for the period 1985-1995) a decline in internal migration even against a substantial increase in regional differentials in terms of unemployment rates and real per capita GDP. After this period, there was an increase in migration in the presence of a substantial increase in regional differentials of fundamentals like wages and unemployment (Faini *et al.*, 1997, Cannari *et al.*, 2000 and Fachin, 2007).

Since our whole sample goes from 1985 to 2006, it may be divided into two subsamples that can better describe the behaviour of migration in Italy. In light of this, table 4 presents the results of models 1 and 3 for the sub-period 1985-1995[11].

According to the results of the baseline model for the period 1985-1995, the conventional variables are weak in explaining the migration flows: the wage differential coefficient is positive but not significant even with a lag; the unemployment variable is highly significant at level with the correct sign, while with a lag it is not significant and with the wrong sign.

[table 4 about here]

Looking at model 1 for the first decade, it seems that there could be other economic and social variables that could better capture migration flow within Italian regions. As we asserted above, regional differences in house prices could play an important role in explaining the falling trend of migration in this decade, constituting a considerable cost of living effect that could have been omitted.

Model 3 in table 4 takes into account the house price differentials and population density. As in model 1, the conventional variables substantially do not change their sign or significance levels. However, the housing variable is highly significant both at level and with a lag. Interestingly, current house prices and lagged house prices may have different effects on migration flows. The current variable reflects an immediate effect, while the lagged variable reflects a more cumulative effect. The density variable coefficient is not significant but positive, implying that the agglomeration could create technological and knowledge spillovers in generating economic growth and thus attract people.

Differences in wages do not exert influence on internal migration. An increase in wages differential relative to national average wages does not seem to describe the migration pattern

[11] Model 1 in table 2 was estimated using lagged variables as in table 1 model 3. However, for the lagged variables used (W and U), the estimates were not statistically significant and were dropped.

well. These results could help explain falling internal migration in Italy in that period against a substantial increase in regional differentials in terms of unemployment rates and real per capita income, the so-called “empirical puzzle”. Model 3 seems to confirm our intuition of the need to include monetary and non-monetary *cost* involved when moving from one region to another.

The final step of our empirical analysis focuses on the role of the determinants of internal migration in the period 1995-2006. In this step we replicate the estimates made in the previous period, still emphasizing the role of the housing market. Furthermore, we verify whether adding two new social variables (carbon dioxide emissions and juvenile delinquency) can better capture migration flows between regions. Unfortunately, due to a lack of the social variables data for the first decade, we can use them only for the second period.

Table 5 model 1 shows the results for the second period for the baseline model. The conventional variables in this subsample have a strong influence on internal migration flow. Indeed, all the coefficients have the correct sign and are significant at different levels.

Model 3 shows ambiguous results. On the one hand, the wage differential is confirmed as an important determinant of internal migration in this period with a correct sign. On the other, unemployment, house price differentials and population density are not significant although with the correct sign. There are two possible explanations for the unemployment result: first, many workers might emigrate not only because of a job contract but also due to other reasons not linked to seeking employment; secondly, unemployment differentials were uniformly distributed across regions in that period, making region *i* no worse off than regions *j*. The house price differential does not appear to lie behind interregional migration in Italy, not exerting any impact on it. However, in the previous results (1985-1995) the same variable showed a more powerful influence on the dependent variable. This could be due to the different house price trends in the two decades shown in figure 2. In the first decade, the housing market could have played a major role as there was a sharp rise in prices, while in the second period it became negligible in explaining regional migration probably because house prices first declined and then started to accelerate but less sharply than in the first period.

As regards the population density variable we found that it does not affect migration flows. However, it is worth pointing out that while it is not significant in either subsample, it affects migration for the period from 1985 to 2006. A possible explanation could be that this variable changes very slowly over time, which is why its effect may only be considerable in the long run.

Thus, we opted to estimate model 3 again but with an important change. Model 4 (table 5) allows us to analyse the influence of two non-economic variables, namely carbon dioxide emissions (C02) and juvenile delinquency.

[table 5 about here]

The results obtained for model 4 do not change the significance of the conventional variable and for housing prices. However, the crime variable is significant and with the correct sign. The CO2 variable is statistically significant with a positive sign. Despite the fact that carbon dioxide emissions should be seen as a cost for health and a disincentive to migrate, it is highly correlated with urban agglomeration which creates spillovers in generating economic growth. The crime variable is significant with a negative sign, meaning that individuals tend not to migrate to regions with high crime levels. These results make it clear that region-specific externalities do matter.

5. Conclusion

In this paper we sought to capture the effects of new determinants of internal migration in Italy being added to the traditional H-T model. The aim was to explain the different trends that characterized migration flows in the period 1985-1995 and in the subsequent decade, 1995-2006, even in the presence of a substantial increase in regional differentials in terms of unemployment rates and real per capita income in both decades.

In addition to GDP per capita (used as a proxy for wages) and unemployment differentials, the impact of house prices and externalities like population density, carbon dioxide emissions and juvenile delinquency were studied. Our main results can be summarized as follows. In the decade with falling migration, an increase in wages differentials vis-à-vis national average wages fails to accurately describe the migration pattern, thereby confirming the existence of the empirical puzzle. We also found that differentials in house prices affected the migration flow in this particular period, supporting the need to take into account other important factors omitted by traditional models. Moreover, in the second decade the wage differential was found to be an important determinant of internal migration. On the other hand, unemployment and housing price differentials seemed to lose their power to explain migration from one region to another. Population density does not affect the migration flows in each subsample, although it affects migration for the period from 1985 to 2006. The crime variable has a negative effect on migration, as expected. Carbon dioxide emissions have a positive impact and help explain inter-regional movements. Despite the theoretical ambiguity of the impact of some externalities, like carbon dioxide emissions and population density on internal migration, our results showed that they are considered more as benefits than costs: they may be viewed as particularly effective proxies for agglomeration in cities.

The main implications of these findings are the following. First of all, the simple H-T model is unable to explain the complexity of the inter-regional migration process in Italy. The lack of some important economic and non-economic variables does not allow the traditional model to be representative of the migration pattern. Second, for different periods different determinants have to be taken into account. Our results make it easier to understand why finding a logical explanation for internal migration in Italy is likely to remain difficult. On the agenda for future research is the analysis of migration flows based on macro areas, which could shed light on the effective role of variables like housing and externalities as determinants of migration.

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Appendix

Table 1 - Definition of dependent and explanatory variables

Variable	Description (source)
M_i	Net migration flow (outflows – inflows) of a region "i" with respect to the population of the same region (source ISTAT)
W_i	log of the ratio between per capita GDP of the region "i" and the average per capita GDP at the national level (source ISTAT)
U_i	log of the ratio between unemployment rate of the region "i" and the average unemployment rate at the national level (source ISTAT)
H_i	log of the ratio between house prices index of the region "i" and the Italian housing prices index (source Zollino et al, 2008)
D_i	Log of population density defined as the ratio between the population and size of the region "i"
A1	juvenile delinquency index (%) (excluded thefts) (Total number of minors reported for every type of crime excluding theft on the total number of minors reported) (source Tagliacarne)
A2	carbon dioxide emissions (source Tagliacarne)

Table 2 - Summary Statistics

Variables	**Mean**	**Maximum**	**Region with Max.**	**Minimum**	**Region with Min.**	**Std. Dev.**	**Coeff. of Variation**
M	0.0259486	0.655195	Valle d'Aosta	-0.604449	Calabria	0.2400883	9.252457
W	15736.54	28959.25	Emilia Romagna	4369.457	Calabria	6177.038	0.392528
U	10.58489	26.8	Calabria	2.5	Abruzzi	5.576241	0.526811
H	92.26963	197	Lazio	29.8	Trentino A.A.	35.83689	0.388393
D	176.9444	430.7507	Campania	34.84953	Valle d'Aosta	105.443	0.59591
A1	2.120833	6.48	Valle d'Aosta	1.35	Sardinia	0.699144	0.329655
A2	60.75889	90.5	Molise	6	Valle d'Aosta	10.71869	0.176414

Table 3 Panel eq. (4.2) - Diff. GMM 1985-2006

Section 1, coefficient estimates	*Baseline Model*	*Baseline+ H+D*	*Baseline+ H+D with lags*
Model	**1**	**2**	**3**
M_{t-1}	0.520558**	0.5011592**	0.5029675**
	(0.000)	*(0.000)*	*(0.000)*
W	0.330773**	0.4469815**	0.0762912
	(0.010)	*(0.000)*	*(0.741)*
W_{t-1}			0.426816 ♦
			(0.076)
U	-0.083839**	-0.077585**	-0.1178866 **
	(0.000)	*(0.000)*	*(0.000)*
U_{t-1}			0.0556521 ♦
			(0.063)
H		0.0504165	0.1069118
		(0.215)	*(0.145)*
H_{t-1}			-0.0617679
			(0.389)
D		1.079798*	1.031876 ♦
		(0.060)	*(0.076)*
Section2 Diagnostics:			
Sarg-test	*316.2851*	*343.7414*	*333.3644*
	[0.3454]	*[0.5090]*	*[0.6208]*
AB-test (AR1)	*-9.705*	*-9.7982*	*-10.377*
	[0.000]	*[0.000]*	*[0.000]*
AB-test (AR2)	*0.73827*	*0.9119*	*1.2417*
	[0.4604]	*[0.3618]*	*[0.2143]*
Wald	*227.55* $\chi^2(3)$	*268.41* $\chi^2(5)$	*272.20* $\chi^2(8)$
	[0.000]	*[0.000]*	*[0.000]*

z –statistics probability in brackets; ♦significant at the 0.10 level;
*significant at the 0.05 level; **significant at the 0.01 level ;
Sarg = Sargan test of overidentifying restrictions;
AB-test = Arellano-Bond test for zero autocorrelation in first-differenced errors
*Obs. (*yearly) = 380

Table 4 Panel eq. (4.2)- Diff. GMM 1985-1995

Section 1, coefficient estimates		
	Baseline Model	*Baseline+ H+H_{t-1}+D*
Model	**1**	**3**
M_{t-1}	0.1663976** *(0.029)*	0.101882 *(0.164)*
W	0.2772216 *(0.457)*	0.3864668 *(0.199)*
W_{t-1}	0.0559672 *(0.890)*	
U	-0.1344107** *(0.006)*	-0.1390601** *(0.000)*
U_{t-1}	0.0105105 *(0.815)*	
H		0.2746395** *(0.004)*
H_{t-1}		-0.2264171** *(0.010)*
D		1.066506 *(0.141)*
Section2 Diagnostics:		
Sarg-test	*150.7902* *[0.1258]*	*156.3284* *[0.2279]*
AB-test (AR1)	*-7.4216* *[0.000]*	*-7.1144* *[0.000]*
AB-test (AR2)	*0.10692* *[0.9149]*	*0.76725* *[0.4429]*
Wald	*31.20* $\chi^2(5)$ *[0.000]*	*46.78* $\chi^2(6)$ *[0.000]*

z –statistics probability in brackets; ♦significant at the 0.10 level;
*significant at the 0.05 level; **significant at the 0.01 level ;
Sarg = Sargan test of overidentifying restrictions;
AB-test = Arellano-Bond test for zero autocorrelation in first-differenced errors
*Obs. (*yearly) = 180

Table 5 Panel eq. (4.2) - Diff. GMM 1995-2006

Section 1, coefficient estimates	*Baseline Model*	*Baseline+ $H+H_{t-1}+D$*	*Baseline+ $H+H_{t-1}+D+A$*
Model	**1**	**3**	**4**
M_{t-1}	0.5941106** *(0.000)*	0.5832321** *(0.000)*	0.4682828** *(0.000)*
W	0.3832051** *(0.007)*	0.4425904** *(0.002)*	0.6165261** *(0.002)*
U	-0.0393301♦ *(0.073)*	-0.0355782 *(0.113)*	-0.0166681 *(0.631)*
H		-0.0722889 *(0.457)*	-0.1869238 *(0.148)*
H_{t-1}		-0.003556 *(0.965)*	0.0632788 *(0.538)*
D		1.219575 *(0.119)*	1.066506 *(0.141)*
A1(crime)			-0.0012321* *(0.009)*
A2(Co2)			0.0283364* *(0.008)*
Section2 Diagnostics:			
Sarg-test	*242.9509* *[0.1092]*	*239.2216* *[0.1139]*	*151.6757* *[0.1280]*
AB-test (AR1)	*-6.0572* *[0.000]*	*-6.0627* *[0.000]*	*-4.4727* *[0.000]*
AB-test (AR2)	*0.31042* *[0.7562]*	*0.32355* *[0.7463]*	*0.51014* *[0.6100]*
Wald	*202.14* $\chi^2(3)$ *[0.000]*	*205.89* $\chi^2(6)$ *[0.000]*	*99.98* $\chi^2(7)$ *[0.000]*

z –statistics probability in brackets; ♦significant at the 0.10 level;
*significant at the 0.05 level; **significant at the 0.01 level ;
Sarg = Sargan test of overidentifying restrictions;
AB-test = Arellano-Bond test for zero autocorrelation in first-differenced errors
*Obs. (*yearly) = 180