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Summary

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Keywords: Italy, Labour Migration, Internal Migration, Income Differences, Panel Cointegration

JEL Classification: C23, J61, R23

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Internal migration across Italian regions: macroeconomic determinants and accommodating potential for a dualistic economy.

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Abstract. We provide econometric evidence that relative per capita GDP and relative unemployment rates are the main determinants of migration flows across Italian regions from 1970 to 2002. The empirical analysis is based on an accurate study of the dynamic properties of the series. In fact, we deal with the issues of non-stationarity and co-integration and estimate an error correction model in which both the short- and long-run dynamics are modelled at once. The regional unemployment rate is robustly inversely related with net regional migration rate, while per capita GDP is strongly positively linked with it. As far as the accommodating potential of internal migration to regional unbalances, we have detected very little room for such a role. Indeed, the degree of labour mobility across Italian regions cannot be active as an effective equilibrating mechanism.

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1. Introduction.

A well known fact about Italian economy is its regional dualism between the wealthy Centre-northern regions and the less developed Southern ones (the *Mezzogiorno*). After WWII millions of workers moved from the backward Southern and, at that time, North-eastern regions towards the Central and North-western ones.[1] Such a phenomenon has been of paramount importance in recent Italian economic history because thanks to it, during the sixties of the last century, Italy experienced the so-called *miracolo economico* (economic miracle) that, in little more than a decade, enabled the country to become one of the most industrialised of the world. During the late seventies and up to the middle of the eighties an empirical puzzle (Faini *et Al.*, 1997) was the growing unemployment differentials along with the falling of internal migration. Among the many factors that have been put forward to explain it, market imperfections and labour mismatch (Attanasio and Padoa-Schioppa, 1991) and insensitiveness of Southern wages to the local labour market conditions (Brunello *et Al.*, 2001) are the most frequently cited. However, in the very recent years, various studies (SVIMEZ, 2006; Piras, 2006), have pointed out that starting from the middle of the nineties of last century a new wave of interregional migration flows has been recorded.

In order to study internal migration across Italian regions, we follow the recent macroeconomic empirical literature on migration and test what role it has been played by relative per capita GDP and relative unemployment rates differentials. However, differently from almost all existing literature, notable exceptions are Hatton (1995), Brücker and Schröder (2007) and Fachin (2007), we deeply investigate the dynamic characteristics of the series and study migration inside a cointegration framework.

As far as we know, Salvatore (1977) is the first to study internal migration across Italian regions. He analyses migration flows from the *Mezzogiorno* as a whole and from each one of the Southern regions to both the North-western and the Northern regions during the 1958-1974 time period. His main result is that regions with relatively high unemployment rates have relatively high out-migration rates. Attanasio and Padoa-Schioppa (1991) study migration flows across six macro regions from 1960 to 1986 and estimate an empirical model in which net migration is explained by local and national wages both in public and private sector, by local and national male unemployment and

[1] Italy has a long history of international migration as well. Del Boca and Venturini (2005) report that during the 1861-1976 time period more than 26 million people, mostly low-skilled people, left the country. Becker *et Al.* (2004) document that during the nineties of last century Italian international migration has been characterized by an increased proportion of highly-qualified individuals among migrants.

by housing prices. Though mixed, their results suggest that “housing prices, public sector real wages and, to a lesser extent, private sector real wages and unemployment differentials” (p. 286) are important factors in shaping internal migration. Brunello *et Al*. (2001) estimate migration outflows from each of the eight Southern regions to the rest of the country from 1970 to 1993. Their reported evidence is “that the rapid increase both of relative wages and of social transfers per head during the 1970s and the 1980s has significantly reduced migration flows, more than compensating the opposite effect on migration of higher regional unemployment” (p. 23).

More recently, other papers that share our macroeconomic approach have been published. Furceri (2006) retrieves the data on interregional migration as population changes plus deaths minus births, thus including also external migration from each region with the rest of the world. His aim is to ascertain whether net migration responds to GDP regional cyclical components, and he find that indeed this is the case during the period from 1985 to 2001. Basile and Causi (2007) use provincial data and estimate separately two periods: 1991-1995, when migration flows were decreasing; 1996-2000, characterised by an increase of internal migration. These authors find that during the first period the effect of economic variables on net migration flows were negligible or nil, on the contrary during the second period they reacted more promptly to them. Fachin (2007) concentrates his analysis on male migration during the period from 1970 to 1996. He considers seven macro-areas (North-West, North-East/Alps, North-East/Po Valley, Centre, Lazio, South-East and South-West) and studies emigration from the two Southern towards the remaining five macro-areas of the country. Etzo (2008) applies a gravity model to bilateral migration flows across Italian regions to find that per capita GDP has played a strong role in both sending and receiving regions, whereas the effect of unemployment on regional migration appear to be stronger in the sending regions than in receiving ones. Finally, according to Mocetti and Porello (2010) in the 1995-2005 time period migration flows from the *Mezzogiorno* are driven from better employment prospects in Central-northern regions. In addition, they claim that the recent upsurge of internal migration has also been affected by less favourable job opportunities in the public sector that, traditionally, in the South has been very important in offering job opportunities.

Both Salvatore (1977) and Attanasio and Padoa-Schioppa (1991) apply OLS estimators, Brunello *et Al*. (2001) utilise an instrumental variables estimator. Furceri (2006) exploits three different estimation methods: OLS, fixed effect and Arellano-Bond

(1991), whereas Basile and Causi (2007) use an iterative feasible GLS estimator as well as two spatial linear regression models. Finally, both Etzo (2008) and Mocetti and Porello (2010) apply panel data methods: fixed effects with vector decomposition the former, standard fixed effects the latter.

A crucial weakness of all these works is that none of them takes the issue of non-stationarity of the data into account. Contrary to them in this paper a thorough investigation of the dynamic characteristic of the series is carried out in order to investigate the long-run macroeconomic determinants of internal migration. In spite of the burgeoning of both theoretical and empirical literature on migration in the recent years, it is surprising that very few works have dealt with the issues of non-stationarity and cointegration. Notable exceptions are Brücker and Schröder (2007) and the aforementioned works of Hatton (1995) and Fachin (2007). According to Hatton (1995) there exists a long-run relationship between the migration *rate* and the explanatory variables of equation (1). In other words these variables have to be cointegrated and preliminary to any estimation, a carefully analysis of their statistical properties must be carried out. More recently, Brücker and Schröder (2007) develop a migration model with heterogeneous agents in which the equilibrium relationship comes out between income differentials and migration *stocks*. Differently from Fachin (2007), in our paper the time span is longer, the analysis is done at regional rather than at macro-areas level and for the migration rate defined with respect to the whole population, not just for the males. Furthermore, we also explore what role can be played by internal migration as an adjustment mechanism to economic and social unbalances in an economy, such as the Italian one, in which a strong dualism is still present. Labour migration is a powerful mechanism of adjustment to economic and social unbalances: a region that experiences low income and a high unemployment levels looses population which is pushed towards those regions with more favourable economic conditions in the labour markets. We find that, although interregional migration flows react to regional unbalances, the size of such a reaction is quite small as regards per capita GDP and almost negligible as for unemployment.

The paper is organised as follows. In Section 2 we give a brief exposition of the empirical approach to migration given in the economic literature. In Section 3 we illustrate the data while in Section 4 we discuss our empirical methodology and present our results. In Section 5 we simulate the potential role of internal migration in reducing regional disparities. Finally, Section 6 concludes.

2. Theories of migration and empirical specification.

In the economic literature the starting point in modelling migration is the assumption that people migrate to enhance their economic well-being measured by expected income which, in turn, depends on wages, the (un)employment rate and other welfare benefits that might be available to migrants. In addition, other push and pull factors related to location-specific amenities may affect the migration decisions.

Many contributions to the recent literature start from the Harris and Todaro (1970) model of intersectoral migration. In this set up people migrate from the rural (agricultural) sector to the urban (manufacturing) sector taking into account expected income, which, in turns, is defined by the wage rate times the probability of finding a job. As pointed out by Pissarides and McMaster (1990) an implicit assumption of the Harris and Todaro approach is that individuals are risk-neutral and that they are not quantity constrained. Since these conditions in practise are not satisfied, Pissarides and McMaster (1990) claim that both relative wages and unemployment differentials should enter separately into the model specification and in empirical estimates on migration decisions. Hatton (1995) presents a microeconomic founded model in order to explain the probability for an individual to migrate. He models this probability taking into account the difference between the expected utility of staying in the home country versus the alternative of moving to a foreign country. The model also accounts for the probability of finding a job and for the migration costs. Pedersen *et Al.* (2004) present empirical evidence on international migration on the bases of a theoretical model proposed by Zavodny (1997) in which individuals choose their location maximising a utility function which depends on location-specific amenities, individual characteristics and previous location. Among the location-specific amenities, a key role is played by average earnings and unemployment rates.

Introducing some notation, a very general macroeconomic migration function can be written as:

$$m_{ij} = F\left(Y_i, Y_j, U_i, U_j, \mathbf{Z}_i, \mathbf{Z}_j\right), \qquad (1)$$

where migration from country/region i to country/region j, m_{ij}, is explained by per capita incomes, Y_i and Y_j, and unemployment rates U_i and U_j, in both countries/regions and by other push and pull factors $\mathbf{Z}_i$ and $\mathbf{Z}_j$. Usually, migration flows are specified as migration *rates*, namely as the ratio of migrants to resident population either in the sending or in the receiving country/region. Following Hatton (1995), the standard approach in the recent empirical literature on migration across countries or regions (Coulombe, 2006; Alvarez-Plata *et Al.*, 2004; Andrienko and Guriev, 2004; Alecke *et Al.*, 2001; Puhani, 2001) imposes a logarithmic or, more frequently, a semi-logarithmic form to equation (1). The semi-logarithmic specification is particular useful when estimating net migration flows, since in such a case the dependent variable can assume negative values and the logarithmic approach is precluded. In addition, if one assumes that the push and pull factors captured by $\mathbf{Z}_i$ and $\mathbf{Z}_j$ do not change significantly over time, then they can be modelled as constants specific to each region.

[Figure 1]

Equation (1) must be adapted to the case of Italy (see Figure 1)where the flow of migrants has almost always been unidirectional from Southern regions (Abruzzo, Molise, Puglia, Campania, Basilicata, Calabria, Sicilia and Sardegna) towards Centre-northern ones (Piemonte, Valle d'Aosta, Lombardia, Liguria, Trentino Alto Adige, Friuli Venezia Giulia, Veneto, Emilia Romagna, Marche, Toscana, Umbria and Lazio) and, as argued by Bentolila and Dolado (1991), in such a situation, from a macroeconomic perspective, it does not make a difference whether net rather than gross migration rate is used. From the viewpoint of other disciplinary methods, the use of net migration has sometimes been criticised (Rogers, 1990) since, among other things, it does not capture the relative levels of in- and out-flows and cannot be used for rates in a probabilistic sense. Yet, as claimed by Smith and Swanson (1998), it could be very useful in many other circumstances in that, for instance, it provides a summary measure of one component of population change. Moreover, whenever the concern for the migration impact is on labour markets, the spotlight of many migration studies on net migration is a sound and reasonable choice. Therefore, following the standard macroeconomic approach as outlined above, we study internal migration flows across the 20 Italian regions from 1970 to 2002 assuming the following long-run relationship holds:

$$m_{iITAt} = \alpha_0 + \alpha_1 \ln\left(\frac{Y_{it}}{Y_{ITAt}}\right) + \alpha_2 \ln\left(\frac{U_{it}}{U_{ITAt}}\right) + \mu_i + \varepsilon_{it} \qquad (2)$$

where $m_{iITAt} = \dfrac{(\text{inflows} - \text{outflows})_{iITAt}}{pop_{it}}$ is the net migration rate of region i with respect to all other regions as a percentage of the sending region's population, $\left(Y_{it}/Y_{ITAt}\right)$ is region's i per capita GDP relative to national average, (U_{it}/U_{ITAt}) measures region's i unemployment rate relative to nationwide unemployment rate, α_0 is a constant, μ_i are regional effects and ε_{it} is an additive error term. Because of the direct and indirect transportation migration costs, a typical component usually taken into account in applied research on migration is the distance between countries or regions. As can be seen, in our empirical approach we use the relative values of regional per capita income and unemployment rates with respect to nationwide averages on the right-hand side, thus such a component is precluded in the present analysis. Nonetheless, some issues on spatial dependence will be discussed in the empirical section. Analogously, we cannot take into account the past periods stock of individuals who migrated as a proxy for network effects, given that the regional migration rate is defined with respect to all other regions. By using per capita GDP and unemployment in relative terms, we establish a link from a source region to all other regions, overcoming the need to introduce a bilateral comparison of these variables from each couple of Italian regions and specifying a much more parsimonious econometric specification.

In equation (2) region's i net migration rate is expected to be positively linked with region's i per capita GDP relative to national average and negatively related with region's i unemployment rate relative to nationwide unemployment rate. Intuitively, when a region experiences a higher than national average per capita GDP, it becomes relatively more attracting than other regions; conversely, a region that suffers a higher than national average unemployment rate turns out to be less attractive. In the former case the net migration rate increases, in the latter decreases, therefore we expect $\alpha_1>0$ and $\alpha_2<0$.

3. Data.

In our empirical analysis the time period under investigation spans 33 years from 1970 to 2002. It is therefore the largest data-set built so far to study internal migration in Italy. Regional per capita GDP comes from the Crenos databank[2], whereas unemployment is taken from the national institute of statistics (ISTAT various years, b). The data on interregional migration flows (ISTAT, various years, a) are taken from the municipal registrars' offices (*comuni*), aggregated at regional level and reported on an origin-destination matrix.

[2] Available on-line at http://www.crenos.it/.

Like many other studies and given the results found by Leuvensteijn and Parikh (2002) who employ both labour and population migration data and show that the use of either of them do not make any significant difference to their results, we use population data to study labour migration. In so doing the main drawback is that the role of economic variables is underestimated. Intuitively, such a result follows because people move also for other reasons than only the search of better employment conditions. Think, for example, at retirees that come back to their regions of origin after having worked in another region, or at students that move to a university located outside their region. In the Italian context, while the latter is unlikely to be relevant given that students usually keep their official residence in the place of origin of their families, the former, on the contrary, could be potentially more important. Indeed, the Italian economic boom during the years after WWII was made possible thanks also to the millions of workers that, from the poorer Southern regions, moved towards the Northern ones. At the end of their working life, many of them decide to go back towards their regions of birth to retire, fuelling a stream of return migration which is not explained by equation (2).

As far as unemployment data is concerned, ISTAT has recently updated its previous series (based on the *Rilevazione Trimestrale delle Forze di Lavoro*) by applying a new methodology (*Rilevazione Continua delle Forze di Lavoro*) that makes the two of them not homogeneous. The new series, disaggregated at regional level, spans from 1995 to 2005. The old series, however, are available up to 2002, therefore we are able to examine the 1970-2002 time period.

Table 1 reports the basic summary statistics for net migration, relative per capita GDP and relative unemployment rate. A look at figures shows the wide differences across Italian regions as a consequence of the long-lasting dualistic structure of the economy.

[Table 1]

4. Empirical analysis.

4.1 Non-stationarity, cointegration and long-run dynamic equilibrium.

The variables entering the long-run migration equation (2) need to be carefully scrutinised in order to address spurious correlation problems. Notwithstanding the flourishing of many empirical works in the recent years, it is quite surprising that very few papers have tackled this issue, notably exceptions being Hatton (1995), Brücker and Schröder (2007) and Fachin (2007). To address this problem, in the first step of our empirical analysis, individual unit root and panel unit root tests are used to verify the order of integration of the regional net migration rate, the natural logarithm of relative per capita GDP and the natural logarithm of relative unemployment rate. Secondly, we apply the very recent panel cointegration tests proposed by Westerlund (2007) to check whether these variables form a cointegrated set. Finally, having established that indeed this is the case, we estimate an error correction model that, as it is well-known (Banerjee *et Al*. 1993), allows both the short- and long-run dynamics to be modelled simultaneously.

4.2 Unit root and cointegration tests.

Individual unit root tests are performed through the efficient Augmented Dickey-Fuller (ADF-GLS) test proposed by Elliot *et Al*. (1996) and the Kwiatkowski *et Al.* (1992) test (KPSS test). The former has a null that the series are I(1), whereas the latter has stationarity under the null and non-stationarity under the alternative, thus making inference complementary to the former. The ADF-GLS test is used as a screening device whereas the KPSS test is run to confirm it. It should be noticed that the former greatly improves the efficiency of more traditional Dickey-Fuller tests, achieving substantially higher power. Since there is not any *a priori* reason to think that these series have a time trend or not (Brücker and Schröder, 2007), the tests are performed both with and without it.

[Table 2]

Table 2 shows that with only one marginal exception (Toscana's test with trend at 10%) the net migration rate is I(1). The natural logarithm of relative per capita GDP is also I(1) for all regions but for Lazio (without trend at 10%) and Liguria (without trend at 1%). Finally, the natural logarithm of relative unemployment rate is I(1) for all regions.[3] Moreover, as can be seen from Table 3, the KPSS test confirms that the great majority of regional series are I(1). By combining these two tests it comes out that the only regional series that are not I(1) in both tests are exactly those found with the ADF-

[3] We have also performed the ADF-GLS for the differentiated series to test whether the non-stationary series are difference-stationary and we have found that, for almost all of them, this is indeed the case.

GLS test, namely Toscana net migration rate with trend and relative per capita GDP without trend for Lazio and Liguria.

[Table 3]

To better investigate the dynamic properties of our panel, in addition to individual unit root tests we also present two panel unit root tests proposed by Hadri (2000) and Pesaran (2007). The former has a null of stationarity, thus as long as the null is rejected the panel is assumed non-stationary. On the contrary Pesaran (2007) has a null of non-stationarity, therefore whenever the null cannot be rejected the panel is assumed non-stationary. Both tests assume heterogeneity in the alternative. Hadri's tests belong to the first generation panel unit root tests, since it assumes that the series are independent across the units. Differently from it, Peasaran's test assumes cross-sectional dependence and this is a more realistic assumption in our case since, as highlighted by Breitung and Pesaran (2006), many macroeconomic time series are contemporaneously correlated because of a variety of reasons such as, for example, spillovers effects or common business cycles. Table 4 reports the results. Hadri's test always rejects the null of stationarity in all specifications for all the series;[4] Pesaran's test rejects the null of non-stationarity for the net migration rate without trend.

[Table 4]

On the whole, on the basis of both individual and panel unit root tests it can be claimed that the non-stationarity of the series does not seem to be rejected by the data. We then test for cointegration between the variables using the four panel cointegration tests developed by Westerlund (2007). These tests are based on structural dynamics, have a null of no cointegration and the simulations provided by the author "[…] suggest that these tests maintain good size accuracy and that they are more powerful than the residual-based tests"[5] such as those developed by Pedroni (2004). More specifically two tests, labelled panel statistics P_τ and P_α, are run under the alternative that the panel is cointegrated as a whole and other two, labelled group mean statistics G_τ and G_α, under the alternative that at least one member of the panel is cointegrated. In addition, "Each

[4] However, it should be remembered that such a test has poor finite sample properties, though the very high *p*-values should, somehow, guarantee the goodness of the result.
[5] Westerlund (2007, p. 710).

test is able to accommodate individual-specific short-run dynamics, including serially correlated error terms and non-strictly exogenous regressors, individual-specific intercept and trend terms, as well as individual-specific slope parameters.

[Table 5]

The results, presented in Table 5, strongly suggest that the null hypothesis of no cointegration is rejected and that the panel is cointegrated as a whole. Hence the variables of our model form a cointegrated set and we can claim that there exists a long-run relationship between regional migration rates, relative per capita GDP and relative unemployment.

4.3 Econometric model.

We have proved in the previous section that the regional net migration rate, the natural logarithm of relative per capita GDP and the natural logarithm of relative unemployment rate form a cointegrated set. In this section we estimate an error correction model in which both the short and long-run dynamics are modelled at once. As a matter of fact, migration is likely to respond with a lag to changed circumstances mainly because it takes time for information to be acquired.[6] In so doing, we follow Brücker and Schröder (2007) and estimate:

$$\begin{aligned}\Delta m_{i\,ITA\,t} = {} & \beta_1 m_{i\,ITA\,t-1} + \beta_2 \ln\left(\frac{Y_i}{Y_{ITA}}\right)_{t-1} + \beta_3 \ln\left(\frac{U_i}{U_{ITA}}\right)_{t-1} + \\ & + \beta_4 \Delta \ln\left(\frac{Y_i}{Y_{ITA}}\right)_t + \beta_5 \Delta \ln\left(\frac{U_i}{U_{ITA}}\right)_t + \beta_6 \Delta m_{i\,ITA\,t-1} + \mu_i^{SR} + \varepsilon_{it}\end{aligned} \qquad (3)$$

where $\mu_i^{SR} = -\beta_1 \mu_i$ represents the short-run value for the regional effects and the speed of adjustment to the long-run equilibrium is represented by β_1. If β_1 is negative and significant, we can conclude that the error correction mechanism exists and it tends to close the gap with respect to the long-run relationship whenever, in the short-run, the migration rate deviates from its long-run equilibrium. The proposed dynamic specification has the advantage of making it possible to model explicitly the sluggish adjustment of internal migration with respect to the relevant variables. The long-run

[6] In addition, the inclusion of the lagged dependent variable could be seen as a crude approximation of a migration chain variable.

parameters can easily be recovered from (3) and are given by $\alpha_1 = \beta_2 / -\beta_1$ and $\alpha_2 = \beta_3 / -\beta_1$.

As an alternative to a simple pooled OLS estimator, which is biased and inconsistent due to correlation of the lagged dependent variable with the regional specific effects, a number of panel data estimators have been proposed. Both the random and fixed effects models are known to have an estimation bias which is more severe the shorter the panel dimension (Baltagi, 2005). For *T*=30, Judson and Owen (1999) find a bias ranging from 3 to 20% for the coefficient of the lagged dependent variable. In a study of international migration from 18 countries to Germany during the 1967-2001 time period,[7] Brücker and Siliverstovs (2006) have shown that, on the one hand the random effect estimators produce very heterogeneous results and, on the other, that the standard fixed effect estimator exhibits superior forecasting performances (in terms of five and ten years ahead root mean square errors) with respect to many other estimators such as GMM and other instrumental variables estimators, heterogeneous parameters estimators as the Mean Group estimator, pooled OLS and many others.

To overcome the estimation bias of the fixed effect model various alternatives are available, ranging from instrumental variables techniques (Anderson and Hsiao, 1982), to GMM estimators (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998). These estimators are particular useful in our case since it could be the case that regional per capita GDP and unemployment rate are endogenously determined. In fact, on the one hand migration influences regional per capita GDP by changing regional population, on the other it has an effect on the labour force and on employment, thus influencing the regional unemployment rate (Bentivogli and Pagano, 1999). In a GMM framework we can easily cope with this source of distortion as well. In the next section we apply various estimators to the error correction model given by equation (3) and discuss the main results.

4.4 Estimation results.

Table 6 contains the estimation results of equation (3) and the implied long-run coefficients. We present a simple pooled OLS, a fixed effect (FE) estimator with robust standard errors, a feasible generalized least squares model (FGLS) that allows for a more complex error structure[8] and a system GMM model. Firstly, notice that all

[7] Note the almost coincident panel structure with respect to our study.
[8] It allows for region-specific first order autocorrelation and heteroskedastic error structure.

parameters have the expected sign in all specifications. In particular, the negative coefficient of the error correction term implies that, when there are deviations from the long-run equilibrium, short run adjustment in the migration rate will be made to restore the long-run equilibrium. Secondly, in almost all cases the estimated coefficients are statistically significant; predominantly the FGLS and the SYS-GMM estimations are highly significant. Thirdly, although these *qualitative* results are similar for the various estimators, the point estimates are different. Comparable results are found for the speed of adjustment to the long-run equilibrium in the pooled OLS and the FGLS regressions[9] on the one hand and in the FE and the SYS-GMM, on the other. These findings suggest that the FE and the SYS-GMM yield very similar estimates and confirm that both OLS and FGLS estimator are biased. Given the aforementioned results obtained by Judson and Owen (1999), this comes not completely as a surprise. Fourthly, both in the short- and in the long-run, regional migration reacts stronger to GDP than to unemployment rates differentials. In the short-run the relative per capita GDP coefficient ranges from 0.0776 (GLS) to 0.1451 (SYS-GMM), whereas the relative unemployment rate coefficient varies from -0.0124 (GLS) to -0.0419 (FE). In the long-run, the former varies from 0.3171 (FE) to 0.4378 (SYS-GMM), the latter from -0.0563 (GLS) to -0.1227 (FE).

On the whole, even though the FE regression performs quite similar to the SYS-GMM, the latter is our preferred one in that, as previously said, copes with the endogeneity issue of the regressors. In this specification, the validity of the instruments, according to the Hansen test, cannot be rejected. Moreover, the Arellano-Bond test of autocorrelation indicates the presence of first-order autocorrelation in the residuals and no second-order autocorrelation.[10]

[Table 6]

5. Implications for adjustment to regional unbalances.

In the very recent years, various studies (SVIMEZ, 2008; Piras, 2006), have pointed out that starting from the middle of the nineties of the last century a new wave of interregional migration flows has been recorded running again mainly from Southern to Centre-northern ones. This renewed propensity to mobility, on the one hand points

[9] Notice that for these two estimators the other parameters estimates are very similar as well.
[10] The SYS-GMM estimator is consistent if there is no second-order autocorrelation.

towards an improved role of labour mobility as an adjustment mechanism in the Italian economy, on the other hand needs to be more carefully evaluated as regards the accommodating potential of internal migration (Puhani, 2001).

Migration, both internal and international, is a powerful mechanism of adjustment to economic and social unbalances. A region that suffers from a lower income and a higher unemployment level with respect to the national average looses individuals who are attracted by those regions with more favourable economic conditions in the labour markets. Other mechanisms can also work in the direction of equilibrating the unbalances like, for example, new firms that, attracted by the lower wage level and by the availability of workers in the depressed regions, may be induced to move towards them.

Theoretically, when labour is freely mobile, its marginal productivity equalise across regions; on the contrary, if it is not perfectly mobile, unemployment and, more generally, interregional differentials in income levels and living standards do emerge. Starting from the seminal paper of Blanchard and Katz (1992), many other empirical studies (see, *inter alia*, Eichengreen, 1993; Decressin and Fatas, 1995; Bentivogli and Pagano, 1999; Daveri and Faini, 1999) have addressed the issue of how local (either regional in a national context or national in an international framework) labour markets respond to economic unbalances. The main result of almost all of these studies is that the responsiveness of migration to unemployment and wage differentials is lower in the European countries (particularly among them, but also within their own national boundaries) with respect to the United States or Japan. As an example, Eichengreen (1993) estimates that elasticities of internal migration with respect to unemployment and wages are lower in the United Kingdom than those estimated for the United States and, more importantly as far a the present paper in concerned, that the regressions regarding Italian regions deliver no statistically significant coefficient, with the exception of migration in the previous period. In their analysis of gross migration (both internal and international) flows from Southern Italian regions, Daveri and Faini (1999) include a risk factor along with regional unemployment and wage rates. They find that wages generally have the expected sign, whereas regional unemployment has not.

It is interesting, in the light of these issues and of our empirical results, to conduct a simulation exercise in order to have a flavour of how internal migration across Italian regions would react to changes in unemployment and income differentials. Preliminary to such a simulation, it should be highlight how the estimated coefficients could be interpreted. In the semi-logarithmic equation approach given by equation (2), α_1 and α_2 are long-run semi-elasticities, this means that, ceteris paribus, a one per cent increase in, say, region's i relative per capita GDP, would lead to a $\alpha_1/\overline{m}_{iITA}$ percentage points increase in region's i migration rate, m_{iITA}, where $\overline{m}_{iITA}$ is the average migration rate between region i and all other regions during the time period under investigation. Such a percentage increase, in turn, corresponds to $100\alpha_1$ increase in region's i migration rate m_{iITA}.

In order to evaluate the long-run impact of a variation of relative per capita GDP and unemployment rate on the net regional migration rate, we consider the long-run semi-elasticity estimates of the SYS-GMM model of Table 6. Thus, for example, a 1 per cent increase in the log of relative per capita GDP for, say, Emilia Romagna would lead to an increase of 1.1563 per cent in its net regional migration rate, which amounts to 0.004378 percentage points, namely $100\alpha_1$ or 1.1563 per cent of Emilia Romagna's average net migration rate 0.2737. In the same vein, a 1 per cent increase in the log of relative unemployment for Campania would lead to an increase of 0.3034 per cent in Campania's (negative) average net regional migration rate, which amounts to 0.000999 percentage points, namely $100\alpha_2$ or 0.3034 per cent of Campania's average net migration rate -0.3154.

[Table 7]

In the first two columns of Table 7 we report the results of the magnitude of the migration-induced population change due to a 1 per cent increase in the relative per capita GDP and in the relative unemployment rate. As one can see, a variation in the former does not change too much regional population and even less is able to induce a variation in the relative unemployment rate. Therefore, even though internal migration reacts to regional unbalances as one theoretically would expect and as we actually have found in our empirical investigation, the magnitude of such a reaction is quite small as regards per capita GDP and almost negligible as for unemployment. Another interesting simulation exercise is carried out in the last two column of Table 7. Following Puhani (2001, p. 133), under the assumption that all migrating individuals are unemployed in the sending region and that they immediately find a job in the receiving region, for every region we have computed the percentage of adjustment in regional unemployment due to migration. Thus, column 3 gives the result of a 1 per cent increase in regional unemployment, whereas column 4 reports the percentage of adjustment in regional unemployment due to migration. These results agree perfectly with those of Puhani (2001) who find for Italy that only 2.7 per cent of unemployment is absorbed by internal migration. In our simulations, this percentage varies from 6.27 in Trentino Alto Adige to 1.59 in Calabria. More generally, the adjustment percentage is higher in the Centre-northern regions rather than in the *Mezzogiorno*.

6. Conclusions.

The present paper has shed light into the nature of Italian interregional migration for the period 1970-2002. By fitting an error correction model into a panel data analysis we have found that the reaction of internal migration to the main regional macroeconomic indicators, namely unemployment rate and per capita GDP, has been prompt. The error correction model has the great advantage that it allows both the short- and long-run dynamics to be modelled at once. Thus, it has the benefit of modelling plainly the slow adjustment of internal migration with respect to the relevant variables and, at the same time, of estimating the long-run coefficients.

Almost all existing literature on migration, internal and international, ignores the dynamic properties of the series under investigation. On the contrary we have framed our study inside a cointegration framework. Preliminary to such an analysis, on the basis of individual as well as panel unit root tests, we have proved that net migration rate, relative per capita GDP and relative unemployment rate are I(1) variables. In addition, the recent Westerlund (2007) tests for panel cointegration reject the null hypothesis of no cointegration suggesting, as one would expect, that a long-run dynamic equilibrium between net migration, per capita GDP and unemployment do exist for the Italian regions.

The main results are as follows. First, all parameters have the expected sign in all specifications. Second, almost all estimated coefficients are statistical significant. Third, the FE and the SYS-GMM estimators yield very similar results. Forth, internal migration reacts stronger to GDP rather than unemployment rates differentials, and this is true in the short- as well as in the long-run. In spite of the different econometric methodology, our results parallel those of Basile and Causi (2007) and Furceri (2006) and give support to the fact that interregional migration in Italy has been driven principally by economic fundamentals. Our empirical results are not easily comparable with those of Fachin (2007), firstly for the reason that he concentrates on male migration only, secondly because he studies emigration from two Southern macro-areas (South-East and South-West) towards other five macro-areas of the country. Anyhow, he finds a weak effect for unemployment differentials and mixed results as for income differentials, whereas home income is found to be strongly significant.

As far as the accommodating potential of internal migration to regional unbalances, we have detected very little room for such a role. Indeed, the degree of labour mobility across Italian regions, although statistically correlated to the main economics factors, is still very low and cannot be active as an effective equilibrating mechanisms.

Future research on this field is needed in order to measure the impact of internal migration on the convergence process across Italian regions and to ascertain whether the long-run impact of internal migration could imply a brain drain from Southern to Centre-northern regions as other recent studies seem to suggest (Piras, 2007). In addition, the study of bilateral migration flows by using spatial econometric techniques could certainly help to a better understanding of this phenomenon.

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Table 1 – Summary statistics for the Italian regions (years from 1970 to 2002).

Regions	Net migration rate				Relative per capita GDP				Relative unemployment rate			
	Mean	St. Dev.	Max	Min	Mean	St. Dev.	Max	Min	Mean	St. Dev.	Max	Min
Piemonte	0.0863	0.2447	1.022	-0.227	1.1711	0.0176	1.215	1.145	0.6960	0.0992	0.898	0.512
Val D'Aosta	0.3287	0.1865	0.655	-0.025	1.5456	0.1332	1.783	1.308	0.5356	0.2191	1.401	0.295
Lombardia	0.1261	0.1704	0.552	-0.034	1.2871	0.0286	1.334	1.231	0.5378	0.1035	0.725	0.370
Trentino A. A.	0.0326	0.0853	0.176	-0.121	1.3185	0.0615	1.407	1.199	0.4476	0.1429	0.731	0.256
Veneto	0.0987	0.0226	0.156	0.056	1.1075	0.0545	1.198	1.017	0.6045	0.1590	0.908	0.353
Friuli V. G.	0.1441	0.0608	0.271	0.028	1.0623	0.0527	1.160	0.988	0.6580	0.1422	0.921	0.412
Liguria	0.0534	0.1183	0.355	-0.164	1.0675	0.0306	1.122	1.014	0.8798	0.0992	1.062	0.677
Emilia R.	0.2737	0.0851	0.467	0.130	1.2194	0.0463	1.279	1.101	0.6314	0.1685	0.856	0.366
Toscana	0.2239	0.0476	0.341	0.142	1.0992	0.0198	1.126	1.064	0.7701	0.0993	0.957	0.535
Umbria	0.1682	0.1739	0.391	-0.410	0.9521	0.0367	1.012	0.866	0.9703	0.2278	1.375	0.559
Marche	0.1282	0.1285	0.284	-0.209	0.9934	0.0356	1.063	0.944	0.6707	0.1248	1.035	0.471
Lazio	0.1281	0.1170	0.458	-0.052	1.1078	0.0229	1.152	1.071	1.0981	0.1524	1.390	0.851
Abruzzo	0.0194	0.1351	0.157	-0.419	0.8550	0.0335	0.900	0.755	1.0180	0.2328	1.503	0.601
Molise	-0.1413	0.1937	0.073	-0.804	0.7522	0.0475	0.809	0.652	1.2353	0.1912	1.503	0.867
Campania	-0.3154	0.1023	-0.181	-0.588	0.6791	0.0310	0.730	0.621	1.8193	0.2717	2.360	1.353
Puglia	-0.2350	0.1404	-0.035	-0.677	0.6848	0.0211	0.726	0.647	1.3619	0.1717	1.693	1.113
Basilicata	-0.4547	0.3479	-0.118	-1.712	0.6940	0.0449	0.782	0.628	1.6175	0.2227	2.262	1.075
Calabria	-0.4518	0.2613	-0.034	-1.168	0.6224	0.0329	0.693	0.574	1.9969	0.3202	2.727	1.557
Sicilia	-0.2294	0.1472	0.004	-0.628	0.7113	0.0325	0.755	0.651	1.6521	0.3849	2.266	1.061
Sardegna	-0.1215	0.1320	0.042	-0.633	0.8004	0.0474	0.918	0.739	1.7409	0.1797	2.080	1.296

Relative per capita GDP is computed at constant price.

Table 2 - Individual time series ADF-GLS test.

	Net migration rate		Log of relative per capita GDP		Log of relative unemployment rate	
	with trend	no trend	with trend	no trend	with trend	no trend
Piemonte	-0.984	-0.288	-2.125	-0.512	-1.170	-1.111
Valle d'Aosta	-1.411	-1.029	-2.891	1.242	-0.859	-0.088
Lombardia	-1.668	-0.879	-1.654	-1.598	-2.271	-1.871
Trentino A. A.	-1.985	-0.549	-0.436	-0.639	-2.368	-0.846
Veneto	-2.498	-1.804	-1.514	-0.459	-2.058	-1.026
Friuli V. G.	-1.437	-1.323	-2.484	-0.285	-1.661	-0.707
Liguria	-0.548	-0.370	-2.846	-2.959***	-1.980	-1.742
Emilia R.	-2.561	-1.499	-2.273	-0.594	-2.080	-0.156
Toscana	-3.409*	-1.121	-0.846	-1.000	-0.878	0.055
Umbria	-1.091	0.012	-1.222	-0.556	-0.818	-0.689
Marche	-2.424	-0.270	-3.046	-2.855	-1.351	0.712
Lazio	-2.249	-0.927	-2.533	-2.451*	-1.483	-0.770
Abruzzo	-0.525	0.226	-0.705	-0.217	-2.783	0.882
Molise	-1.295	0.422	-1.504	-0.068	-1.576	-1.319
Campania	-0.924	-0.876	-1.693	-0.665	-1.404	-0.841
Puglia	-1.150	-0.768	-2.301	-1.157	-1.655	-1.402
Basilicata	-0.616	-0.403	-0.926	-1.040	-2.289	-0.606
Calabria	-1.578	-0.700	-0.987	-1.093	-1.447	-0.910
Sicilia	-1.240	-0.853	-1.790	-0.983	-2.232	-0.206
Sardegna	-1.054	-0.671	-1.463	0.051	-1.252	-0.247

Optimal lag selected according to the modified Akaike information criterion. 10%, 5% and 1% statistical levels of confidence for the null hypothesis of unit root are indicated by *, ** and *** respectively.

Table 3 - Individual time series KPSS test.

	Net migration rate		Log of relative per capita GDP		Log of relative unemployment rate	
	with trend	no trend	with trend	with trend	no trend	with trend
Piemonte	0.252***	0.443*	0.110	0.703**	0.224***	0.240
Valle d'Aosta	0.147**	0.140	0.156**	1.110***	0.190**	0.862***
Lombardia	0.192**	0.555**	0.144*	0.607**	0.138*	0.490**
Trentino A. A.	0.090	1.150***	0.306***	0.622**	0.100	0.929***
Veneto	0.070	0.160	0.110	1.220***	0.205**	1.000***
Friuli V. G.	0.214**	0.210	0.164**	1.100***	0.156**	0.817***
Liguria	0.288***	0.700**	0.138*	0.320	0.070	0.280
Emilia R.	0.123*	0.703**	0.136*	0.861***	0.110	1.170***
Toscana	0.100	0.130	0.227***	0.578**	0.268***	0.829***
Umbria	0.240***	0.756***	0.220***	0.739***	0.168**	1.140***
Marche	0.167**	0.883***	0.141*	0.140	0.100	1.170***
Lazio	0.154**	0.684**	0.127**	0.130	0.194**	0.766***
Abruzzo	0.300***	0.794***	0.312***	0.854***	0.050	1.230***
Molise	0.207**	0.931***	0.262***	1.010***	0.159**	0.378*
Campania	0.235***	0.330	0.146**	1.150***	0.206**	0.847***
Puglia	0.260***	0.330	0.110	1.080***	0.206**	0.639**
Basilicata	0.275***	0.947***	0.282***	0.389*	0.080	0.080
Calabria	0.206**	0.512**	0.323***	0.686**	0.177**	0.482**
Sicilia	0.264***	0.420*	0.199**	1.000***	0.080	1.210***
Sardegna	0.258***	0.549**	0.239***	1.210***	0.155**	0.513**

The maximum lag order has been selected following the procedure put forward by Hobijn *et Al.* (1998). The autocovariance function is weighted by the quadratic spectral kernel. 10%. 5% and 1% statistical levels of confidence for the null hypothesis of unit root are indicated by *, ** and *** respectively.

Table 4 - Panel unit roots tests.

	Net migration rate		Log of relative per capita GDP		Log of relative unemployment rate	
Hadri (2000):	with trend	no trend	with trend	no trend	with trend	no trend
Homoskedastic disturbances across the panel	38.776***	34.620***	44.034***	56.580***	23.410***	54.377***
Heteroskedastic disturbances across units	32.446***	30.715***	33.671***	47.883***	22.920***	45.004***
Serial dependence in errors	15.660***	13.175***	15.750***	19.276***	8.968***	19.998***
Pesaran (2007)	-1.759	-2.300***	-0.956	-1.639	-1.520	-1.624

Hadri (2000) test has a null of stationarity, and its test statistic is distributed as standard normal under the null. Pesaran (2007) runs a *t*-test for unit roots in heterogeneous panels with cross-section dependence; the null hypothesis assumes that all series are non-stationary (optimal lags have been selected according the Akaike Information Criterion). 10%, 5% and 1% statistical levels of confidence for the null hypothesis of unit root are indicated by *, ** and *** respectively.

Table 5 - Westerlund (2007) panel cointegration tests.

Statistic	Value	*Z*-value	*p*-value
P_τ	-12.445	-4.633	0.000
P_α	-12.311	-5.155	0.000
G_τ	-3.194	-5.631	0.000
G_α	-13.287	-2.968	0.002

The null hypothesis is no cointegration. P_τ and P_α are run under the alternative that the panel is cointegrated as a whole; G_τ and G_α under the alternative that at least one member of the panel is cointegrated.

Table 6 - Interregional migration in Italy. The dependent variable is Δm_{iITAt}.

	Pooled OLS	FE	FGLS	SYS-GMM
	Short-run dynamics			
	-0.2184***	-0.3415***	-0.2199***	-0.3314***
$m_{iITAt-1}$	[0.000]	[0.000]	[0.000]	[0.000]
$\ln(Y_i/Y_{ITA})_{t-1}$	0.0782**	0.1083	0.0776***	0.1451***
	[0.034]	[0.365]	[0.000]	[0.000]
$\ln(U_i/U_{ITA})_{t-1}$	-0.0196	-0.0419*	-0.0124**	-0.0331**
	[0.233]	[0.063]	[0.017]	[0.021]
$\Delta\ln(Y_i/Y_{ITA})_t$	0.3926**	0.3111	0.3682***	1.2768***
	[0.038]	[0.155]	[0.000]	[0.000]
$\Delta\ln(U_i/U_{ITA})_t$	-0.0772	-0.0850*	-0.0583***	-0.0542
	[0.120]	[0.057]	[0.000]	[0.276]
	-0.1785***	-0.1964***	-0.1590***	-0.2451***
$\Delta m_{iITAt-1}$	[0.001]	[0.000]	[0.000]	[0.000]
Constant	0.0072	0.0066	0.0088***	0.0096
	[0.125]	[0.393]	[0.000]	[0.173]
Instruments				22
A-B test for				-3.08
AR(1)				[0.002]
A-B test for				-1.78
AR(2)				[0.075]
Hansen test				13.41
				[0.570]
R^2-bar	0.2299	0.3130		
Wald $\chi^2(6)$			296.5	633.62
			[0.000]	[0.000]
	Implied long-run coefficients			
$\ln(Y_i/Y_{ITA})$	0.3582**	0.3171	0.3527***	0.4378***
	[0.028]	[0.148]	[0.000]	[0.000]
$\ln(U_i/U_{ITA})$	-0.0898	-0.1227**	-0.0563**	-0.0999**
	[0.222]	[0.011]	[0.013]	[0.026]

Sample period 1970-2002. Total observations: 620. p-values in brackets: 10%, 5% and 1% statistical levels of confidence are indicated by *, ** and *** respectively. Hansen test is the Sargan-Hansen test on the validity of over-identifying restrictions. The null hypothesis is that the instruments used are not correlated with the residuals. A-B AR(1) and AR(2) tests are Arellano-Bond first and second order serial correlation tests, respectively.

Table 7 - Migration-induced population changes and unemployment adjustment due to migration.

Regions	(1)	(2)	(3)	(4)
Piemonte	192	-44	1197	3.65
Val D'Aosta	5	-1	22	5.29
Lombardia	388	-89	1829	4,84
Trentino A. A.	39	-9	141	6.27
Veneto	191	-44	916	4.60
Friuli V. G.	53	-12	278	4.36
Liguria	76	-17	520	3.35
Emilia R.	172	-39	932	4.22
Toscana	155	-35	1006	3.52
Umbria	36	8	269	3.01
Marche	62	-14	353	4.03
Lazio	221	-50	1884	2.68
Abruzzo	54	-12	411	3.01
Molise	14	-3	143	2.30
Campania	243	-55	3370	1.65
Puglia	172	-39	1745	2.25
Basilicata	27	-6	329	1.85
Calabria	91	-21	1303	1.59
Sicilia	218	-50	2691	1.85
Sardegna	70	-16	951	1.69

Notes: (1) Migration-induced population change due to a 1% increase in per capita GDP; (2) Migration-induced population change due to a 1% increase in unemployment; (3) 1% change in regional unemployment; (4) unemployment adjustment due to migration.

Figure 1. Italian regions.

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