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Foreign migrations and population aging in Italy

1. INTRODUCTION AND RESEARCH QUESTION

The final steps in the demographic transition entail important reductions in the natural dynamics of a population and a progressive aging of its structure. A natural change around or below zero and population aging characterise also the following time periods. Positive net migration may add, then increase the total population significantly and, probably, also affect the population structure. Recently, in some European countries, immigration has played a fundamental role in changing the population growth rate from negative to positive (Sobotka, 2009; Strozza, 2010).

However, it is unclear whether and how much the immigration of young people contributes to the rejuvenation of the age composition of the host population. The question is not new in demography. In the last decades various contributions have dealt with the problem of the possible demographic impact of international migration on the population in the receiving countries.

In some cases, the analyses have been developed at a *theoretical level* by using the stable population model, which assumes that age-specific fertility, mortality and migration rates remain constant. Some studies have shown that a population with constant fertility below replacement level could eventually become stationary (zero increase and unchanged amounts by age over time) if a constant number of immigrants with unchanging age composition are allowed in to offset its natural losses (Espenshade *et al.*, 1982; Mitra, 1983; Mitra and Cerone, 1986). The size of this population is particularly sensitive to the number and the age structure of immigrants at the time of their entry into the country (Arthur and Espenshade, 1988). On the basis of the following developments, some attempts have been made to assess which immigration involves changes in the population age structure and, in particular, causes population rejuvenation (Mitra, 1990; Schmertmann, 1992; Wu and Li, 2003). An assumption on the proportionality of migration flows (i.e. a cohort net migration proportional to the number of births) was discussed or adopted in other recent contributions that evaluate the long-run effects of migration on the size and aging of low-fertility populations (Liao, 2001; Alho, 2008).

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Besides the theoretical approaches that look at the hypothetical distant future, many papers adopted a *de-facto approach* that aims to describe the dynamic and structural effects of migration and the presence of foreign or foreign-born immigrants and their descendants on the population. In addition to the contributions on an international scale (e.g.: OECD, 1991, 2001; Borrie and van de Kaa, 1992), there are also many papers at the national and local levels.

In some cases, the role of migration on the total population size and age structure was estimated by using a *retrospective 'what-if…' approach* by comparing the actual population with the expected one computed without migrations. Obviously, this approach is aimed at measuring the direct and indirect effects of past migrations. Internationally, it was used by Le Bras (1991) to examine the effects of international migration on the population of seven OECD countries between the first censuses after World War II and the censuses run in the early 1980s. He showed that migrations were an important component in population growth, but they did not have a significant effect on rejuvenating the age structure of the populations considered. A later paper by Golini and Strozza (1998) focused on the impact of international migration between 1950 and 1990 on the population of six European countries, four receiving and two sending ones.

The classical cohort-component model of demographic forecasts has been used more frequently in the *prospective 'what-if…' approach* adopted to analyse the possible effects of international migration on the size and future structure of the population in some host countries (e.g.: Lesthaeghe *et al.*, 1988; de Sarno-Prignano, 1989; Wattelar and Roumans, 1991; McDonald and Kippen, 1999; Lutz and Scherbov, 2002). In some cases, the model was modified or expanded to consider the interactions between the national/native and foreign/immigrant population (e.g., mixed marriages, naturalisations, the link between native and immigrant fertility, etc.). The aim is to assess the quantitative and qualitative effects of different sizes and structures of immigration (constant or variable over the projection time-period) according to the past or possible future trends. Thus, all the projection methods that include the migratory component can be used for this purpose (e.g.: Feld, 2000; Bijak *et al.*, 2007).

Papers that use the projection methods in the socalled *'target' approach* to determine the size and structure of foreign immigration required to achieve the stability of certain demographic or demoeconomic parameters are quite different. The most famous and broadly debated report is by the United Nations (2000) on the so-called 'replacement migration', defined as the volume of international migration needed to offset possible population shortages (declines in the size of total population or working age population) as well as to offset the overall population aging. The future migration scenarios have been evaluated for eight countries and two regions on the basis of the 1998 medium variant of the United Nations World Population Prospects. Some of the

alternative targets were to maintain the following parameters constant over time at the highest level they would reach in the absence of migration after 1995: *i*) the total population size; *ii*) the size of working-age population; and *iii*) the potential support ratio (ratio between the population aged 15-64 years and the population aged 65 and over, i.e. the reciprocal of the elderly dependency ratio). Before and after the release of the United Nations report, several contributions have adopted the target-approach by using specific assumptions and proposing even more detailed analyses and discussions of the results (Blanchet, 1988; Wattelar and Roumans, 1991; Coleman, 1992; Gesano, 1994; Bruni, 2007).

We will try to answer the question of whether immigration can be a solution to population aging and to what extent through the analysis of both the recent past trends and the possible projections in the short- and medium-run future in Italy. We will evaluate what the impact of immigration on the aging of the resident population in Italy has been in the last decade through the use of a retropective 'what-if…' approach (Section 2). On the basis of the most recent Istat demographic forecasts, we will try to assess, for the next forty years, the demographic impact of different constant net migration per year (prospective 'what-if…' approach) and the number of migrants necessary to maintain some demographic or demo-economic parameters constant ('target' approach). In the last part of Section 3, we will evaluate the effects of different combinations of fertility levels and net migration on the aging of the population residing in Italy in the next 20-40 years (short- and medium-term). A summary of the results, with the answer to the specific research question, and some short policy indications will be reported in the last Section.

2. A HISTORY ALREADY WRITTEN: THE RECENT IMPACT OF MIGRATION IN ITALY

The first question concerns the effect that international migration in the recent past has had on the structure of the population now residing in Italy. The answer can be found by applying the cohort-component projections with the well-known retrospective 'what if…' approach. In our case, we can compare the actual population at the most recent date (beginning of 2010) with the expected population at the same date computed in the absence of international migration during a given period of time.

The first problem is to define this time period and the actual population at the beginning. We opted to consider a short period of eight years, from 2002 to 2010. In previous analyses (Le Bras, 1991; Golini and Strozza, 1998) longer periods of 20-40 years were considered. There are two main reasons for this: *i*) in the last eight years the migrations registered in Italy have been truly exceptional, much larger in both the absolute and relative terms than those

recorded in the previous two decades; *ii*) it is possible to revise the population by sex, age and citizenship at the beginning of 2002 by using the results of the post enumeration survey of the 2001 population census. While the first is a substantive reason, the second is a technical one that makes the comparison between the recorded and expected population at the beginning of 2010 more accurate. Otherwise it would be affected by the registrations that have reduced the under-counting of the last census in the years following the census.

We start with 57.8 million inhabitants in Italy at the beginning of 2002, separately estimated by sex, age and citizenship (Italians/foreigners) according to the evaluation of coverage in the 2001 census (Istat, 2009: 111)[1].

Table 1 – *"Actual" and "Expected" resident population and relevant demographic changes by citizenship: Italy, period 2002-2009 (values and differences in thousand)*

Citizen-ship	Resident population Jan. 1st 2002[a]	2002-2009 Natural Change			Resident population Jan. 1st 2010	"Migratory Change"[b]
		Births	Deaths	Natural Change		
Actual population						
Italians	56,318	4,029	4,536	−508	56,105	+295
Foreigners	1,512	440	27	+413	4,235	+2,310
Total	57,831	4,468	4,563	−95	60,340	+2,605
Expected[c] population						
Italians	56,318	3,894	4,510	−616	55,702	0
Foreigners	1,512	194	20	+173	1,686	0
Total	57,831	4,087	4,530	−443	57,388	0
Differences between actual and expected values						
Italians	0	+135	+26	+108	+403	+295
Foreigners	0	+246	+7	+239	+2,549	+2,310
Total	0	+381	+33	+348	+2,952	+2,605

Notes: (a) The resident population by sex, age and citizenship (Italians/foreigners) at the beginning of 2002 was revised to consider the under-coverage in the 2001 census (Istat, 2009). (b) Difference between total change (final minus initial population) and natural change that gives a residual component composed of migratory change and other secondary factors (also citizenship change in the sub-populations of Italians and foreigners). (c) Without international migration in the period 2002-2009.
Source: Own calculations from Istat data.

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[1] The rates of coverage by single age, separately for the four groups resulting from the combination of sex and citizenship (Italians and foreigners), were drawn from the structure by birth cohort of the registrations 'for other reasons' in the municipal population registers (*"anagrafi comunali"*) during the 2002-2009 time period, which should correspond approximately to the census undercounts.

Eight years later, the updated resident population in Italy attained 60.3 million due to the exceptional net immigration from abroad of about +2.6 million (an average of nearly +330,000 per year), compared with a negative natural balance of nearly –100,000 units (Table 1). This growth is almost exclusively due to the foreign population that increased from about 1.5 to over 4.2 million in the time-period 2002-2009. The growth of foreign residents in Italy was due in part to their positive natural change (more than +400,000) and mainly to net migration from abroad (more than +2.3 million). If we consider that during the past eight years approximately 271,000 foreign residents have become Italian citizens, it is clear that the growth of the resident population in Italy is due exclusively to the foreign component, since the Italians had a near zero net migration and a strongly negative natural balance (–500,000).

Without any migration the population expected at the beginning of 2010 should have been 57.4 million, about 450,000 less than at the beginning of 2002 and just under 3 million less than the population actually recorded by Istat at the most recent date. The indirect effect due to the contribution of immigrants to births and then to the natural change must be added to the direct effect of the immigration. Without the migratory contribution, also the natural change would be even more negative (close to –450,000). This is mainly due to fewer births among foreigners (almost –250,000 less than the actual number) and among new Italian citizens (–135,000). The latter ones are mainly children of mixed couples.

The impact of foreign immigration on the recent Italian population dynamics is unquestionable. To evaluate the effect on the demographic structure, we projected the resident population in Italy by sex, age and citizenship without migration from the beginning to the end of the time period and assumed: i) the same trend, by sex, of the mortality observed in 2002-2009 starting from the estimated 2001-2002 life tables, separated for the Italians and foreigners (the latter having a higher survivorship than the former); ii) the age specific fertility rates for the Italian women equal to those actually observed in the period, and for foreign women (i.e. only those resident in Italy at the beginning of 2002) equal to the values estimated for 2001-2002 and updated linearly by a decrease of foreign women's total fertility rate (TFR) from 2.45 to 1.95 children per woman in 2009 and a slow but progressive change in the age profile approaching that of Italy (mean age at childbearing rising from 27.4 to 28.7 years). Moreover, we had to consider that about a quarter of the births to foreign mothers are Italian citizens, according to data from the population registers. The acquisition of citizenship could not be considered here. Therefore, the foreign population at the end of 2009 also includes people that became Italian in the 2002-2009 time-period.

The ratios, age by age, between the actual population and the expected one in the absence of migration enables us to have an analytical framework on the differential impact of the recent international migration on the age structure of the population living in Italy at the beginning of 2010 (Figure 1). The

highest values of the ratio between the actual and expected population (more than 115%) are recorded in the early ages of life because of the sum of direct and indirect effects of migration. In other words, we refer to the arrivals of young migrants in the wake of their parents or for family reunification and to those born in Italy by parents who immigrated in the period. The ratios decrease quickly until they reach minimum values between 10 and 20 years of age and then again progressively increase up to 28-32 year old when they attain a relative maximum, declining in the later ages. In summary, the impact of immigration is focused primarily on the younger working age, confirming the relevance of labour migration, and in the first years of life, without significant gender differences, reflecting the importance of family reunion and the process of stabilization of immigrants. The impact of immigration is higher among women than men in the ages 24-32 and 45-60 years. In the 24-32 age-span, more women than men come to Italy because they are searching work and for family-reunion reasons. The importance of these two motivations varies among the different national groups: e.g., the first reason prevails among the Philippine women and the second among Moroccan women. Instead, the high number of women migrating in the 45-60 years age group is due to the middle-aged women coming from Eastern Europe (in particular from Ukraine) to be employed as housemaids or paid caregivers to elderly people or children.

Figure 1 – *Ratio between the actual and expected[a] resident population by sex and age: Italy, beginning of 2010 (actual per 100 expected residents)*
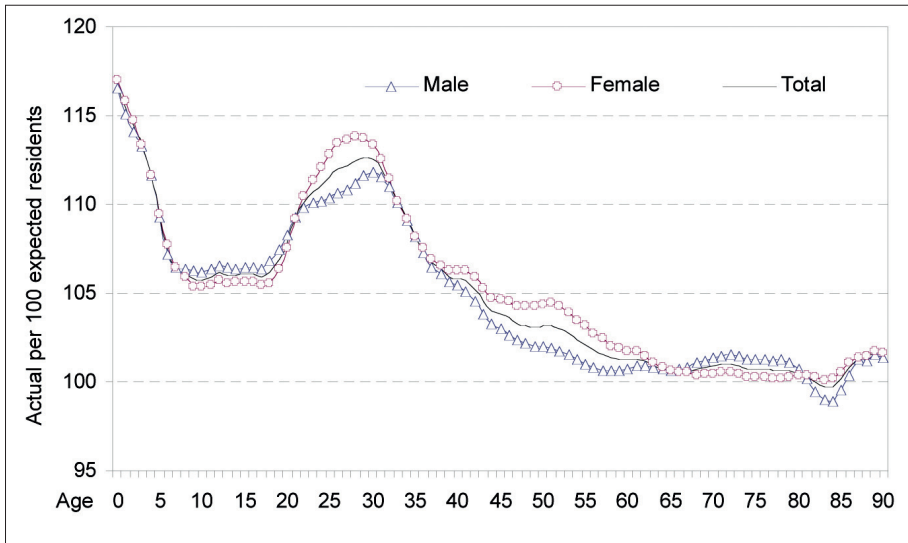
Note: [a] See note c in Table 1.
Source: Own calculations from Istat data.

Table 2 summarizes the effects of immigration on the population structure in Italy. At the beginning of 2002, the elderly population (people aged 65 and over) made up 18.6% of the population and would become 21.1% by the beginning of 2010 in the absence of international migration. However, Istat recorded the elderly population at 20.2% at the beginning of 2010, almost one percentage point less than what was expected in the absence of migration. The immigration in the last eight years was not able to stop the aging process of the Italian population; however, it produced a significant slowdown. It produced a lower growth not only of the share of the elderly, but also of the oldest component of the working-age population (half a percentage point less than expected). This situation was caused by the contribution of migration to the young and adult population in the 20-44 year age group. The weight of these two broad age groups is therefore higher than expected, half and more than one percentage point, respectively.

Table 2 – *Demographic structure of the actual and expected resident population: Italy, beginning of 2002 and 2010 (percentage values and indexes)*

	Jan. 1st 2002	Jan. 1st 2010		Differences		
	Actual[a] population (A02)	Expected[b] population (E10)	Actual population (A10)	E10 − A02	A10 − A02	A10 − E10
Sex and age group structure (%)						
Female / Total	51.6	51.4	51.5	–0.2	–0.1	+0.1
0-19 yrs	19.4	18.4	19.0	–0.9	–0.4	+0.5
20-44 yrs	36.9	33.1	34.1	–3.9	–2.8	+1.1
45-64 yrs	25.1	27.4	26.7	+2.3	+1.5	–0.7
65 yrs and over	18.6	21.1	20.2	+2.5	+1.7	–0.9
Structural indexes (%)						
65+ / 20-64	29.9	34.9	33.3	+5.0	+3.3	–1.6
45-64 / 20-44	68.1	82.9	78.1	+14.8	+10.0	–4.8

Notes: [a] See note a in Table 1. [b] See note c in Table 1.
Source: Own calculations from Istat data.

The elderly dependency ratio (65+ / 20-64 year-olds) increased 3.3 percentage points in the last eight years, but 1.6 points less in comparison to how much was expected in the absence of migration. The structure of the working-age population has also aged, but less than expected: at the beginning of 2010 there were 78 people aged 45-64 for every 100 people 20-44 year-old, 10 people more aged 45-64 year-old than eight years earlier, but around 5 less than

expected without migration.

It seems evident that the exceptional and unexpected immigration in the recent past resulted in a slowing of population aging in Italy. Of course the effects vary significantly at local levels. For instance, the five geographic divisions highlight important differences in the impact of migration on the age structure: in the North-Central region, and especially in the two divisions in Northern Italy, immigration (both international and internal) curbed population aging more than at national level, while in the South and the Islands migration has accelerated, albeit slightly, the aging process. Here, international migration did not succeed in completely compensating for losses of many native young people moving toward the central and northern areas or abroad.

What does the future hold? Can international migration contain or annul the demographic process of aging? Can migration compensate for the reduced number of births due to fertility far below the replacement level? With a TFR of 1.4 children per woman and a life expectancy of 79 years for men and 84 for women, the intrinsic annual growth rate of the Italian population would be equal to –1.26% in the absence of migration[2], with the elderly population making up close to one third of the population. This share would be reached in 30 years. In the very long-term, the stationary population corresponding to these levels of fertility and mortality assumed a constant net immigration of 300,000 people per year, with an age structure equal to that observed in the recent past, would stand about 43 million, with the share of the elderly being less than 27% and 6 percentage points less than in the absence of migration[3].

3. THE FUTURE'S NOT OURS TO SEE

The ex-post analyses of errors in population forecasts (e.g., Keilman, 1991) and considerations about the uncertainty of their components (e.g., de Beer, 1992) leave little room to predict population trends. This is the main reason why, since the 1990s, stochastic population forecasts have come along with the traditional Low/Medium/High projections, so that an evaluation of uncertainty can be done under some statistical hypotheses (e.g., Lee and Tuljapurkar, 1994; Hartmann, 2004). However, the population machinery, mainly based on the cohorts' shift, and a presumed stability or soft changes in demographics invite agencies, experts and others to forecast populations also in the long run (Romaniuk, 2010).

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[2] According to the estimate formula proposed by Preston and Wang (2007), the intrinsic growth rate in the presence of migration is however close to zero (exactly equal to +0.12% in 2007 and –0.15% in the period 2005-2009).
[3] Of course, the increase of the survival levels will determine, *ceteris paribus*, a more marked aging process (see the following Section).

Following the aforementioned importance of the migration components in the dynamics of modern populations, most of the forecast uncertainty is found in population mobility, especially in the migrations directed at the more developed areas. In these moves, various populations are involved, each having different demographic structures and behaviours that are affected differently by the migration. Moreover, migrations highly depend on the economic trends in the related labour market. They are trimmed by international and national regulations that change over time according to policy preferences and labour market needs (Doomernik and Jandl, 2008). Foreseeing future migration flows is therefore largely questionable, but the task of arguing about the following impacts is even more difficult because of the tangled relationship between migration flows and the demographics of the involved populations.

3.1 *The tangled relations between future migrations and population forecasts*

The push and pull factors are of paramount importance in weaving together the international migration networks. Besides the micro factors (Eurostat-Nidi, 2000), macro factors can be identified in the structural disequilibria in either the sending or/and the receiving populations, which are especially highlighted in the relevant labour markets. Migration flows, however, cannot be derived by those disequilibria as it could be done in a hydraulic system. Other important factors intervene, some of which stem from specificities of the population structures.

For instance, the lengthening of old life in the well-off societies not only makes the aging of their population more severe, but in some of them it draws specific migrants (especially middle-aged women) who can help families in caring for their older members if handicapped or living alone. Furthermore, the dimension and structure of the nuclear families can affect immigration in the developed countries. The investments and expectations for a single child (or a few children) cause many young native-born Italians to reject low-level jobs (e.g. in the building industry or cleaning services), to which migrants, especially young migrants, may be drawn. It is evident that such differently structured migrations produce far different demographic effects in the host population, provided that at least part of them settle down in the immigration country and reunify their family there or make up a new one, either with other migrants or with natives.

On the other side, migrants from diverse countries, who have different demographic characteristics and migration projects, can fulfil the same shortages in the labour market. For instance, the elderly assistance in Italy has been provided by Philippina, Sri Lankan, and Peruvian women, as well as by often middle-aged women from Romania, Ukraine and other republics

of the former Soviet Union. Clearly, those workers have a different demo-graphic behaviour and migration project, and interface differently with the host population. This fact should be considered in modifying the hypotheses about the future settling of migrants, their family reunification, and the 'mixed marriages' with the natives. This could have different consequences on the overall fertility level and the convergence processes in demographic behaviours.

Those different paths in the connections between migrants and the host population will affect both the population and social structure in the long run. Therefore, labour market needs and future migration estimates should be modified. The hypotheses about future fertility and mortality of the host population may be important in estimating and shaping future migrations, which, in turn, are likely to change those hypotheses consequently.

3.2 *Far different results attained under different hypotheses or targets*

In order to measure possible future aging of the Italian population, we used the 2007-2051 forecasts by Istat, which used different levels of fertility, mortality, and migration flows[4]. By recalculating them with some approxima-tion, we obtained the relevant transition matrixes that allowed us to update the starting point at the beginning of 2010 and to run some different hypotheses in future net migration.

Two different approaches were adopted. The prospective 'what if...' ap-proach adds two hypotheses on the 2010-2050 net migration to those provid-ed by Istat: *i*) a zero net migration during the entire projection period, or *ii*) maintaining the average 2002-2009 net migration estimated above at 330,000 a year. The 'target' approach, on the contrary, draws future net migration so that some targets can be maintained during the projection time lag. Some strictly demographic targets were selected to be kept more or less constant in the period: *iii*) the total population, or *iv*) the share of the population of for-eigners, or *v*) the share of the elderly population, i.e. those aged 65 years and over. Some demo-economic targets were also fixed to be maintained approx-imately constant in the period: *vi*) the share of the working-age population

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[4] See <http://demo.istat.it/uniprev/index.html?lingua=eng>. The three scenarios – High (HS), Cen-tral (CS), and Low (LS) – provide, respectively: an increase of fertility from the current 1.4 chil-dren per woman up to 1.75 in the HS, or 1.6 in the CS, while it remains at 1.4 in the LS. In the meantime, foreign women's fertility should drop from 2.3 children per woman currently to 2.05 in the HS, 1.86 in the CS, and 1.65 in the LS. Mortality is assumed to be the same for Italian and for-eign residents. Some important increases are provided in life expectancy, especially in the HS and for the elderly population. Net migration reaches rapidly the annual level of about 240,000 in the HS, 195,000 in the CS, and 150,000 in the LS. Note that in all our exercises we used the CS trends provided for fertility, mortality, naturalisation, and sex-and-age distribution of net migration.

(20-64 year-olds), or *vii*) the share of the 'young' part of them (i.e. those aged 20-44 years), or *viii*) the ratio between the elderly (65+) and working age population (20-64), which is a proxy of the 'social security ratio', i.e. the ratio of paying workers to retirees in a pay-as-you-go pension system. The results are in Figures 2-4 and show the different levels attained in forty years according to the different hypotheses or targets.

Total population (Figure 2) is maintained in a range of about 19 million (from +9.5 to –9.5 million with respect to the population at the beginning of 2010) under the 'what if...' hypotheses and the 'constant foreign population share' target. The latter would reduce the population in Italy by 15% in forty years, as would the 'zero net migration' hypothesis. On the other hand, all the other targets would make the total population climb to more than 100 million, with an average annual rate of increase from +1.5% to +2.0%, whereas the recent increase has been around +0.5%. A zero-growth population is almost

Figure 2 – *Total population trends (million) under some projection hypotheses or demographic and demo-economic targets: Italy, 2010-2051*
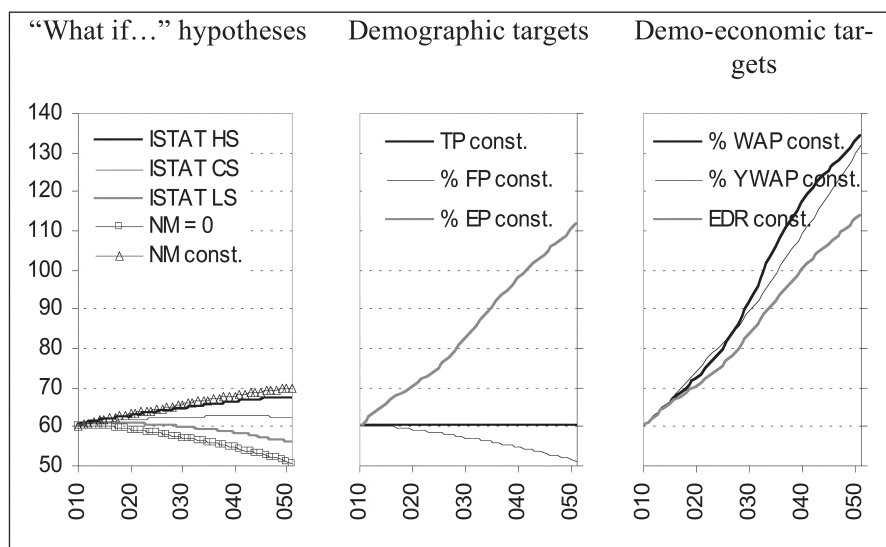
Legenda: CS = Central Scenario; LS = Low Scenario; HS = High Scenario; NM = Net Migration; TP = Total Population; % FP = Share of Foreign Population; % EP = Share of Elderly Population (65+ yrs); % WAP = Share of Working-Age Population (20-64 yrs); % YWAP = Share of Young Working-Age Population (20-44 yrs); EDR = Elderly Dependency Ratio (65+ / 20-64 yrs); const. = constant.

Notes: In the non-Istat Scenarios the Istat Central Scenario is adopted for the demographic variables different from migration change.

Source: Own calculations from Istat 2007 Population Forecasts updated by the Authors.

achieved by the Istat Central scenario, as by the corresponding target projection.

Notwithstanding that Istat projections provide a naturalisation rate (i.e. acquisition of Italian citizenship) ranging from 1% to 1.5% of the foreign residents a year[5], the amount and share of the foreign population largely depend on the net migration hypothesized. As shown in Figure 3, the share is maintained near or below the current level (about 7%) only in the 'zero net migration' option, along with the corresponding target projection[6]. The share is limited

Figure 3 – *Trends of the share of the population of foreigners (%) under some projection hypotheses or demographic and demo-economic targets: Italy, 2010-2051*
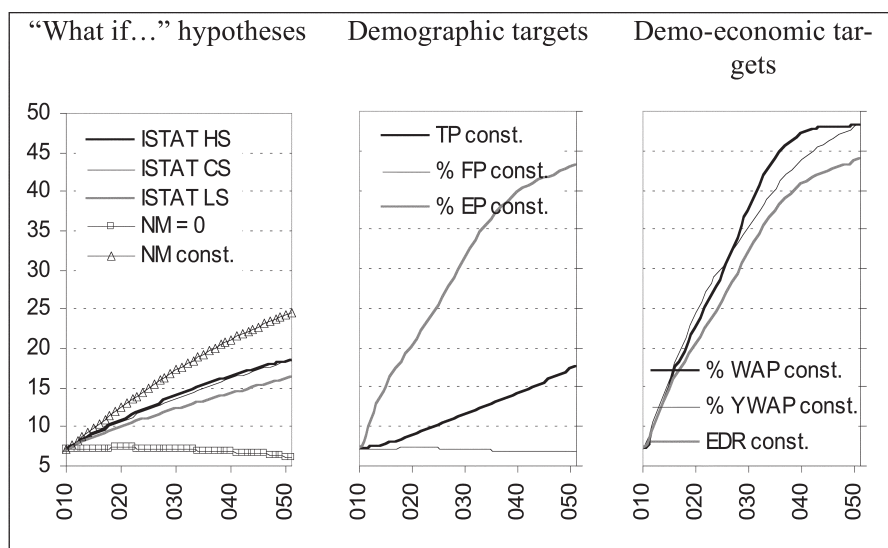
Legenda: CS = Central Scenario; LS = Low Scenario; HS = High Scenario; NM = Net Migration; TP = Total Population; % FP = Share of Foreign Population; % EP = Share of Elderly Population (65+ yrs); % WAP = Share of Working-Age Population (20-64 yrs); % YWAP = Share of Young Working-Age Population (20-44 yrs); EDR = Elderly Dependency Ratio (65+ / 20-64 yrs); const. = constant.
Source: Own calculations from the Istat 2007 Population Forecasts updated by the Authors.

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[5] We also adopted the same rates in our projection exercises. In the demographic projection, however, maintaining most of the migrants as foreign population means applying foreign fertility and mobility to them irrespective of the length of their stay in Italy or their migration history (i.e. if they are 'second generations' and born in Italy or had immigrated as young children).
[6] The concurrence of the Italian net migration and naturalisations prevented the share of the population of foreigners from being kept perfectly constant.

between one seventh and one forth in the other 'what if...' hypotheses and only in the 'constant total population' target. The other target projections make the quota of the resident population of foreigners become larger than 40%, whereas the two 'constant working age population' targets predict that almost half of the population residing in the country in 2051 would be foreign citizens.

Without any further immigration, the share of the elderly population (65 years and over) is likely to almost double in forty years from the current 20%. The same would happen if the share of the foreign population were maintained at the current level (Figure 4). On the contrary, apart from the specific target projection, all the demo-economic targets would maintain the share around 20%, or they would even reduce it in the long run ('constant share of working-age population' targets). All the Istat scenarios seem to be shaped so that the share of the elderly population follows similar paths, reaching 33% asymptotically before 2051.

On the opposite side, the projection targeted at maintaining the current share of the elderly population (20.2%) entails an average annual net migration of 1,051,000 in the next forty years (with a maximum of 1,534,000 in 2029), which should produce a final population of 111,4 million and a share of the foreign population at 43.1%. In return, the elderly dependency ratio (the 65+ year-olds out of the 20-64 year-olds) could be capped below 35%.

It may be interesting to summarise the changes provided in the 'what if…' hypothesis of a constant net migration numbering 330,000 a year, which approximates the average net migration resulting in the last eight years (see Section 2). Notwithstanding that this time period is deemed an exceptional one since two massive regularisations occurred during it, no particular tension has been registered in the labour market or in the society. Total population would increase linearly up to 69.8 million at the beginning of 2051, which corresponds to an annual rate of increment around +0.37%, lower than the one experienced recently. The foreign population would reach one forth of the total population, provided the scarce transition into the Italian population hypothesised for the long-term resident migrants and the number of young foreign people born or who grew up in Italy[7].

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[7] Foreign people who have been present in Italy for more than ten years are estimated in less than 650,000 at Jan. 1st 2007, according to the permits to stay. Currently (Jan. 1st 2010), we have about 573,000 foreign residents born in Italy (i.e., the 'second generation') and 933,000 minors, which largely include the second generation. In the future, under the constant net migration hypothesis, the foreign newborns should increase from 87,000 to 180,000 a year.

Figure 4 – *Trends of the share of the elderly population (65 years and over; %) under some projection hypotheses or demographic and demo-economic targets: Italy, 2010-2051*
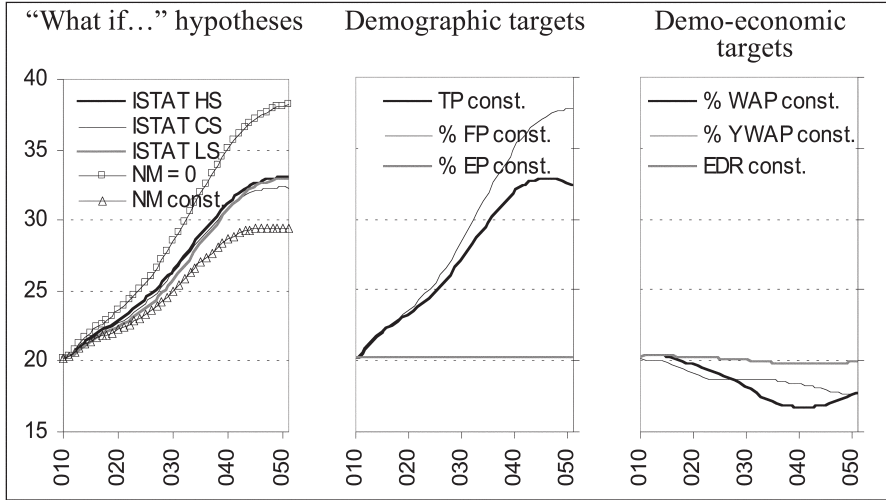
Legenda: CS = Central Scenario; LS = Low Scenario; HS = High Scenario; NM = Net Migration; TP = Total Population; % FP = Share of Foreign Population; % EP = Share of Elderly Population (65+ yrs); % WAP = Share of Working-Age Population (20-64 yrs); % YWAP = Share of Young Working-Age Population (20-44 yrs); EDR = Elderly Dependency Ratio (65+ / 20-64 yrs); const. = constant.
Note: In the non-Istat Scenarios the Istat Central Scenario is adopted for the demographic variables different from migration change.
Source: Own calculations from the Istat 2007 Population Forecasts updated by the Authors.

The share of the elderly population should stabilise at below 30% by the beginning of the 2040s. The share of the working age population should decrease asymptotically towards 52.5%. The overall result is that the elderly dependency ratio would worsen from the current 3 elderly people for every 10 in working age to 5.6, asymptotically after 2045. The ratio between the 'old' (45-64 years) and 'young' (20-44 years) working age population would hardly go higher than unity by the 2020s, when the large cohorts born in the 1960s and 1970s will be in their sixties and the small cohorts born around 2000 will enter the working-age[8].

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[8] We also run an iterative process towards population stationarity by starting from Jan 1st 2051 and maintaining the relevant rates and an annual net migration of 330,000. The population would attain a maximum of about 74 million after one hundred years, after which it would begin a very slow decrease. Furthermore, the share of the foreign population would peak in the 2080s at 29.4%. The share of elderly population would oscillate from 27.9% to 29.4% and head towards 29.3% in the very long run, while the elderly dependency ratio levels at 54.6%.

Figure 5 summarises the effects of different net migrations on two index-es of population aging measured in 2010, 2031 and 2051. The final results of some 'what if…' and targeted projections are also reported. For both indexes the effect appears important. For the share of the elderly population, the effect in 2051 ranges from almost doubling in case of zero net migration to +0.9 per-cent points if a net migration of one million a year could be sustained in the next forty years. It is interesting to note that a share of the population aged 65 years and over that is below one forth could be attained only with an average net migration higher than 610,000 a year, while an elderly share of one third would require 156,000 a year. The aging of the working-age population will suffer more from the passage of the baby boom cohorts than from the effects of dif-ferent net migrations, which, however, benefit the younger ages more. In fact, the differences are much more evident in 2031 than in 2051, when parity is not reached even in the case of zero net migration. In 2031, on the contrary, the 'zero net migration' hypothesis would multiply the current ratio (less than eight 45-64-year-olds for every ten 20-44-year-olds) for about 1.5. The index, how-ever, seems destined to worsen a little in the next forty years.

### 3.3 Fertility redressing and immigration against population aging

Migration from abroad is often opposed to the natives' fertility in contrast-ing population aging (UN, 2000; Alho, 2008; De Santis, this issue). The latter one is often preferred because rejuvenation is self-produced without any increase in the adult population and because longer times are needed by the additional members to reach old ages, whilst people immigrating in adult age would take less time to reach old age. However, in-migration is undoubtedly a faster way to increase the non-old population and, since it is mainly concentrated in working ages, it decreases the elderly dependency ratio immediately, without waiting for the twenty years necessary for newborns to enter the working age[9].

Given different constant net migrations in the 2010-2050 time lag, we cal-culated which level of the elderly share would be eventually produced according to different levels of Italian women's fertility[10]. Figure 6 shows that an average TFR of five children per woman would be necessary to maintain the current share of the elderly population in case of zero net migration. On the other hand, maintaining the average 2010-2050 TFR of the Italian women provided by the Istat Central Scenario (around 1.44) would cause almost the doubling of the eld-erly share if no migrants were admitted. No hypothesis here considering future net migration could maintain the current elderly share with no fertility increase.

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[9] For instance, in the current Italian situation, we should have a jump of the Italian women's fer-tility from 1.3 to 1.6 in one year to obtain 100,000 additional newborns, a number that can be attained easily by letting more foreign migrants in.

[10] Actually, the calculations were run by fixing the elderly share and deducing the corresponding Italian fertility level under diverse sizes of net migration.

Figure 5 – *Expected population according to the 2010-2050 average net migration: Italy, 2010, 2031, and 2051*
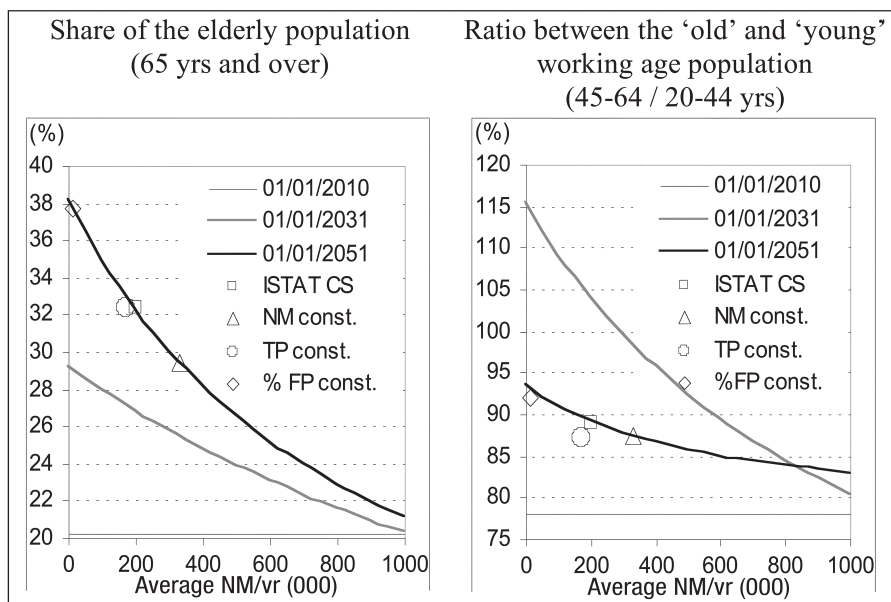
Legenda: CS = Central Scenario; NM = Net Migration; TP = Total Population; % FP = Share of Foreign Population; const. = constant.
Note: In the graphs, the 2051 points corresponding to the following scenarios or targets are also shown: 1) Istat Central Scenario; 2) 2002-2009 average net migration constant; 3) To maintain the total population constant; 4) To maintain the share of foreign population constant.
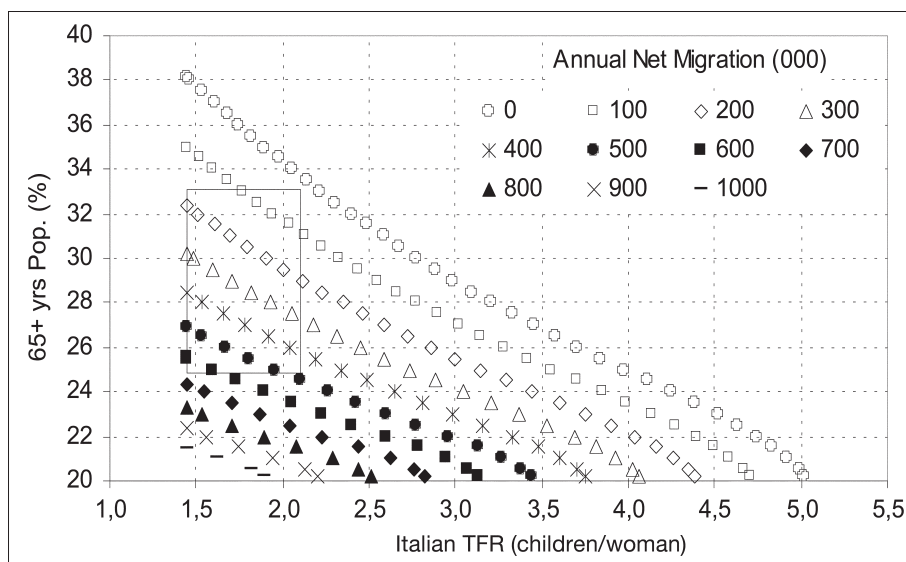*Source:* Own calculations from the Istat 2007 Population Forecasts updated by the Authors.

Clearly, most of the combinations are unsustainable because of either the large and fast increase required in the reproductive behaviour or the huge annual immigration entailed. However, a sustainable window was identified and drawn in the graph, in which TFR is maintained between the Istat CS level (1.44 children per Italian woman) and 2.1 (the cohort-replacement level) during the projection period. Let us also fix a range of 'sustainable' future aging in the share of elderly population (65+ year-olds) from one forth to one third of the total population. The former target would be attained eventually by a constant annual net migration of 644,000 if an Italian TFR of 1.44 were maintained, while 'only' 460,000 per year would be necessary in the case that the Italian women increase their fertility to the substitution level immediately. The elderly population at one third would be attained eventually by an annual net migration of 165,000 if the TFR of the Italian women were maintained at 1.44, but even in the case of an immediate jump up to the substitution level, a net migration of 14,000 each year would be necessary to obtain

the same result. A final result placed in the middle of the window - the TFR of the Italian women at 1.75 and the share of elderly population at 29%, which seem more attainable and likely solutions - would entail an annual net migration of about 288,000, which should produce a final population of 70.8 million in 2051 and a share of foreign residents of about 22%.

Figure 6 – *Expected share of the elderly population (65 years and over) by Italian women's fertility level (Italian TFR) and annual net migration: Italy, 2010-2051*

Note: The expected share of elderly population is reached no later than the beginning of 2051.
Source: Own calculations from the Istat 2007 Population Forecasts updated by the Authors.

4. CONCLUDING REMARKS AND POLICY ISSUES

Both our analysis of recent trends and hypothetical forecasts assert that in-imigration plays a pivotal role in reducing population aging in the short run, but cannot reverse it unless huge inflows are admitted. In the medium run (20-40 years), the indirect 'rejuvenating' effects of immigration may fade down as rapidly as the difference in reproduction levels reduces along with the migrants' length of stay. The first generation of immigrants shifts progressively into the old age, and if they have not returned home, they too contribute to the population aging in the receiving country. In the long run, the model of stable population with immigration prevails and the structure takes the shape of an exponential survivor function in the case of a growing population. In the case of a decreasing population, the native population dies off and the overall

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structure is influenced by the sex-and-age distribution of the constant inflow of migrants (Cerone, 1987: 435).

From a policy point of view, it is clear that no instant immigration can solve the population aging in the host area since the fading effects can be contrasted only by continuous inflows of new migrants. However, also the competing solution via an important fertility increase would entail a permanently increased number of annual births. In a structural perspective, immigrants could be considered as 'late births' or people born elsewhere who have been incorporated in the host population. From a strictly demographic point of view, there is no difference in whether those births happened within or outside the hosting region. Only the younger ages of the demographic structure would be affected. In a purely demo-economic balance, births outside the host region and the subsequent immigration of adult workers could even reduce the investments in earlier breeding and basic education of the migrants. However, the differences between the two solutions - increasing internal births vs. receiving more migrants born elsewhere - are not yet considered here for what regards the acceptance issues as well as the settling and integration problems[11].

Population aging has been and will be an inevitable process (Coleman, 2008) mainly linked at the national level to birth control (below-replacement fertility) and to the lengthening of human life (increased longevity). Our results, regarding the competing solutions between increasing internal fertility vs. letting important migration flows in, suggest that no one solution seems to be practicable alone (Avramov and Cliquet, 2005). After all, despite the fact that migration is a demographic phenomenon that is less stable and more difficult to forecast, future foreign immigration appears favoured from the joined effect of important push and pull factors. In particular, the exceptional growth of the working age population in Asia, Latin America and Africa will force the western countries to face a strong and growing migratory pressure. Present and future population policies in Italy, as well as in other countries with lowest-low fertility and fast population aging should combine incentives to increase fertility along with in-migrations by annually fixing quotas, developing re-settlement programmes and working towards effectively integrating the migrant population. This seems the only way to reduce the pace of population aging - not to reverse it - and to control its demographic consequences.

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[11] For instance, the immigrants to the Northwestern Italian regions in the 1950s and 1960s were born in the Northeast or in the far distant regions of the South, and now they are an integral part of the host population. The difference from the current foreign immigrants is only in the longer distance the latter ones run and the national boundaries that divide people by citizenship according to the historically varying shape of the countries. Difference in nationality, on the contrary, may be much more important in the integration process (although the cultural and behavioral habits were far different also between southern and northern people in the last-century internal migrations in Italy), but they should reduce greatly in the following generations if settlement opportunities and integration processes are carried out by the hosting communities.

Acknowledgements

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