Volume LXVII N. 2
Aprile-Giugno 2013

Rivista Italiana di Economia Demografia e Statistica

2

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SOCIETÀ ITALIANA DI
ECONOMIA
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Il presente volume è stato realizzato grazie al contributo dell'Istituto Banco di Napoli

VOLUME FUORI COMMERCIO – DISTRIBUITO GRATUITAMENTE AI SOCI

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INDICE

IN THIS ISSUE

This issue contains the guest papers of the 50th Scientific Meeting of the Italian Society of Economics, Demography and Statistics, entitled "Economic and social transformations to the beginning of the third millennium: analysis and perspectives", held at the European University of Rome on 29-31 May, 2013.

The meeting was opened by Professor Giovanni Maria Giorgi who underlined the connection of the arguments treated in the meeting with the particular social and economic context in which we live.

The issue begins with a paper by Gian Carlo Blangiardo that focus on the search of new equilibrium with respect to new demographic scenario.

Cinzia Castagnaro and Raimondo Cagiano de Azevedo analyze the changes (since World War II) in the age structure of the population, the perception of age and the phenomenon of aging and counter aging through the Censuses of the Italian population.

Romina Fraboni discusses the transition to adulthood in Italy to shed light on the dynamics between events in order to highlight the main changes related to generations and gender.

The paper presented by Domenica Fioredistella Iezzi describes the Italian femicide history from 2000 to 2012, and detects different profiles, using 1,000 ads from the National Agency Associated Print (ANSA), proposing a comparison of different clustering algorithms to select the best performance when we use unstructured data.

Matteo Mazziotta and Adriano Pareto address the problem of summarizing a set of socio-economic indicators by providing some general guidelines for the construction of a composite index.

The work proposed by Cristina Freguja gives an overview of these measures under a defined angle, the one that relates to the scarcity of money and material deprivation showing how the evolution of optimization techniques could support decision making at policy level.

The main aim of the paper written by Luigi Fabbris and Irene Sguotti is to give a contribution to the problem of measuring poverty using longitudinal data in a particular time span.

Piero Cipollone and Andrea Cutillo analyze the trend of demand and supply of university graduates and the wage college premium in Italy, as well as their effects on the university enrollment.

The aim of the work by Chiara Gigliarano is to provide a new class of mobility indices that takes into account the inter-temporal status movements over more than two periods of time.

Barbara Annicchiarico, Fabio Di Dio, Francesco Felici quantify the potential macroeconomic effects of various pro-competitive reform packages on the Italian economy using the Italian General Equilibrium Model (IGEM) of the Department of Treasury of the Italian Ministry of the Economy and Finance

The paper written by Fabio Bacchini, Maria Elena Bontempi, Cristina Brandimarte, Roberto Golinelli, Cecilia Jona-Lasinio and Carmine Pappalardo illustrates the model results for policy evaluation and the research activities that are ongoing to extend the domain of analysis of the model to the energy sector.

Cecilia Frale, Serena Teobaldo, Marco Cacciotti, Alessandra Caretta present a new mixed frequency methodology to estimate output gaps and potential outputs on a quarterly basis.

Claudio Ceccarelli
RIEDS Editor

INTRODUCTION TO THE 50th SCIENTIFIC MEETING OF THE ITALIAN SOCIETY OF ECONOMY, DEMOGRAPHY AND STATISTICS

Giovanni Maria Giorgi
SIEDS President

First of all I would like to thank Paolo Scarafoni, Rector of the European University of Rome, and the colleague Matilde Bini, head of the Economic area of the same University, who allowed the realization of the 50th Scientific Meeting of the Italian Society of Economics, Demography and Statistics, in a period that, from the economic and financial point of view, can be defined of "lean cows" both for our country and for the Italian scientific research.

Allow me also to extend, on behalf of myself and SIEDS, a heartfelt wish of fruitful work to Prof. Enrico Giovannini that today was supposed to be here with us to give a talk on "The national statistical system in front of the change in the country". However, we all know, he was appointed Minister of Labour and Social Policy and the new, heavy commitments do not allow him, today, to give a contribution to our scientific meeting. I want to thank him for the revitalization, in his previous position of President of the National Institute of Statistics, of the links between Istat and Scientific Societies, urging the latter to emerge from academic isolation and work actively in the society that surrounds them. Thanks Prof. Giovannini for what you have done and for what you can do as Minister for our country.

Keeping in mind the invitation of Giovannini, we all have to get out of our rooms to contribute to the "new modernity" that is pervading our lives and our society. This kind of "modernity" has been developed by countries (e.g. China, India, etc.) geographically far from us, and it derives from the technology directly and not from thought, feelings, dreams of men as it had previously happened when Europe created the so-called "modern world". As scholars aware of our past, we must try to make our contribution to avoid that the "new modernity" is only technical and soulless.

The topics to be addressed in these days want to be a contribution to what we have just said, namely an attempt to address the various demographic, social, economic and statistical aspects in the right way and not in an aseptic way.

We are experiencing a period of great change and also the Italian academic world is experimenting new ways and in particular a new way – with respect to the past - to evaluate scientific research.

As President of a Scientific Society, urged by many colleagues, after listening to the debates and discussions with scholars from different cultural background, I

urge you to ensure that this new way of proceeding is not limited to the enumeration of the citations of the scientific papers, because in that case this would be a decline, and not an improvement.

First of all, esteemed colleagues, we must not forget that a scientific result can also be quoted for reasons less noble than goodness, originality and intrinsic value of the result. In other words, we must not forget that scientific results - the so-called publications - are evaluated correctly only by reading and studying them because we cannot delegate this task to the so-called impact factor. Although this may seem self-evident, we should not forget it. And, more important, this fact should not be forgotten by the colleagues who have the delicate task of being members of the committees for access to or progression of university careers.

Now, since the topics to be covered are various and interesting in order to leave due time for discussion, I do not go beyond. In thanking you for your kind attention, I declare open the 50th Scientific Meeting of the Italian Society of Economics, Demography and Statistics.

Rome, 29th May 2013

ITALIANS OF TODAY AND TOMORROW: AWARENESS OF NEXT SCENARIOS AND SEARCH OF NEW EQUILIBRIUM

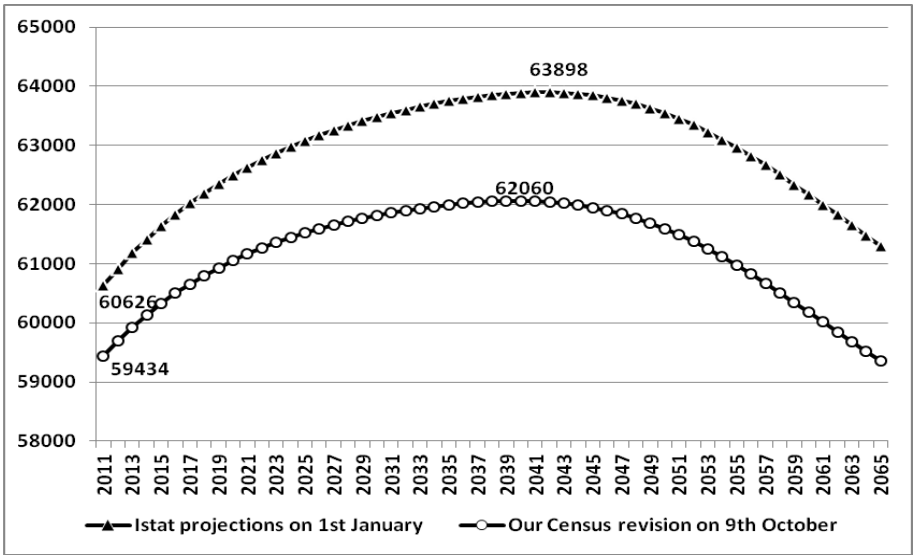
Gian Carlo Blangiardo

1. The demographic parabola

After twenty years of substantial stability, at the turn of the new century the Italian population has again started to grow: from 57 million residents in the 2001 census to nearly 60 million in the 2011 one.

The average annual growth rate 2001-2011 is increased to 0.42 per cent, as in the seventies, and the latest projections suggest a further growth periods for at least two/three decades.

Figure 1 – *Resident population in Italy: 2011-2065 (thousands)*

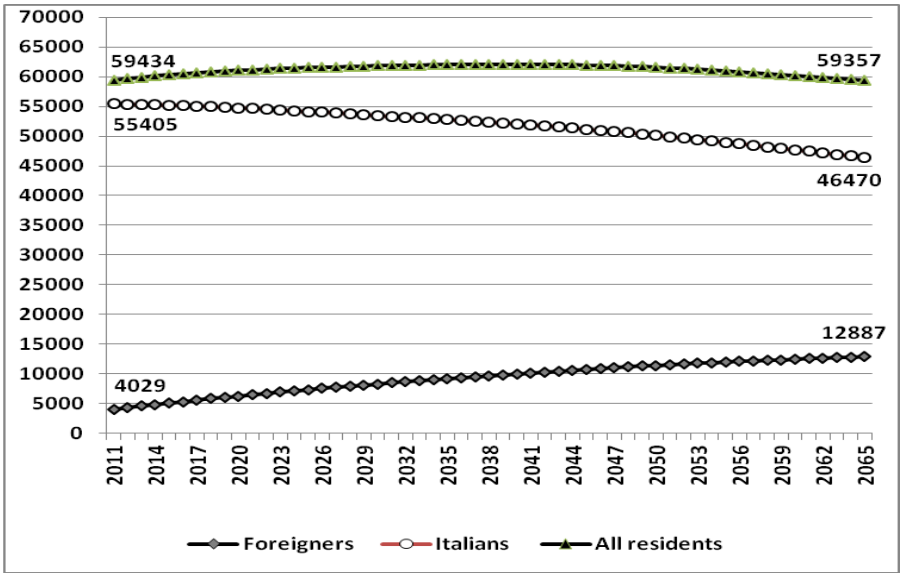


Source: Istat projections 2011 according to our census revision

Eventually, even after reviewing the estimates for the future, according to the corrections due to the outcomes of the last census, on 9th October 2011[1], the whole population will reach 62 million in 2036 and its maximum, only slightly higher, in 2040. By then the Italian population will begin to decrease and will be addressed to fall under 60 million habitants in 2062. So that, in half a century, the demographic parabola will be completed.

Actually it must be pointed out that the recovery of the Italian population can be entirely attributed to the support of immigration. The foreign residents were 1.3 million in the 2001 census and they rose to 4 million in 2011. Also in the next decades the Italian demographic vitality will be supported by immigration flows. In fact from 2011 to 2065 the Italian citizen residents will decrease by nine million units (from 55.4 to 46.5) while the foreign residents will increase nearly by the same amount (from 4 million to 12.9).

Figure 2 – *Resident population in Italy by citizenship: 9th October 2011-2065 (thousands)*



Source: Istat projections 2011 according to our census revision

However the contribution of foreign immigration will not be enough to ensure stability with respect to birth cohorts. It is expected that the symbolic annual

[1] As usual, the census count shows less residents than the Official statistics through the population register. In 2011 census the difference was about 1.2 millions. As a consequence, also the population projections, whose basic reference was the Population Register, must be reviewed (on reduction) according to the new census basis.

threshold of half a million births will not be reached, first moderately in the course of the next '20s, then more sharply from 2049. It is estimated that in 2064 the births will be lower by 9% than today. The growth of the foreign-born, destined to double (even if the corresponding population tripled!), will not be enough to offset the sharp decline in the Italian births:-127 thousand between 2012 and 2064 (-27%). Therefore it is not surprising that the biggest challenge facing the Italian population in the coming decades will be ageing: a phenomenon that in the past few years has already increased strongly and that in next scenarios, beside the falling of births, will be a consequence of a longer life (survival effect), and of the entrance of the "baby boom" generations, born after World War II, among the elderly (structural effect).

2. Towards an ageing society

The view of ageing is widely reflected in the comparison of the age pyramids of 2011 and thirty years later. In thirty years the group most represented in the age structure of the Italian population will be that of the seventies.

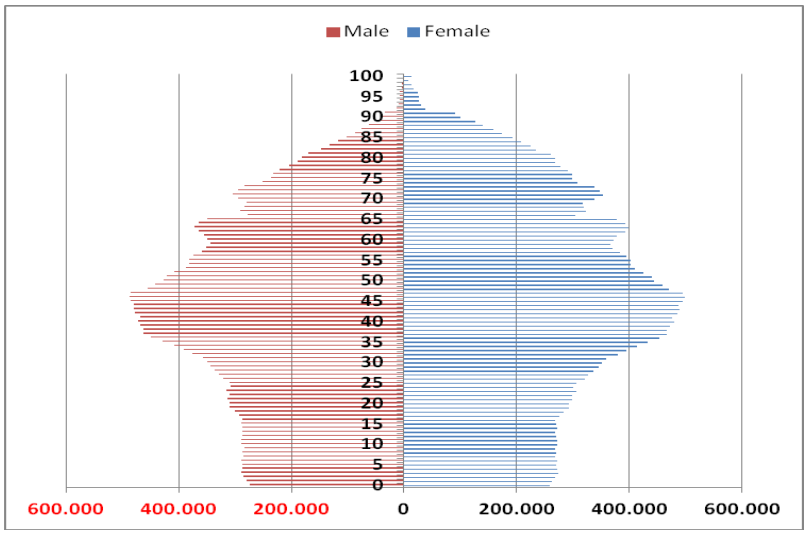
The dependency ratio D_R = [$Population_{65+}$ / $Population_{20-64}$] that, through the relationship:

$$GDP_{\text{for pensions}} / GDP_{\text{as a whole}} = [D_R] \{(AP) / [(GDP/Employed) * (Employed/Active)]\},$$

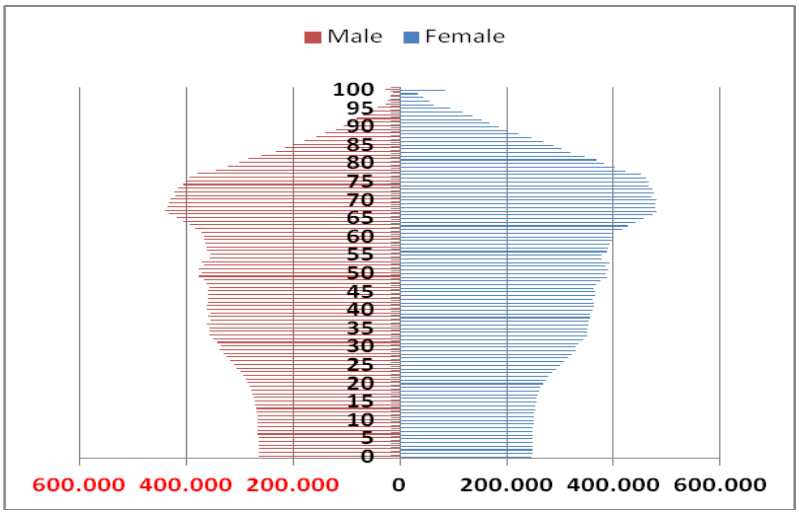
can be linked to the share of GDP absorbed by pensions ($GDP_{\text{for pensions}} / GDP_{\text{as a whole}}$) – together with the average amount of pensions (AP), the productivity per capita (GDP/Employed) and the employment rate (Employed/Active) – will tend to double in the next thirty years: from 35% in 2011 to 62% in 2041. This means that, *ceteris paribus*, the share of GDP for pensions will also double. Actually it does not realistic to believe that the strong increase of the ratio of aged to active population will be offset by a similar increase in the productivity and/or in the employment rates. Nevertheless no compensation would be possible through a reduction of the average level of pensions, so that the only valid response to the sharp increase in the relative weight of the elderly component could come from a parallel growth in economic development: a goal as much desired as difficult to achieve, nowadays more than ever.

However, the consequences of demographic ageing are not only related to the economic and social welfare. To pay pensions - not to mention the other great theme of survival of health care system- is certainly a major challenge but it is not the only problem connected to demographic change to be managed.

Figure 3 – *Resident population in Italy by sex and age, 9th October 2011*



9th October 2041

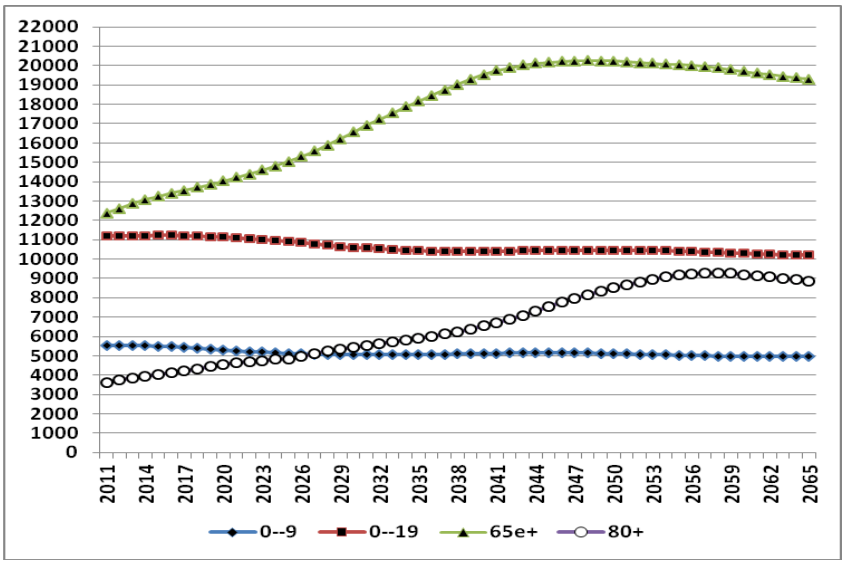


Source: Istat projections 2011 according to our census revision

It should not be underestimated even the new reality that is emerging in terms of the weight of generations and the relationships between them. While few years ago we have seen the overtaking "of grandparents on grandchildren" (since the beginning of the century the population aged 65 and over is greater than that with

less than 20 years), in a very near future we will see the overtaking of "the great-grandparents on great-grandchildren": since 2028 the population aged 80 and over will be largest than those with less than 10 years (CEI, 2011).

Figure 4 – *Resident population in Italy: old and young (thousand)*



Source: Istat projections 2011 according to our census revision

Therefore in a society destined to live similar transformations, building awareness of the new problems and foster the ability to face them with the tools and the attitudes that are more suitable become essential.

3. Four issues to deal

In light of the ongoing demographic dynamics that induce social, economic and cultural changes, some points are worthy of attention.

3.1. A productive potential more and more weak

The first point that should be addressed concerns the economic issue and, in particular, the analysis of the labour force potential with which the country will be called upon to face the new equilibriums in the coming decades.

According to the *potential demography* approach (Blangiardo 2012; Blangiardo and Rimoldi, 2012) the demographic asset that will shape the future of the Italian population - considering both the current mortality conditions (and the corresponding life expectancies) and the age distribution of the population - can be valued in nearly 2.4 billion life-years as a whole. The decomposition of this figure at different stages of the life cycle of the Italians highlights 1.3 billion years life to be spent in working age, a little over 900 million in retirement age and a little more than 100 million in school-age or training.

Actually the demographic structure of residents in the 2011 Italian Census (assuming 20-66 age group as active) provides a "potential" dependency rate of 69%, about double what you would get through the ratio of the population aged 67 and over (the elder) and the population 20-66 year old (the actives) .

Table 1 – *Demographic assets of the Italian population for specified stages of the life cycle according to the structure by age and sex at the 2011 Census and on 1st January 2031 (in millions of life-years)*

Target population	Steps of the life cycle			
	Education Age 0-19	Job Age 20-66	Retirement Age 67+	Total All ages
Residents at 2011 Census	116.3	1335.3	926.9	2378.5
Whose foreigners	11.9	127.7	66.4	206.0
Residents on 1st January 2031	111.5	1292.2	1146.1	2549.7
Whose foreigners	24.8	260.7	183.6	469.1

Source: Own processing on data Istat

On the other hand, no improvement can be expected in the future. In 2031, the demographic asset of the Italian population will have grown to 2.5 billion life-years, but the share to be spent working age will have dropped by 3.2%, while the share to be spent in retirement age will have risen by 23.6%.

Not even the contribution of the foreign population can be considered capable of modifying the signs of weakness of the productive structure of the resident population in Italy. In 2011, their age structure shows a "potential" dependency rate of 52%, destined to rise to 70% in 2031.

3.2. Problems of welfare

On the level of welfare in the scenarios for the future two aspects seem particularly important to merit careful consideration. The first concerns the

household transformations that are connected to the ageing process of the population.

Over the next twenty years, the population aged 85 and over shows, in the context of an increase of 1.2 million units, a rise of 600,000 singles: a condition which, in the course of old age, inevitably leads to frailty (physical and psychological) and dependence.

It is even more worrying to note that the growth of lonely old people is more intense for the male component (+102% for men compared to 62% for women), i.e. in correspondence of those who, very often, have less aptitude (and habit) to live in independent condition.

Table 2 – *Population over 85resident in Italy by household position*

	Single	Couple	Couple & children	Sole parent	Others	Total
Male						
2011	177	231	48	11	37	504
2031	359	465	96	22	77	1019
Female						
2011	696	165	24	68	215	1168
2031	1122	263	38	108	344	1875
Total						
2011	873	396	72	79	252	1672
2031	1481	728	134	130	421	2894

Source: Osservatorio Nazionale sulla Famiglia. 2012

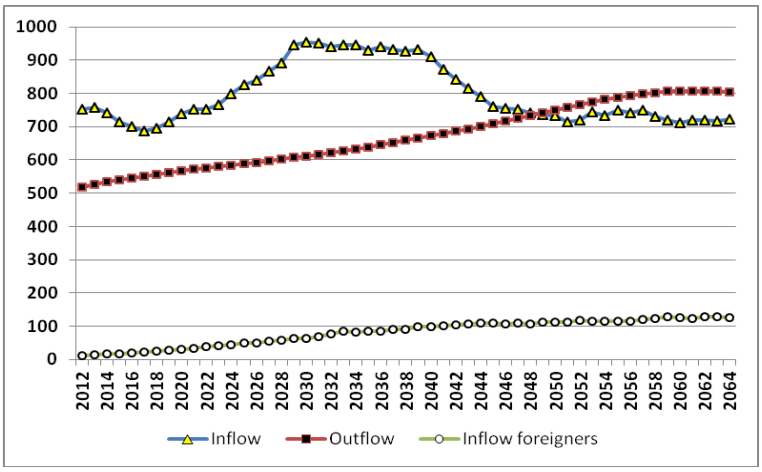
A second observation on the problematic aspects of welfare comes from the analysis of the process of growth of the elderly population. Considering the annual number of inputs and outputs from the population aged 65 and over, the former, up to about the middle of this century, will be much greater than the latter. The difference, now nearly 100,000 units, is going down in the next five years but then it will begin a rapid climb to reach nearly 400,000 units around 2030.

In this regard, it may seem surprising that the peak of inputs observed in 2030 (related to the baby-boom of 1965) does not show in the following years the expected decline that should be related to the fall in the birth rate after 1965. Actually, the flows input into the elder population will be stable above 900,000 units annually till 2040, because of the growing support by the foreign people who will reach age 65.

This contribution may be referred to as "ageing imported". In fact if we compare the expected flows - on the basis of birth 65 years earlier (and taking account of survival) - with the corresponding actual values, there is a constant imbalance (more flows observed than expected) that will arrive to exceed 200,000

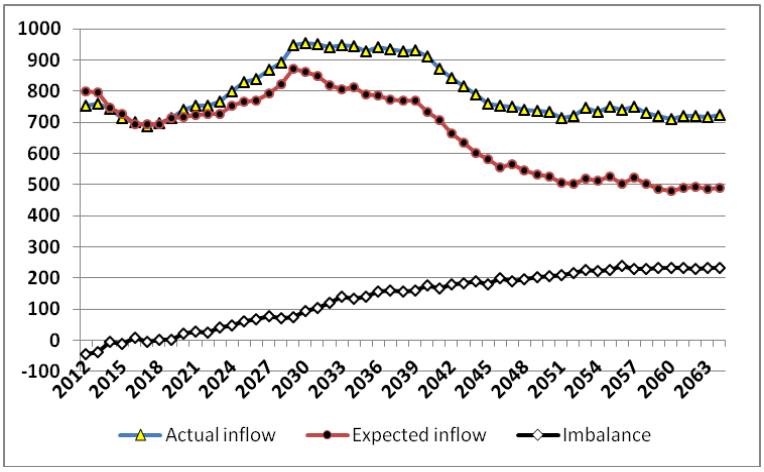
units annually. Such imbalance is higher than the corresponding inflow of foreign people 65 years old owing to the previous acquisition of citizenship by numerous immigrants that will reach the older ages as Italians.

Figure 5 –*Population flows over 65 in Italy: 2012-2064 (thousands)*



Source: Own processing on data Istat

Figure 6 – *Actual and expected inflows into the population over 65 in Italy:2012-2064 (thousands)*



Source: Own processing on data Istat

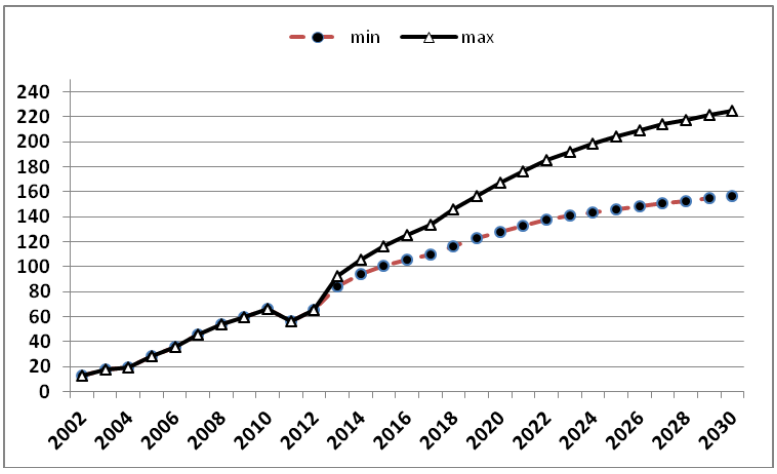
An important consequence of the "ageing imported" on the welfare system in coming decades is that it seems very likely that this new category of older people will have had a particularly difficult contribution to pension. These are often people who have had a regular job in mature age (normally with low wages), and therefore they could have paid contributions that are not sufficient to secure an adequate retirement. Eventually, it will be a task for the social security system (with costs on general taxation) provide them the necessary support to a dignity life.

3.3. The new Italians

The theme of the new Italians is now further considered as the third point of study of the socio-demographic change.

It should be noted that since the beginning of the century about half a million foreigners have become Italians and it is estimated that from a minimum of 2.3 to a maximum of 3 million will follow the same path within 2030 in the absence of legislative changes (Blangiardo, Menonna, 2011). On the other hand, the 50-60 thousand annual acquisitions that have been recently recorded are likely to be affected, even if the rules of naturalization should not change, by the progressive maturation of the right to apply for citizenship by a part of a growing number of foreign residents.

Figure 7 – *Acquisition of Italian citizenship recorded in 2002-2012 and estimated for 2013-2030 on unchanged legislation (thousands)*



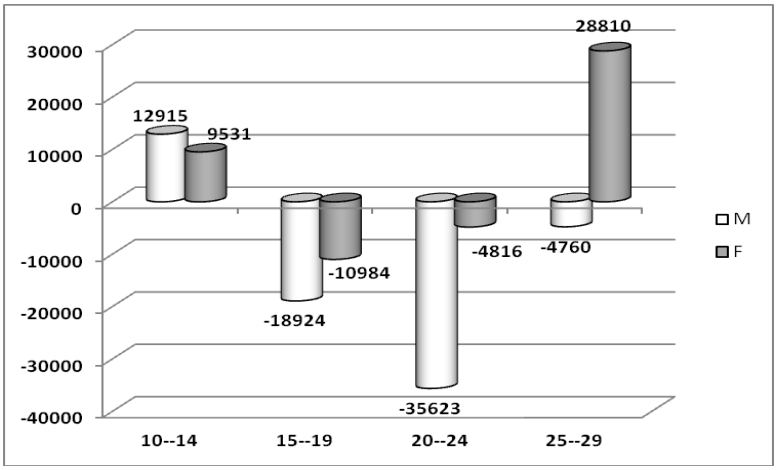
Source: Own processing on data Fondazione Ismu-Ministero dell'Interno

Further significant contributions will be available if some changes of regulation with respect to the granting of citizenship will be introduced. Appropriate simulations show that the reduction from ten to eight or five-year period of residence required for naturalization would result in an annual increase of citizenship requests granted amounted respectively to 12,000 and 28,000 units in the next five years and 5,000 and 13,000 in 2026-2030 (Blangiardo, Menonna, 2011). The acquisition of new citizens could grow further, until reaching well 257,000 units per year in the period 2026 to 2030 if *jus soli* for those born in Italy will introduced. The annual flow will be only slightly lower (244,000) if it is subordinate to the five-year residence at least one parent.

3.4. Lost young

Italy has become an immigration country but while thousands of people move towards its territory, an important flow of Italians, mostly young, go along the reverse path. The comparison between the populations with Italian citizenship at the time of the two most recent censuses emphasizes a significant number of missing units. If the Italian citizens aged 15-19 at 2001 census are compared with those 25-29 year olds in the 2011 census they show a reduction by approximately 30,000 units. And the unbalance rises to 40,000 if we consider the comparison between those aged 20-24 in 2001 and 30-34 in 2011.

Figure 8 – *Balance of young residents with Italian citizenship 2001-2011 by gender*



Source: Own processing on data Istat

This is in contrasts with the positive balance for the younger (10-14 year old in 2001) and women aged 25-29. But it should be considered that in the past decade 383,000 people (of which 56% females) have become Italians, by naturalization or marriage. This explains the surplus of women (the effect of becoming "Italian by marriage") and younger (the effect of "citizenship on the 18th birthday or acquired by the parents"), but also underlines how the balance in the two central classes is negative despite the contribution of young foreigners who have became Italian.
Eventually, considering also such contribution it can be estimated that the "net loss" of young Italians in the decade 2001-2011 goes well beyond the 100,000 units as a whole.

4. Conclusions

In a country that is going through a phase of demographic temporary recovery only due to the contribution of people from abroad, the open questions are still several and important. More than thirty years of fertility below the level of replacement left deep changes in the age structure of the Italian population that can hardly be erased. The demographic future of Italy demands new equilibrium in the economy and in society. We must avoid the illusion that immigration can magically solve every problem. The weakening of the productive potential and the growing demands on the front of the welfare state are two indisputable facts from which we should move to re-build a social project. A project that must be able to give an opportunity to two fundamental components for the future of Italy: the new Italians that - with or (still) without citizenship - provide an essential contribution to the economy and the social fabric, and the young natives. The latter are already a scarce resource that, as we have seen, paradoxically we risk losing.

Only if knowledge of demographic change will create awareness of the problems and move us into action, it will be possible to reach a new equilibrium capable of responding adequately to the challenges of the demographic change without lowering the quality of our lives.

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SUMMARY

The recovery of demographic vitality that, supported by foreign immigrants, has recently affected the Italian population seems to be oriented to run out, following a parabola that will have its maximum with 62 million residents estimated for 2036.

At the same time, changes in the age structure and population ageing will be consolidated and will produce significant changes in the economy, in the welfare state and in the intergenerational networks.

Trusting that migration can't be the magic solution to all our problems, it is necessary to take note of the emerging difficulties - of which the weakening of the productive potential and the growing demands on the front of the welfare offer eloquent examples - to build a new social project. In this sense, seem to enhance priority two components that are essential for our country's future: the "new Italians" (with or without citizenship), which provide an essential contribution to the economy and the social fabric, and the young natives: a resource already scarce that, through the resumption of emigration "of quality", we risk to lose more and more.

Only if knowledge of demographic change will create full awareness of the problems, so as to induce coordinated and effective actions, it will be possible, through new equilibriums, respond adequately to the challenges of demographic change without any negative impact on the quality of life.

Gian Carlo BLANGIARDO, Università degli Studi di Milano – Bicocca. giancarlo.blangiardo@unimib.it

AGEING AND COUNTER AGEING IN THE ITALIAN CENSUSES[1]

Cinzia Castagnaro, Raimondo Cagiano de Azevedo

1. Introduction

Resident population in Italy, according to the 2011 Census, amounts to 59,400 inhabitants and, more than 12,300 are elderly (aged 65 years and older). The aging process, that has been characterizing Italy for many years, is today a central issue of numerous national and international debates.

The current age structure evolution is an inevitable outcome of an effective birth and death control which have determined through the past decades, a significant increase of the elderly population

The action of these two forces, from the late nineteenth century to the present days has resulted on one hand, in the doubling of life expectancy and on the other in the fall by one-third of the average number of children per woman. These trends have made Italy one of the oldest countries in the world (149 people aged over 65 per 100 people aged under 15 according to to the 2011 Census).

Aim of this work is to analyze since World War II, the changes in the age structure of the population, the perception of age and the phenomenon of aging and counter aging through the Censuses of the Italian population.

The demographic data is sourced from the population censuses from 1951 to 2011 (resident population).

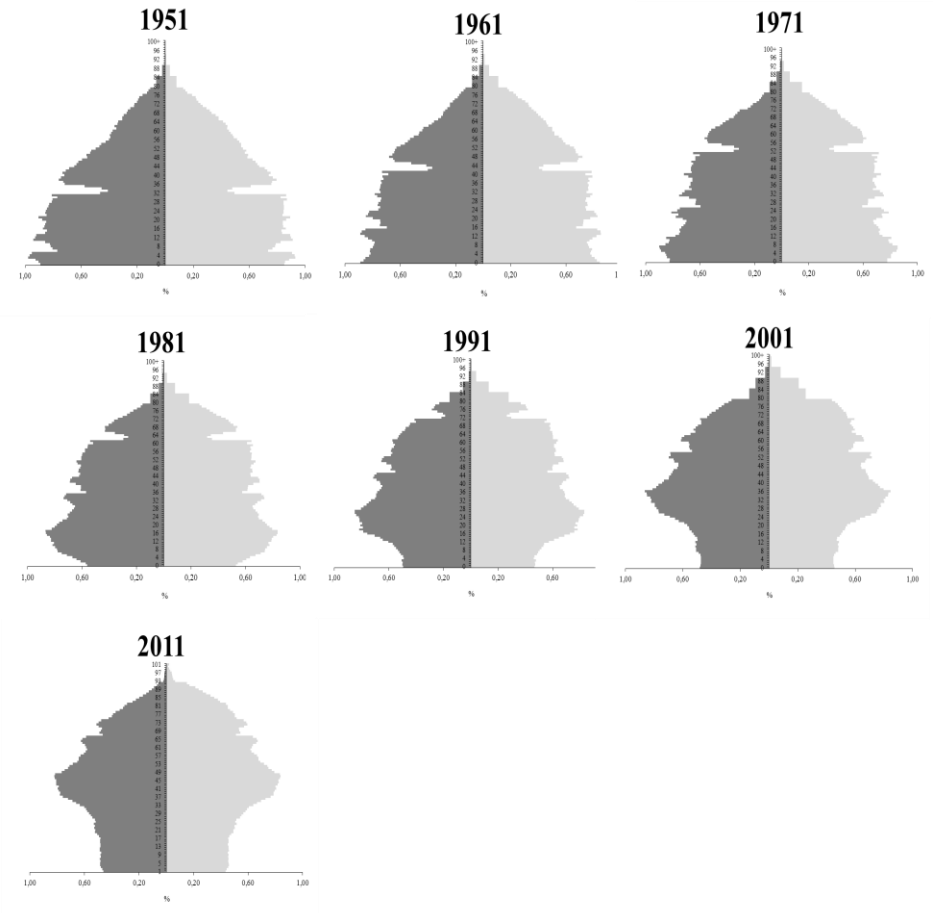
2. Aging and counter aging: the age pyramids

For a better understanding of the phenomenon, the following population pyramids compare, through the Censuses from 1951 to 2011 the age and sex structure of the population. What may by understood at a glance is the the transition from a pyramid which shape explains a national-state in the nineteenth

[1] Although the article is the result of the joint work of the authors, paragraphs 1 and 4 were written by Raimondo Cagiano de Azevedo and paragraphs 2 and 3 by Cinzia Castagnaro

century, with its wars and extreme poverty wounds, to a real reversing of the age pyramid, nowadays characterized by a thin bottom and a large at top.

Figure 1 – *Age pyramids at Census – 1951 to 2011 – Italy (percentage)*



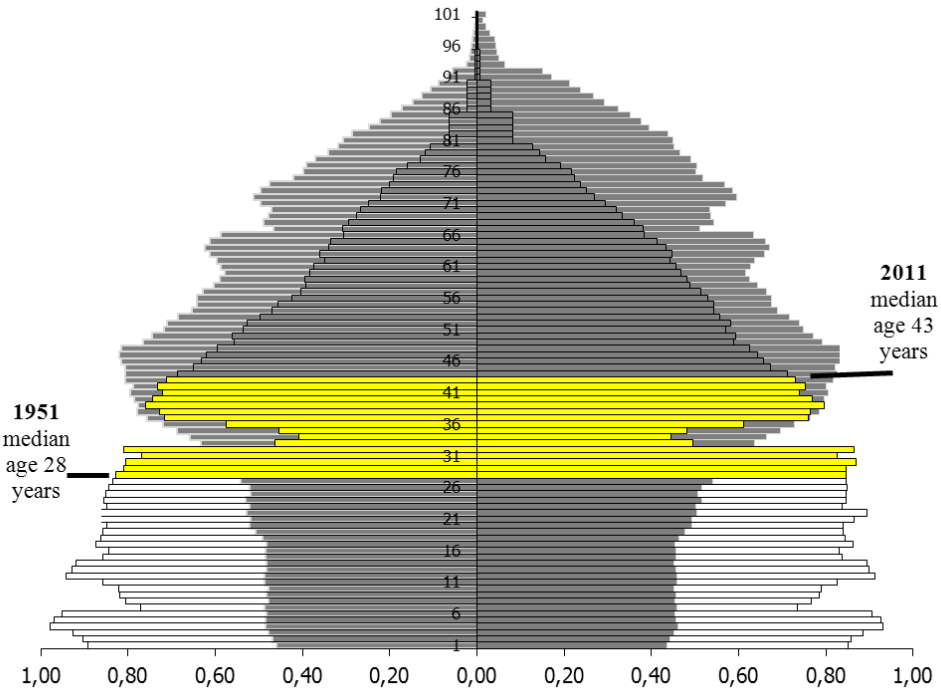
Source: Istat, Resident population at Census

The 1951 population pyramid shows the evident signs of World War I, in correspondence with the central age groups (30-35 years) and also shows the birth decline during World War II (age group 5-10 years), although in a much less evident way. The fertility decline and the increased mortality due to the two wars have marked Italy's age structure to the present days. The figure shows how the

shrinking in correspondence of these two classes moves forward in the pyramids in correspondence of the census dates.

It's also possible to point out the baby boom effect evident in the 1971 census population pyramid. An enlargement of the classes between 5 and 8 years shows this evidence due to a conspicuous increase of births in the mid-60s. The birth rate decline, which occurred straight after in the early 70s, has then left the signs in the following generations below the age of 30, which get progressively thinner.

Figure 2 – *Age pyramids at Census – 1951 and 2011 – Italy (percentage)*



Source: Istat, Resident population at Census

The 1971 pyramid shows two important aspects: the first that there has been a considerable lengthening of life, which has lead the classes of older age groups to weigh much more than the entire population, compared to twenty years ago. As a matter of fact, in comparison to the 1951 pyramid, the "over 65" in 1971 weigh on the total population 38% more. The second aspect shows the birth trends, and hence the age structure, of the younger generations. We may note the recovery of

births after the end of World War II (age group 20-25 years), a tendency to reduce the extent of successive generations as a result of a stabilizing birth, followed by the baby boom of the mid-60s (age 5-8 years).

The baby boom effects and the progressive decline of the birth rate, are increasingly evident in the pyramids after 1971, where the contrast between the relative abundance of the baby boom generation relates to a increasingly smaller base of the pyramids resulting from a continuous decline of the birth rate.

The pyramids of 1981 and 1991 show the origin and development of the complete demographic transition process. In 2011, the pyramid has a completely transformed structure, typical of those countries with a low birth rate and an increasing longevity.

A significant example of what we should change in the approach to the aging concept may be seen in the first and last pyramids of the observation period (see Figure 2). The example here focuses on the Italian population, but the same may be said for developed countries in general, and in particular for those in Europe. In recent years the phenomenon is spreading even in developing countries The pyramids show that until 60 years ago, the population was characterized by a high turnover of young population due to a high birth rate and a length of life that showed a modest condensation of the elder population. Today, however, the decline in the birth rate combined to a high life expectancy, have led to a very slow population turnover with a consequent condensation of the elder population. What is not easy to notice quickly is that this 'late' replacement produces also a rejuvenation of the population. There are in fact 15 generations that rejuvenate.

The median age, i.e. the age that divides the population into two equal halves, may be used as an indicator of population ageing. In Italy, in 2011, the median age was 43 compared to 28 in 1951; this means that, in the pyramid, 15 generations between 28 and 43 years old pass from the older population to the younger population in 60 years. Over 12 million people, which at the time would have been part of the 'older' population are today the 'younger'. So what we are going to observe is a counter aging, due both to the entry of immigrant populations, with a younger age structure and a more prolific reproductive behavior, and a rejuvenation of 15 generations. But how many are the elders today in Italy? If we consider the classical threshold of 65, the so-called elderly population, in the 2011 Census, amounts to 12,384,963 individuals, almost 21% of the total population.

Through the demographic indicators it is possible to notice on one hand, the imbalance between young population and adults, and on the other, the one between the young and old population. As it is clearly shown, the incidence of the old population on the total population is increased by 154%. in 60 years.

The National population projection (Istat, medium variant) indicates that the Italian population, in 20 years, will increase approximately another 4 million

elderly and therefore, more than one individual out of 4 will be 65 years and older (2030 data). The sixty-five male population can today count on an average of 6 more years of life, while women about 8.. According to the demographic 20 years projection, the male population, aged 65 can expect to live other 21 years old; and women 24.5 years.

Table 1 – *Summary indicators of aging in Italy – Census 1951 to 2011 and 2030*

Years	Elderly (65+)	Elderly threshold	Elderly (65+) %	Life expectancy Males	Life expectancy Females
1951	3.895.184	65	8,2	12,6	13,7
1961	4.827.416	65	9,5	13,4	15,3
1971	6.102.720	65	11,3	13,3	16,5
1981	7.485.126	65	13,2	13,6	17,3
1991	8.700.185	65	15,3	14,8	18,7
2001	10.645.874	65	18,7	16,9	20,7
2011*	12.384.963	65	20,8	18,3	21,9
2030	16.580.956	65	26,1	20,7	24,5

Source: Istat, Census data (1951 to 2011, de jure population) and National population projection by age and sex (2030).
Note: (*) 2010 Life table.

This phenomenon does not stop, in time, the increase of the population aged 80 and over (3.6 million in the 2011Census, three times higher compared to 1951) and of the centenarians (which in the last Census amounted to over 15,000 individuals, about 10 times more than in 1951), the so-called 'oldest old'.

With the evidence of this phenomenon, considering the threshold of old age at 65 is not an answer. In this scenario, where one is young up to 43 years, the conventional criteria of becoming old at 65 years (threshold that marks the entrance to old age), leads to the contraction of an aggregate of population fundamental for the country's balance: the adults.

As a matter of fact, life cycles articulated in young age, adulthood and old age, are yes valid for certain simplifications, but no longer correspond to the current needs. Based on the increased level of education, the precariousness of the labor market, the housing conditions, the postponement of a family creation and the meeting the needs between family and work. And again, young people become adults later in life and are older than in the past. If we keep the threshold of old age fixed at 65 years, the adults of today drastically narrow the time frame in which to study, get a job, have a family, ensure generational change, ensure the country's development, set aside money for a pension and finally, get old! While fifty years ago adults had more than 40 years to do achieve what listed, today they have less than half of that time.

With the evolution of the pyramid structure, chronological age, defined as the distance from the birth point, becomes increasingly less representative of the ages

of an individual, which are manifold and contribute to give different perceptions of themselves. On one hand chronological age becomes one of the ages, to which one can match physical, intellectual, psychological, cultural, political, medical ages etc. On the other hand, the perception of age, will range from feeling young, feeling good, feeling healthy, feeling useful, feeling active, feeling alone, etc. The phenomenon thus acquires a multi-dimensional character that requires the transition from the static consideration of a fixed threshold of old age at 65, to a dynamic one which assumes flexible thresholds of old age.

With the above considerations about the population's rejuvenation and the improvement of living conditions, always less often at the age of 65 you can observe those characteristics traditionally associated to old age. These changes, which have been recognized not only by the population, but also by science, literature, international organizations, lead us to rethink certain schemes that now require new institutional approaches.

The need to move the threshold of old age was formulated, on the other hand, also by the UN (2001) and the European Commission "*In the absence of migration, to maintain in 2050 the 1995 ratio of persons in working-age for each older person past working-age, would require increasing the upper limit of the working-age span to 77 years*" (Charter Italy, UN, 2001).

3. Dynamic aging thresholds

Because of the universality and irreversibility of this phenomenon, it is necessary to redefine the thresholds of aging through the construction of dynamic scenarios to comply with the real needs of the population and to absorb the impact that aging has on the socio-economic system of the country.

For the construction of dynamic scenarios the base year 1981 has been used. To overcome a definition of aging based on the registry criterion, remaining static in time, an interesting criterion could be to define a "dynamic" threshold: "elderly" people could be, for example, described as the one that to a certain age has defined time horizon. This horizon could be made equal to 10 years, based on the life expectancy of a 65 year old that had at the beginning of the century.

The Scenario n.1 (see Table 2), shows the "elderly" who are expected to live about 13.8 for men and 17.5 for women. Considering a dynamic threshold the "elderly" population, would amount to nearly 9 million people, (14.2% of the total). With the predictions to 2030, the 'old' population would correspond to those who have more than 73 years, with a constant impact on the total population in respect to the most recent observations

With this dynamic threshold definition, the total number of elderly would become increasingly smaller over the years: in particular, from 1981 to 2030 the proportion of elderly people increases; however, the gap would be much smaller than the statistical threshold of 65.

Table 2 – *Population ageing in Italy, 1981-2011 (Census data) and 2030*
I SCENARIO: - life expectancy at age 65 for males =13,8
- life expectancy at age 65 for female=17,5

Years	New elderly	New threshold	Elderly (elderly threshold and over) %	Life expectancy at age 65 (1981) Males	Life expectancy at age 65 (1981) Females
1981	7.485.126	65(M)-65(F)	11,2 (M)-15,2 (F)	13,8	17,5
1991	7.470.770	67(M)-67(F)	10,8 (M)-15,4 (F)	13,8	17,5
2001	8.158.402	69(M)-69(F)	11,7 (M)-16,8 (F)	13,8	17,5
2011*	8.957.791	71(M)-70(F)	12,1 (M)-17,8 (F)	13,8	17,5
2030	9.564.167	74(M)-73(F)	12,3 (M)-17,7 (F)	13,8	17,5

Source: *Istat, Census data (1981 to 2011, de jure population) and National population projection by age and sex (2030).*
Note: (*): *2010 Life table.*

Another hypothesis with a dynamic old age threshold variable over the years could be to imagine fixing the proportion of elderly on the total population at the beginning of the observation period (see Table 3).

Table 3 – *Population ageing in Italy, 1981-2011 (Census data) and 2030*
II SCENARIO: - the elderly to the overall population for males=11,2%
- the elderly to the overall population for females=15,2%

Years	New elderly	New threshold	Elderly (elderly threshold and over) %	Life expectancy at age 65 (1981) Males	Life expectancy at age 65 (1981) Females
1981	7.485.126	65(M)-65(F)	11,2 (M)-15,2 (F)	13,8	17,5
1991	7.470.770	67(M)-67(F)	11,2 (M)-15,2 (F)	13,8	17,3
2001	7.565.926	70(M)-70(F)	11,2 (M)-15,2 (F)	13,3	16,6
2011*	7.973.592	72(M)-72(F)	11,2 (M)-15,2 (F)	13,1	16,0
2030	8.505.505	75(M)-75(F)	11,2 (M)-15,2 (F)	12,8	15,7

Source: Istat, Census data (1981 to 2011, de jure population) and National population projection by age and sex (2030).
Note: (*): 2010 Life table.

In this scenario, due to the population increase occurred between 1981 and 2011 and the forecast to 2030, the proportion of elderly people maintained fixed to 1981, necessarily leads to a very marked increase in the threshold beyond which the elderly population is defined. It is observed that the age beyond which lies the 11.2% of the male population and the 15.2% of the female population has increased by 7 years compared to the base year, and is expected to rise of another 3

years over the next twenty years. But, if we consider a predefined number of elderly population (see Table 4), for example, 7,485,126 of 1981, the Italian population would be rejuvenated, as the proportion of elderly people would rise from 13.2% in 1981 to 12.3% in 2011 and 11.4% in 2030. This hypothesis might be dictated by a purely economic criterion, in which one could assume, for example, a fixed amount of social expenditure.

Table 4 – *Population ageing in Italy, 1981-2011 (Census data) and 2030*
III SCENARIO: the elderly (65 and over) =7.485.126

Years	New elderly	New threshold	Elderly (elderly threshold and over) %	Life expectancy at age 65 (1981) Males	Life expectancy at age 65 (1981) Females
1981	7.485.126	65	13,2	13,8	17,5
1991	7.485.126	67	13,2	13,8	17,3
2001	7.485.126	70	13,3	13,3	16,6
2011*	7.485.126	73	12,3	12,4	15,1
2030	7.485.126	77	11,4	11,5	14,1

Source: Istat, Census data (1981 to 2011, de jure population) and National population projection by age and sex (2030)
Note: (*): 2010 Life table

This scenario shows how the elderly threshold reaches 73 years of age in 2011. Another possible scenario, which we call the "recovery of the adult population," consists in not considering 'economically dependent' the individuals older than 65 years, but in speculating on the retirement benefits through the anticipation of cash flows. In this way the new population employed would consist of all individuals receiving transfers. This set is divided into three major groups:

a) a part of the young population (the size of which may vary depending on the assumptions of entry into the labor market);

b) a proportion of the population between 65 years old and the threshold that determines the final exit from the labor market (this component of the employed population will also be variable, depending on the assumptions underlying the exit from the labor market) ;

c) the total population aged over the elderly threshold.

The different hypotheses in terms of participation rates, size of the contribution period, thresholds for entry and exit from the labor market, suggest the existence of a demographic "treasure": under certain conditions, in fact, the introduction of part-time work in specific age groups, together with the redistribution of financial flows in the individual life cycles, may lead to a reduction of the employed population compared to the classical threshold at 65, resulting in a surplus of years of active life and consequently in a net saving in terms of outputs for retirement.

4. Conclusions

Demographic change has aging at the center of a deep debate of great in industrial because of the social and economic implications arising therefrom. From an economic point of view the impact on savings, consumption and investment through tax and pension; from a social point of view because of health care and life conditions. In a society in which people are young up to 43 years and retired at 65, the adult population becomes an "endangered" species, with a deep impact on the socio-economic system and welfare. In the medium term policy makers' intervention programs become more and more important to absorb the impact of the aging population on the different social spheres - health, social security system, human potential - and the improvement of health services and welfare.

The current path of the European Union towards a comprehensive strategy on aging is mainly based on the fight against age based discrimination, lifelong learning, as well as the late exiting from the labor market. The current Italian and European demographic structure, leads to the rethinking of the entire welfare system. This may be done by anticipating the retirement benefits for the young , by postponing the exit thresholds from the labor market in old age and anticipating the entry thresholds in adulthood. From a purely demographic point of view, the introduction of part-time jobs at the beginning and end of the career makes it possible to redefine in numerical terms, the dependent population. From a structural point of view, we can consider the population aged between 65 and 75 years as a 'new adult population', while the population between 25 and 40 years as an extension of what was once the 'old' youth. This means that, in this scenario, we should rethink the insurance scheme, assuming a pension system for the young 'old' and a first job for the old 'young'.

The message is that it would be desirable to suggest revisions in the institutional, taxonomic classifications, to rely on the renewable energy of the people we now call 'old' This should be associated with pension schemes in favor of the young population that is now in a phase of economic take off. In the medium term new institutional forms will become a constraint rather than a choice. It is self evident that population ageing poses major challenges to society, and, these challenges can only intensify in the next years.

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SUMMARY

The experience of demographic ageing produces in Italy the approach of the average age at death to the maximum age compatible with the current biological watch. That shows a double effect of compression and expansion of the life span. Expansion due to the increase in the number of persons still alive at the old age; and compression due to the same increase in the years spent in life by the whole population. If the median age of a population, in 60 years, moves approximately from 28 to 43 years, this means that fifteen generations of adult pass, in the same period, from the older to the younger part of the population. This is taking place in all the European countries and expresses the image of a counter aging: a biological rejuvenation associate to a demographic ageing. New definitions, policies and alternative scenarios are requested and suggested for a different life-cycle.

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HETEROGENEITY OF PATHWAYS TO ADULTHOOD IN ITALY

Romina Fraboni

1. Introduction

Different disciplines studying the human behaviour agree in recognizing that, since the second half of the XXth century, advanced societies experienced an increasing individualization of socio-demographic phenomena which led to a stronger diversification of pathways among individuals.

A prominent stage of the life-course, where most of the events deeply affecting people's well-being and their life chances occur, is youth. Completing education, being active on the labour market, leaving the parental home, living in couple and becoming parent are only few of the most important steps into adulthood that people may or may not experience during their twenties and thirties (post-adolescence and youth). While most people make these transitions at different ages and following several paths, some never make them (Cavalli and Galland 1993, Corijn and Klijzing 2001).

Many scholars believe that the social conditions of young people are changing rapidly, and that, above all, the ways of transition to adult positions are evolving deeply. Moreover, adulthood as a stage of life, that can be considered a strategic node at which to investigate shifts in the social structuring and the individual organization of the life course.

Major changes in the organization of the work and emerging demographic issues altered the nature of social risks. Today, the de-standardization of individual biographies introduces new forms of vulnerability making the "risk" a structural condition in each area of social life (Beck 2003). For example, early transitions are characterized by early independence and autonomy but, in some case (particularly in case of teen-age childbearing), may also hamper the completion of studies and increase the risk of poverty (Aassve et al. 2007).

The development of a theoretical framework and the introduction of new techniques for the analysis of the intricacies related to the transition to adulthood, have been accompanied by the acknowledgment of the relevance of adequate data-bases on life courses.

Unfortunately, cross-sectional data represent a limited source to establish if and to what extent the social conditions of today young adults have changed from the past (Lucchini and Schizzerotto 2001). Indeed, the social conditions of young adults cannot be adequately understood by just focusing on their position with respect to education, labour force participation, occupational outcomes and so on. Durations and pathways to those specific positions are even more informative of the occurred change (Baizán et al. 2002, Sironi et al. 2013).

2. Aim and hypotheses

The purpose of this study is to provide an overview of the transition to adulthood in Italy and to shed light on the dynamics of events in order to highlight the main changes related to generations and gender.

We examine non-renewable sequences concerning the following events: the end of study (i.e., if not anymore studying, the last available date between drop-out or attainment of the highest level of education in order to address the time of exposure to the human capital investment), the entry into the labour market (the starting date of the first job, distinguishing between the first permanent job and the first temporary job), the leaving of the parental home, the first union (distinguishing between unmarital and marital union) and the birth of the first child.

In this work the analysis of changes in the biographies adopts an exploratory perspective: timing, quantum and ordering of the main events related to the transition to adulthood by generation and gender are presented. Moreover, by means of the analysis of the trajectories we aim at studying the level of differentiation between cohorts.

We outline some hypotheses on the possible relations between the events of the life course and their change across cohorts:

1. the prolonged education affects the timing to first job. The rise of educational participation makes early teenagers more homogeneous as students and causes the postponement of the entry into the labor market. Afterwards, as increasing proportions of young people opt for the entry in higher, secondary and tertiary, education, then a rise in heterogeneity is expected;
2. the introduction of flexible forms of job (atypical workers) determines increasing differentiation of experiences in the most recent generations (timings of transition and states occurred);
3. the different degree of female participation in the labor market (since some of them follow the breadwinner pattern, some have a limited or precarious participation and some others are more work oriented) determines greater heterogeneity;

4. the existence of cultural factors and normative constraints about timings contrast the diversification of family experiences, thus a limited growth of heterogeneity across cohorts is expected.

3. Method and data

Events are the basic units of the life course; experiencing an event marks the transition between two states. In a first stage, Kaplan-Meier estimates of the median age (timing) at each event under study are shown. These events are considered markers of the transition into adulthood and are analysed separately for men and women and by birth cohort. The aim here is to describe the general trends across cohorts in the chronological ages at which the various steps towards adulthood took place in the individual life courses. Moreover, the proportion of people that has experienced a certain amount of steps (quantum) by a given age (for instance age 30) is informative about the major changes due to the shifts in timings.

As a second stage, we study the overall changes occurred in biographies up to a certain age, regardless of the ordering of the events. In this case the aim is to compare birth cohorts and genders in order to highlight to what extent the levels of heterogeneity in two major domains - economic independence and family formation - have grown. Particularly, we refer to the state distributions and we build on the index of heterogeneity at each age.

Finally, the focus is on the chronological order of events to identify the degree of de-standardization from traditional paths and the spread of more innovative behaviours. This requires a joint analysis of the two above-mentioned trajectories.

To that aim, individual life-courses are decomposed according to the events under study concerning the transitions of states for the education, work and family.

In this study we observe individuals who may experience k non-renewable[1] events e_i $i=1,...,k$ within an observation window (e.g. first job, first union, first child, etc.). Recurrent sequences allow taking into account the duration of each event and the ordering of events. Time is assumed to be measured in discrete units (in particular, we adopt monthly units in this work).

For a given individual i and event e_k, we denote by $y_i^{(k)}(t)$ the state of i at time t for $t=1,...,h,$ with h finite representing the observation window. Specifically, $y_i^{(k)}(t)$ takes 2 values, namely 0 and 1, respectively before and after the occurrence of the

[1] During the life course it is possible to experience the same event more than once. As an example having a baby, marrying … can be lived more than just once. However, all renewable events can be shifted into non-renewable events when we take into account the order of such events (having the first child is non-renewable, as well as having the first marriage).

event, i.e. if e_k occurs at time t_0 then $y_i^{(k)}(t)=0$ for $t<t_0$ and $y_i^{(k)}(t)=1$ for $t\geq t_0$. Furthermore, we denote by

$$y_i^{(k)}: \quad y_i^{(k)}(1) \rightarrow y_i^{(k)}(2) \rightarrow \ldots \rightarrow y_i^{(k)}(h) \tag{1}$$

the complete life course of i with respect to e_k . It is also possible to consider the joint sequence[2] as a concatenation of single sequences. Thus, if we study k events, the number of states characterizing each individual at a given time of the life-course equals 2^k. We finally define a domain as a subset of events all having to do with a specific aspect of the life course. Since the number of states increases exponentially with the number of events under study, we focus on individuals aged 35 or more and observe the occurrence, between age 15 and 35, of the following events on a monthly time scale (240 points in time):

Domain 1: economic independence
- S. end of study (attainment or drop-out)
- LT. first temporary job
- LP. first permanent job

Domain 2: family formation
- H. leaving of the parent home
- M. first marriage
- U. first consensual union
- C. birth of the first child.

Thus, for each individual we build two vectors describing economic independence and family status, where each element of the vector represents the status occupied under that domain in a specific month and it makes possible studying the degree of differentiation of the states by age and stratification of the population under study by means of the following measures:

a) States distribution at a given age
b) Entropy or degree of heterogeneity: it takes 0, in case of minimum heterogeneity, i.e. all individuals share the same status, while it takes the maximum value (log(s)) if all individuals are equally spread over different states s:

[2] It has been argued that sequence data can be studied according to the atomistic or the holistic approach. In the former case, only the state ocupied by the individual at a given point in time is of interest, while in the latter the complete history of states up to a given time is considered. Moreover, the time perspective can be static, when it only focuses on one point in time, or dynamic when different points in time are considered (Billari and Piccarreta 2005).

$$E_t = -\sum_{j=1}^{s} p_{tj}.\log(p_{tj}) \quad (2)$$

where p_{tj} is the proportion of individuals occupying state j at time t.

These trajectories are then reassembled in a comprehensive analysis of the order of events that aims to highlight the main changes between typical and de-standardized sequences regarding the two paths simultaneously.

We build data on sequences of states using the Multipurpose households survey on "Family and social subjects", lead by Istat in 2009. This survey collects retrospective information regarding union, fertility, education and job histories on a sample of 24,000 national representative households, for about 60,000 individuals. Data are representative at regional level of analysis (Istat 2006).

The study window starts from the exact age of 15 and ends at the exact age of 35, in a monthly time unit (a length of 240 months). In order to observe the status occupied at the same age by men and women of several generations, we select people aged 35 and more at the time of the interview[3].

4. Analysis of results

4.1. Timing

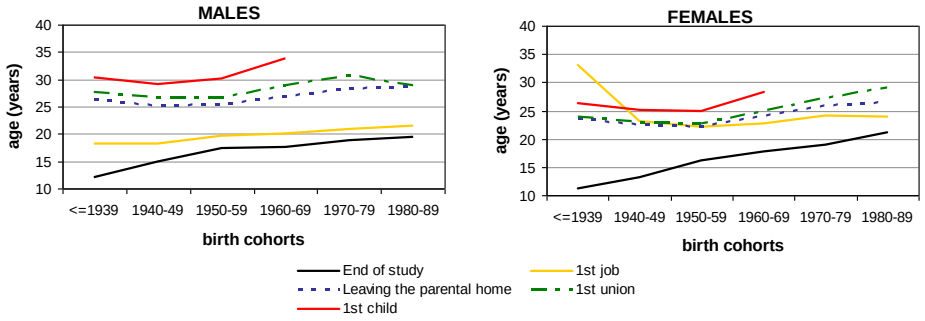
Over the last century, the expansion of the school system and the steady lengthening of the education stage are well witnessed from these data that show a monotonic increase in the age at the end of study (Figure 1). Moreover, since 1960, the female increase in the median age at the end of study has meant a switch from negative to positive age differences between women and men.

The spread of higher education and, consequently, the growth of the age at the study completion, implies a delay of the age at first job experience: the two events are strictly connected as they both shift upward monotonically and the age at first job is systematically higher than the one at end of study. Indirectly, it emerges that social norms and constraints shape the entry into the labour market, once the educational stage is over[4]. The positive age difference between first job and end of study is relatively higher for women than for men (on average 4 versus 2 years respectively). The gap reduction between education and entry into the labour market is mainly due to the increase in the age at end of study.

[3] Individuals belonging to the youngest ten-years cohort have been censored at the age at the interview of the youngest individuals of that cohort. Therefore, as an example, in the 1970-79 birth cohort the trajectories are observed up to age 30.

[4] It should be noticed that the exceptionally high age at first job for women of older birth cohorts is due to the very low proportion of working women.

Figure 1 – *Median ages at selected events by sex and birth cohorts. (Kaplan Meyer estimates).*



Source: Multipurpose household survey on Family and social subjects (Istat, 2009).

Changes across generations are also due to a different regulation of the labour market. As for the type of contract at first job, recent labour market reforms have implied rising proportions of atypical workers (short-term employees, consultants, collaborations). Therefore, especially the youngest cohorts have been involved in atypical jobs: 44,6% of people who ever worked born in the '80s had an atypical job at entry into the labor market; the same condition was shared by 31,1% of workers born in the '70s, by 23,2% of those born in the '60s and by about 16% of those born in the '40s. Remarkable gender differences show that atypical workers are more spread among women and people with tertiary education.

As for the process of leaving the parental home, it emerges a U-shaped trend across birth cohorts. Strictly following the overall trend of marriage timing, the median age at leaving the family of origin has decreased first and increased afterwards. The time lag between leaving the parental home and first marriage is increasing across cohorts especially for men (a set of different reasons for leaving emerges: cohabitation, work, autonomy).

The median age at first union is systematically higher than the age at first job and lower than that at first child. Thus, at least at an aggregate level, people get married only once they find a job and become parents after a stable relation. In a sense, people act respecting already existing social norms. A relevant change among generations emerges as well. Indeed, the family formation process is characterized by U-shaped changes in the timings of major events: older cohorts married and had a baby later than people born during the '40s and '50s. The youngest cohorts are increasingly postponing the occurrence of these events, especially the birth of the first child. There, the gap between age at first union and at first birth is increasing. This is extremely important for men where the age at

first child reached about 33 years for the generation born at the beginning of the ‘60s; moreover, data suggest an upward trend of the survival functions. Again, the trend shows a U-shaped shift in the timing of first child with increasing postponement for younger birth cohorts. Women have similar pattern but at lower levels. As shown in the previous steps to adulthood, where the cohorts born during the ‘40s and ‘50s had lower ages at leaving the parental home and at first union, also timing to first child is lower for these same cohorts than the other ones. Overall, these cohorts were able to take advantage of favourable economic conditions, i.e. characterized by rising employment rates while, afterwards, a prolonged postponement of parental roles emerges clearly for the youngest cohorts.

The most recent cohorts are characterized by increasing school leaving age, delayed entry into the labour market, together with the increasing flexibility (and insecurity) of job, and these factors, together with the persistence of social norms regarding the right sequence among events of transition to adulthood, result in a shift onwards in the timing of first union and first child, especially for men.

In sum, timings of the process to adulthood have changed deeply across cohorts according to two different patterns. On one hand, the process of economic independence where education and first job are both characterized by monotonic increases in the median ages; on the other hand, the steps towards family formation reflect the delay in education and work and show the U-shaped pattern of the median ages. At the aggregate level, timing of transitions reflect the contextual conditions and show that individuals respect social norms.

4.2. Quantum

As a consequence of the shifts in the observed timings, the proportion of people experiencing a certain amount of steps in the transition to adulthood by a given age has deeply changed. Considering the proportion of individuals with at least one family event (such as leaving the family of origin, entering the first consensual union, having the first marriage or the first child) by a given age, a change in the path across cohorts emerges, especially concerning those ages where typically the majority of the events took place. Indeed, a very small proportion of young men experienced a family event before their 20th birthday; less than half of them experienced it before age 25; on the contrary most of them had a family event between their 25th and 30th birthday. However, this proportion reached a maximum among men born in the ‘40s (about 80% of them had at least one family event by age 30) and it declined steadily afterwards (almost 60% for men born in the ‘70s). In the same way, but with a certain time lag, an increasing proportion of women experienced a family event before age 25 until cohorts born in the ‘50s

(about 75%), while, afterwards, a decline started (less than 50% for women born in the '70s). The shifts in the proportion of people following a certain trajectory have changed also in relation to each different event of the transition to adulthood. As an example comparing two birth cohorts of women (table 1) - those born in the '40s - the post world war II ones - and those born in the '70s - approximately daughters of the first group -: it emerges clearly the increase in the proportion still at home, or unmarried or, even more, without children by the 30th birthday both among men and among women. On the contrary the proportion of women with a consensual union by age 30 has risen up to 18% and 16% for women and men born in the '70s respectively.

Table 1 – *Proportion of people having experienced one of the family event at exact age 25, 30, 35 by birth cohort and sex. (Kaplan-Meyer survivor functions)*

	Left the parental home	Had the first union	Had the first marriage	Had the first child		Left the parental home	Had the first union	Had the first marriage	Had the first child
	MEN					WOMEN			
					<=1939				
by age 25	0.61	0.99	0.76	0.89		0.37	0.99	0.43	0.58
by age 30	0.26	0.99	0.33	0.53		0.15	0.99	0.19	0.30
by age 35	0.11	0.99	0.14	0.27		0.07	0.99	0.12	0.19
					1940-49				
by age 25	0.51	0.99	0.68	0.85		0.28	0.98	0.33	0.50
by age 30	0.17	0.98	0.25	0.45		0.10	0.98	0.13	0.24
by age 35	0.09	0.97	0.13	0.26		0.06	0.97	0.09	0.15
					1950-59				
by age 25	0.53	0.97	0.67	0.83		0.27	0.97	0.33	0.50
by age 30	0.22	0.95	0.31	0.51		0.12	0.95	0.16	0.26
by age 35	0.12	0.94	0.18	0.32		0.07	0.94	0.11	0.16
					1960-69				
by age 25	0.61	0.96	0.80	0.91		0.43	0.95	0.52	0.68
by age 30	0.32	0.92	0.48	0.68		0.20	0.91	0.29	0.42
by age 35	0.18	0.87	0.30	0.47		0.10	0.88	0.19	0.26
					1970-79				
by age 25	0.67	0.94	0.90	0.95		0.55	0.91	0.70	0.81
by age 30	0.40	0.84	0.66	0.81		0.25	0.82	0.44	0.57
by age 35	0.22	0.77	0.43	0.57		0.13	0.76	0.28	0.34
					1980-89				
by age 25	0.71	0.93	0.94	0.96		0.59	0.89	0.80	0.85

Source: Multipurpose household survey on Family and social subjects (Istat, 2009).

The postponement effect is even clearer when considering the level of education. If age 35 is taken as a threshold, only 50% of tertiary educated women were mothers against 70% of low educated ones. Moreover, the fertility gap at age 35 between highly educated women and low educated ones has increased: from about 20% for women born in the '40s, to more than 30% for the youngest

generations, especially due to the decrease in fertility among more educated women. Thus, *ceteris paribus*, the increase in the average age of education has pushed women to stay at the parental home longer, postponing their entry into a couple relationship and the reproductive life (Guarneri et al. 2013).

4.3. Changes in the trajectories

The monthly distribution of the states, regardless of the ordering among events in the transition to adulthood between ages 15 and 35, is presented here according to two major trajectories.

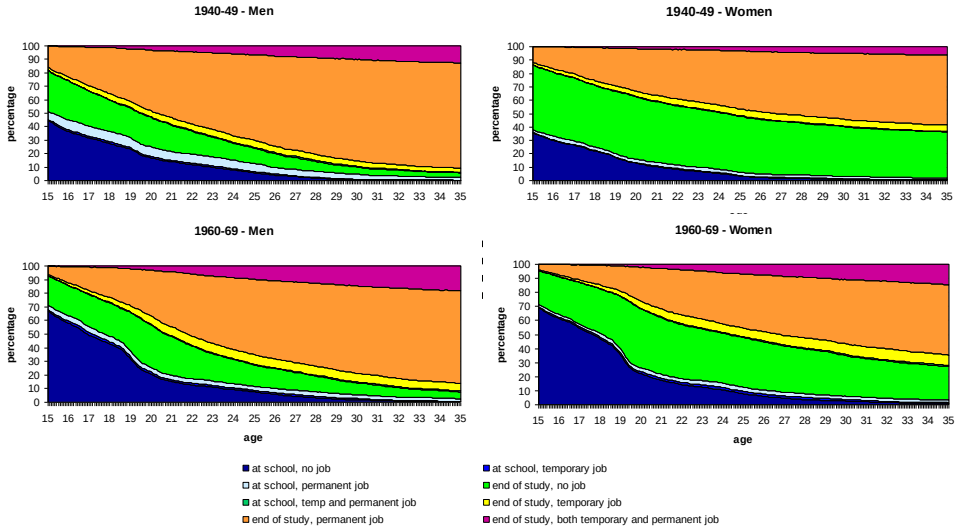
a) economic independence trajectory

The analysis of this trajectory aims to provide an overview of the changes occurring on the educational and work domain across cohorts (Figure 2). First of all, the proportion of people at school and with no job experience up to age 20 increases by cohort (blue area): from 17% to 21% to 27% of men born in the ‘40s, ‘60s and ‘70s respectively, and from 13%, to 22% to 33% of women. As a consequence, the proportion of women that ended education and never had worked before age 30 (green area) declines from 37% to 29% to 24% for the same cohort respectively; this proportion is only around 8% for men, regardless of their birth cohort.

The traditional pattern - where a standard job starts when education ends - declined too (orange area), whereas the experience of atypical jobs increases (yellow area). Indeed, at their 30th birthday, 75% of men born in the ‘40s has had a permanent job while this is true for 65% of men born in the ‘60s and for 59% of those born in the ‘70s. At the same time, those experiencing precariousness before age 30 rise from 4 to 9 % of men born in the ‘40s and ‘70s.

A much lower proportion of women has experienced a job by age 30, yet in atypical positions. Permanent jobs among women declined from 49% to 40% of the birth cohorts of the ‘40s and ‘70s respectively and, at the same time, atypical jobs were spread among 5% to 11% of women.

Figures 2 – *People aged 35 years and more by economic independence states distribution, sex, age and birth cohort.*

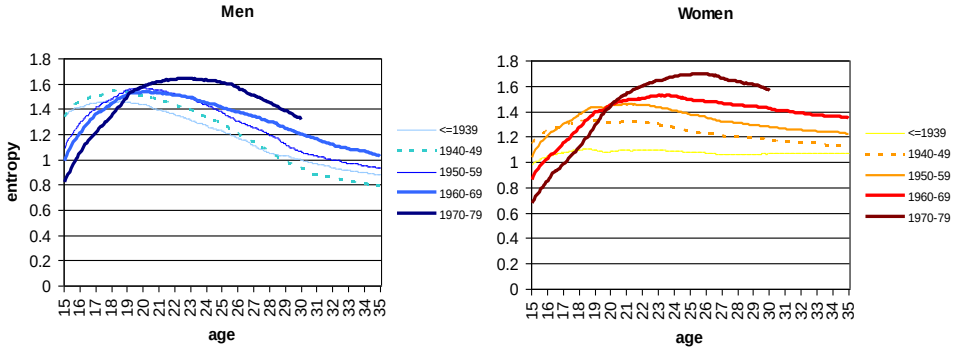


Heterogeneity in economic independence

The increasing individualization of trajectories implies a rise in the level of heterogeneity too, and viceversa, the standardization of life courses implies a decline in the level of heterogeneity (Figure 3). From the analysis of the monthly distributions of states concerning the end of study and the first job it emerges that the overall age pattern of the heterogeneity index is pretty similar among cohorts, especially for men, while women underwent a process of increasing diversification of trajectories.

More specifically, more recent birth cohorts show higher levels of standardization of their life courses between age 15 and age 20, mainly as a consequence of prolonged school attendance. Afterwards, a gradual change by cohorts of the heterogeneity index appears: it highlights the increase in the ages at which the highest level of dissimilarity is reached and the age span where this keeps persistently high.

Figure 3 – *Entropy in economic independence by sex and birth cohorts.*



b) family formation trajectory

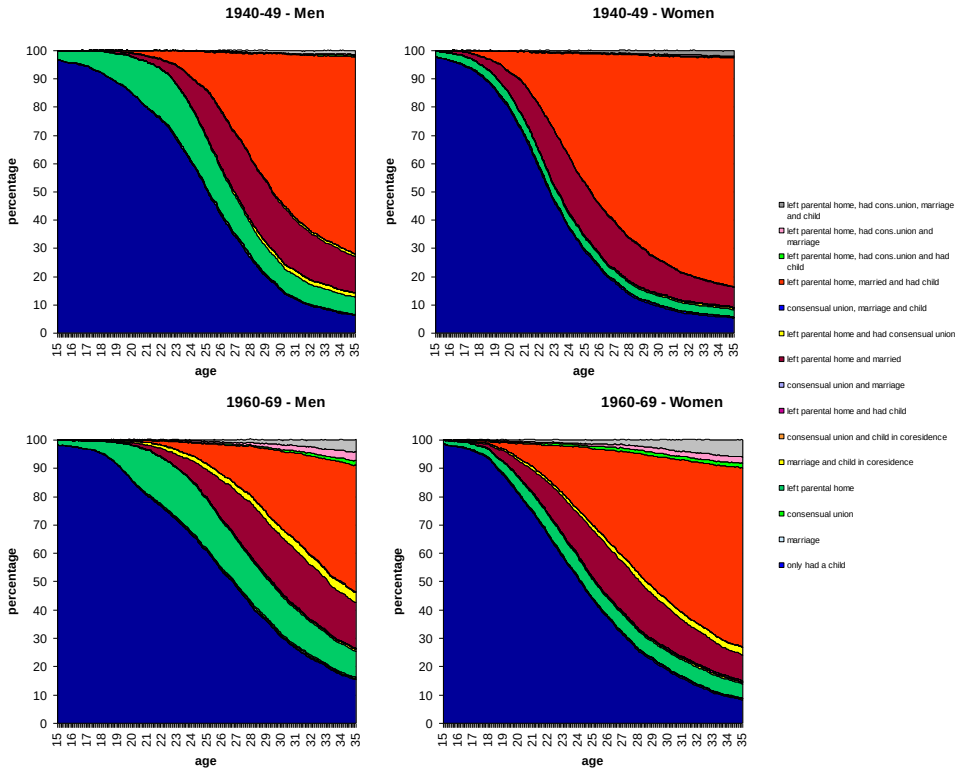
The analysis of this trajectory aims to provide an overview of the diversification of the life courses in terms of home leaving, forming a union and childbearing, regardless of the ordering among events (Figure 4).

First of all, the proportion of people with no transition (dark blue area) at a given age increases across cohorts and, due to the usual age gap in the timing of marriage and fertility, is higher for men. At age 30, 37% of men born in the '70s lives in the family of origin, has not had a union or a child (it was only about 15% among their fathers' generation, born in the '40s); at the same age, 23% of women born in the '70s share the same situation (against 9% of their mothers at the same age, too).

One of the more traditional states - represented by people that left their parents, married and had a child (orange area) - underwent the largest contraction: at age 30 it represented more than half of the states for men born in the '40s and it declined to just 14% for those born in the '70s. Also for women this reduction is very important: from 2 third of the states to one third for the youngest female birth cohorts. At the same time, the diversification of states distribution is shown by less traditional events such as independent living (green) and consensual union (yellow). Indeed, leaving the parental home by age 30 concerns 18% of men and 10% of women born in the '70s while this was the case for just half of their parents (born in the '40s). In the same way, leaving the parental home and having a cohabitation *more uxorio* is shared by about 8% of young people born in the '70s.

Similarly, as signals of greater diversifications of pathways to adulthood, more complex combinations of events, such as cohabitation and marriage or childbearing (pink, grey and light green) are also arising among the youngest generations.

Figures 4 – *People aged 35 years and more by family formation states distribution, sex, age and birth cohort.*

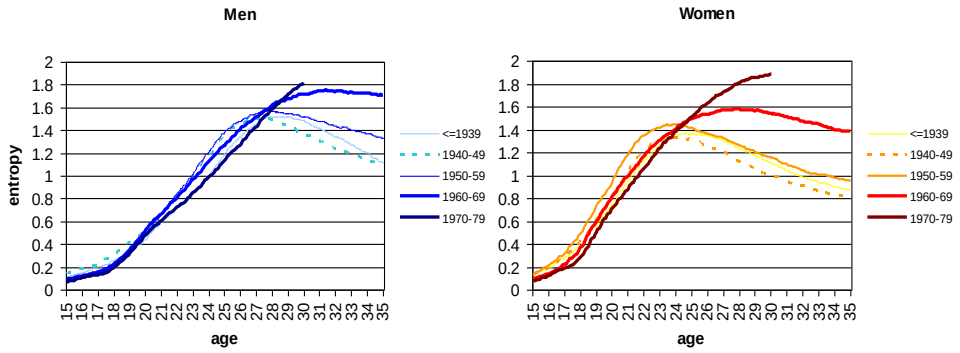


Heterogeneity in family formation

This is also confirmed by the analysis of the complexity of the trajectories in this domain. Even if at the beginning of the life courses there is a relevant homogeneity among cohorts, especially for men, in the family formation process - resulting from the increased standardization observed for the prolonged school attendance -, from age 28 onwards the heterogeneity index rises (Figure 5). This is particularly remarkable since the '60s, where the shifts in the maximum age of entropy and in the age span during which the members of each birth cohort reached the highest levels of dissimilarities, are shown. These results, in accordance with previous analyses based on the study of the cohorts born until the '50, provide also an updated picture of the most recent birth cohorts, whose behaviour at a relatively adult age can be observed with these more recent data. Indeed, subsequent

generations show a change of path with the past, a greater diversification of life courses than before.

Figure 5 – *Entropy in family formation by sex and birth cohorts*



4.4. Does ordering matter?

The distribution of states at a given time of the life course analyzed above expresses in a synthetic way the sum of the events lived by the individuals up to a given age. However, that analysis does not represent the observed sequence occurred on each individual life course. Many scholars focused on the aspects related to the existence of a normative path in the transition to adulthood. Moreover, it is important to join the economic independence and family formation trajectories.

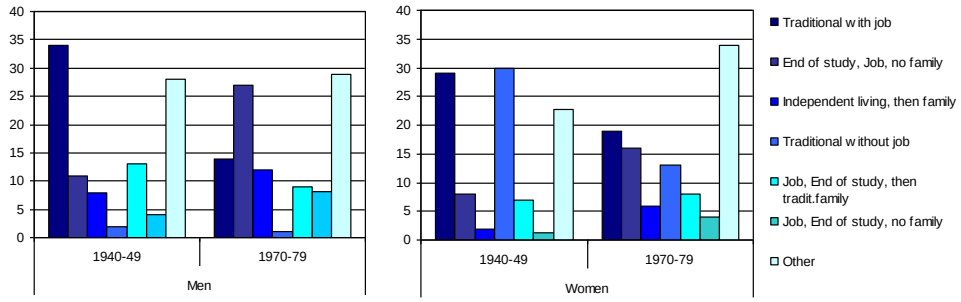
Considering the whole path followed by individuals up to a given age it is possible to ascertain whether there has been a change in the normative sequence. Let us focus on people at their 30th birthday and let us observe the shift in the proportion of the most prevalent pattern. Considering the whole path followed by individuals up to a given age it is possible to ascertain whether there has been a change in the normative sequence. Let us focus on people at their 30s and observe the shift in the proportion of the most prevalent pattern.

As an example, the traditional path to adulthood, where end of study is followed by entry into the labour market, then independent living and family formation (either union and first child) was once lived by one third of men born in the ‘40s while nowadays it involves 14% of men born in the ‘70s (Figure 6). This pattern, typically known as the traditional model of the male bread-winner, declined; at the same time it has been accompanied by a rise in the incomplete path of end of study and job experience but with no family transition up to age 30, therefore a

postponement beyond age 30: this trajectory involves 11% of men born in the '40s and 27% of those born in the '70s, respectively. Also, the least traditional path constituted by a period of independent living and family formation has increased too: from 8% to 12%, respectively.

As for women, the traditional patterns (with or without job experience) were once followed by 30% of people born in the '40s; they include 18% and 13%, respectively, of the trajectories belonging to those born in the '70s. Also among female trajectories it is possible to envisage the postponement of family formation beyond age 30, as outlined by the increase in the process of end of study and labour market participation not followed by family formation. Women, as well as men, are experiencing a rise in the period of independent living followed by the formation of a family.

Figure 6 – *People aged 30 and more by transition sequences at age 30, sex and birth cohort - 2009 (per 100 people with same characteristics)*



5. Concluding remarks

Changes in timing among generations are relevant and reflect a widespread postponement of the events characterizing the process to adulthood but they still suggest the existence of a relative stability of the rules concerning the sequence of transitions. However, an increasing diversification of the steps towards economic independence emerges from the cohort born in the '60s: this diversification of paths is related to the increasing participation of women to the labour market and to the introduction of atypical jobs, mainly affecting younger generations. As regard the family formation domain, an increase in heterogeneity of pathways also emerged: both men and women born in the '60s and '70s show higher levels of heterogeneity, i.e. traditional patterns are run by a proportion of people lower than

in the past and at the same time, more options of trajectories show up. The rise in heterogeneity can be further investigated by including the analysis of the duration permanence in each status, as well as other relevant dimensions of study (such as status of the family of origin and the geographical area).

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SUMMARY

This paper aims at investigating the changes occurred in the pathways to adulthood in Italy. We mainly adopt an exploratory approach to highlight generations and gender differences. First, two major domains of life courses (economic independence and family formation trajectories) are studied in order to highlight the changes in timings regarding the transitions. Second, the shifts in the distribution of states is analyzed. Third, the two trajectories are joined into one, in order to evaluate the persistence of still traditional patterns in the process of transition into adulthood, as well as, the spread of more differentiated ones. Mainly, the prolonged stage of study and the difficulty to obtain stability on the labor market, determine a postponement of the family formation process at a give age, reflected in a rise in incomplete trajectories.

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ITALIAN WOMEN IN THE NEW MILLENNIUM: EMANCIPATED OR VIOLATED? AN ANALYSIS OF WEBMINING ON FATAL DOMESTIC VIOLENCE

Domenica Fioredistella Iezzi

1. Introduction

Violence against women is a global problem that crosses cultural, geographic, religious, social, and economic frontiers. Further, it is a violation of human rights. It deprives women of their right to fully take part in the social and economic aspects of life. It causes a myriad of physical and mental health issues and, in some cases, results in loss of life. Violence is most often perpetrated by an intimate partner and is the most severe form of domestic violence. Intimate partner violence is defined as a "behavior within an intimate relationship that causes physical, sexual, or psychological harm, including acts of physical aggression, sexual coercion, psychological abuse, and controlling behaviors" (WHO, 2010: 11). A multicounty study of the World Health Organization (WHO) on women's health and domestic violence against women shows that 15%–71% of women had experienced physical and/or sexual violence by an intimate partner at some point in their lives (WHO, 2005).

According to the Italian National Institute of Statistics (ISTAT), in Italy women suffering for a physical or sexual violence during their lifetime were 6 million 743 thousand, 31,9% of women aged 16-70, 5 million women were victims of sexual violence (23,7%), 3 million 961 thousand of physical violence acts (18,8%). About 1 million women were victims of rapes or attempted rapes (4,8%), 14,3% of women in a current relationship or in a previous one, were victims of at least one episode of physical or sexual violence by their partner; considering only women with an ex-partner, the percentage rises to 17,3%. 24,7% of women were victims of violence acts by another man. While physical violence is more frequently perpetrated by partners (12% against 9,8%), the opposite happens for sexual violence (6,1% against 20,4%), and this is mainly due to sexual harassment (ISTAT, 2007). Stout (1992) affirms that "femicide is the final act of violence against women" because it is the ultimate violation and act of power over a woman. The Council of Europe Convention on Preventing and Combating Violence against Women and Domestic Violence (Istanbul Convention) on May

11, 2011, has defined a number of punishable crimes against women, including stalking, psychological violence, physical violence, sexual violence and rape, forced marriage, female genital mutilation, forced abortion, forced sterilization, and sexual harassment (Council of Europe, 2011). On June 4, 2013, the Istanbul Convention was also ratified in Italy, and on October 11, 2013, the Italian government passed a new law that will make it easier to protect women against domestic violence. The new measures of this law will also make it easier to prosecute perpetrators before they have a chance to abuse again. Among the 11 points of the new law are stricter penalties for men who attack pregnant women and minors.

Unlike France and Spain, Italy has not yet instituted a national observatory on this phenomenon, and official data are not available because they come from media, especially the local daily press or the web.

In this paper, we explore the sources of violence against women, describe femicide in Italy from 2000 to 2012, and propose a web mining method to classify the different kinds of femicide. To achieve the last item, we collected 1,000 ads from the Agenzia Nazionale Stampa Associata (ANSA) on facts of the crime. We propose several procedures to classify ads and select which one has the best performance using the silhouette index.

In section 2, we describe data and statistics on violence against women. In section 3, we analyze femicide in Italy. In section 4, we describe ANSA ads to detect the Italian femicide profiles, exploit four different methods, and explain the main results of the method with the best performance. In section 5, we discuss the conclusions.

2. Data and Statistics on Violence against Women

Statistics on violence against women is frequently one of the major requirements for providing an accurate quantification of this phenomenon across time and place. Since 1995, the Beijing Platform for Action requested all governments and the United Nations to promote research, collect data, and compile statistics relating to the prevalence of different forms of violence against women, especially domestic violence (United Nations, 2001).

In December 2003, the UN General Assembly mandated—for the first time—the preparation of an in-depth study on all forms and manifestations of violence against women (resolution 58/185[1]). This request was a clear signal of the

[1] Resolution 58/185 includes the following: (1) a statistical overview of all forms of violence against women in order to better evaluate the scale of such violence while identifying gaps in data collection and formulating

importance that member states, through the UN General Assembly, attached to address violence against women.

Moreover, in July 2010, the UN General Assembly created the United Nations Entity for Gender Equality and the Empowerment of Women[2] (UN Women). The creation of the UN Women institution came about as part of the UN reform agenda, bringing together resources and mandates for greater impact. It merges and builds on the important work of four previously distinct parts of the UN system that focused exclusively on gender equality and women's empowerment:

- Division for the Advancement of Women (DAW)
- International Research and Training Institute for the Advancement of Women (INSTRAW)
- Office of the Special Adviser to the Secretary-General[3] on Gender Issues and Advancement of Women (OSAGI)
- United Nations Development Fund for Women (UNIFEM)

2.1. Indicators to measure violence against women

On December 19, 2006, the UN General Assembly selected a core of nine indicators to describe violence against women:

1. Total and age-specific rate of women subjected to physical violence in the last 12 months by severity of violence, relationship to the perpetrator, and frequency.
2. Total and age-specific rate of women subjected to physical violence during lifetime by severity of violence, relationship to the perpetrator, and frequency.
3. Total and age-specific rate of women subjected to sexual violence in the last 12 months by severity of violence, relationship to the perpetrator, and frequency.
4. Total and age-specific rate of women subjected to sexual violence during lifetime by severity of violence, relationship to the perpetrator, and frequency.

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proposals for assessing the extent of the problem; (2) the causes of violence against women, including its root causes and other contributing factors; (3) the medium-term and long-term consequences of violence against women; (4) the health, social, and economic costs of violence against women; and (5) the identification of best practice examples in areas including legislation, policies, programs, and effective remedies and the efficiency of such mechanisms to the end of combating and eliminating violence against women.

[2] See the following website: http://www.unwomen.org/.

[3] For our addition, please refer to http://www.un.org/womenwatch/osaginew/index.html.

5. Total and age-specific rate of ever-partnered women subjected to sexual and/or physical violence by current or former intimate partner in the last 12 months by frequency.
6. Total and age-specific rate of ever-partnered women subjected to sexual and/or physical violence by current or former intimate partner during lifetime by frequency.
7. Total and age-specific rate of women subjected to psychological violence in the past 12 months by intimate partner.
8. Total and age-specific rate of women subjected to economic violence in the past 12 months by intimate partner.
9. Total and age-specific rate of women subjected to female genital mutilation, perpetrator, and frequency.

Figure 1 – *Violence against Women Prevalence Data: extracted from surveys by Country Compiled by UN Women (as of March 2011)*

No.	Country	Survey	Coverage	Year	Intimate Partner Violence (%)						Intimate Partner and/or Non-Partner Violence (%)						Forced first sex (%)	Abuse during pregnancy (%)
					Physical		Sexual		Physical and/or sexual		Physical		Sexual		Physical and/or sexual			
					Last 12 months	Life-time	Last 12 months	Life-time	Last 12 months	Life-time	Last 12 months	Life-time	Last 12 months	Life-time	Last 12 months	Life-time		
26	Ethiopia	WHO	Province	2002	29	48.7	44.4	58.6	53.7	70.9						55.9	16.6	7.5
27	Finland	Other	National	2005	6.3	17.6	2	4.3	7.9							43.5		
28	France	IVAWS	National	2002	2.5		0.9		10									
29	Georgia	CDC-RHS	National	2005	1.6	4.8	0.3	1.5	2	5								
30	Germany	IVAWS	National	2003		23		7		25		37		13		40		
31	Ghana	DHS	National	2008	18	20.6	5.2	8.2	20	22.9	17.2	36.6		18.8		44.5	14.9	5.2
32	Guatemala	CDC-RHS	National	2002	8.6		3.5											
33	Haiti	DHS	National	2005-2006	11.5	14.3	9.8	10.8	16.8	20	15.6	26.5						5.6
34	Honduras	DHS	National	2005-2006	6.3		4.4		8.6			14.7		8.7				
35	Hong Kong	IVAWS	National	2005	1	6	1	5	2	9	2	12	3	14		21		
36	India	DHS	National	2005-2006	21.4	35.1	7.2	10	23.9	37.2	18.9	33.5		8.5		35.4		
37	Indonesia	Other	National	2006												3.07		
38	Ireland	Other	National	2003	1.4	13	0.7	8	3.2	14.5								
39	Italy	IVAWS	National	2006	1.7	12.2	1	6.1	2.4	14.3	2.7	18.8	3.5	23.7	5.4	31.9		

These indicators should be collected by countries using population-based surveys and administrative records to estimate gender violence (United Nations, 2006). UN Women has released a resource that contains data on 86 countries concerning the prevalence of violence against women, which includes physical and sexual violence by both intimate and nonintimate perpetrators. As it can be seen from Figure 1, data on violence against women come from several sources, observed at different times, and sometimes collected with various methodologies,

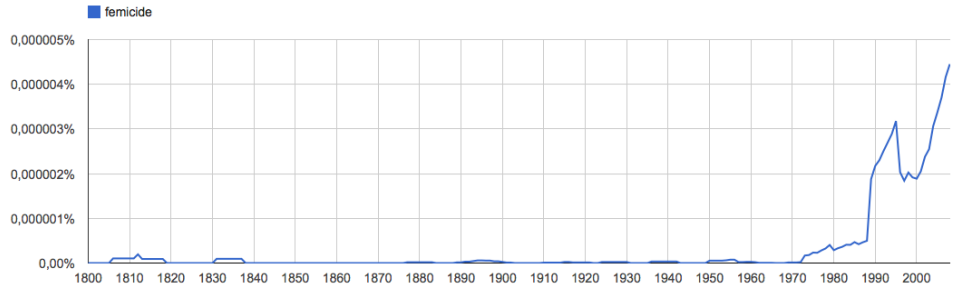
so they are not comparable. Even though a face-to-face interview method was adopted in most countries, in Italy, for example, female interviewers conducted all interviews by adopting the computer-assisted telephone interviewing (CATI) technique (Muratore & Sabbadini, 2005).

Despite incomplete data and the important differences in the methodology of data collection among countries, particularly low-income and middle-income settings, international comparisons on violence against women are frequently used.

3 Femicide

The term "femicide" is defined literally as the killing of a female, while "fratricide" is the killing of a sibling, and "infanticide" is the killing of an infant (Curry, 1801). In the 1970s, the term "feminist movement" took on a different meaning. Diana Russell (2011) defines the word as "the killing of females by males because they are females" or the misogynistic killing of women by men (Radford & Russell, 1992). Figure 2 shows that the word "femicide" is used more and more frequently from the 1970s.

Figure 2 – *Google Books Ngram Viewer - English corpus from 1800 to 2012*



The Italian expression *femmicidio* appeared in the Italian dictionary only in 2006, and it also takes a broad mining of gender violence (Devoto Oil, 2013). We use this expression to refer to the killing of women.

3.1. Femicide in the world

Homicide statistics are mainly collected by the police or through mortuaries, and information about the relationship between the victim and offender is not

commonly recorded. According to a recent review, 38% of female homicides were perpetrated by an intimate partner (Stöckl et al., 2013).

In the world, El Salvador registers the highest rate of femicide (13.2%). In 2008, 401 women were killed there. In Latin American countries, a very high prevalence rate pr has been recorded in Brazil (pr = 5.4 with 4,014 victims), Ecuador (pr = 3.3 with 214 victims), and the Dominican Republic (pr = 3.2 with 299 victims). South Africa also has a very high-risk index, because 3,357 women killed in 2008 (pr = 10.1).

According to Economic and Social Research Centre (EURES) (2013), in Europe, Germany has the primacy in femicides; in fact, in 2009, there were 350 cases, although the prevalence rate per million women was higher in Latvia, Lithuania, and Estonia (see Table 1).

Table 1 – *Femicide in UE (27 countries)*

Country	Number of femicide	Rate for millions of women	Country	Number of femicide	Rate for millions of women
Austria	16	1.3	Luxembourg	3	0.8
Belgium	83	1.5	Malta	3	1.4
Bulgaria	44	2.0	Netherlands	47	0.5
Cyprus	7	1.3	Poland	125	0.8
Denmark	19	0.5	Portugal	36	1.0
Estonia	18	3.4	UK + Ireland	245	0.8
Finland	35	1.3	Czech	71	0.7
France	288	0.9	Romania	194	1.3
Germany	350	0.8	Slovakia	24	0.9
Greece	35	0.3	Slovenia	7	0.7
Italy	148	0.5	Spain	132	0.6
Latvia	31	4.9	Sweden	28	0.6
Lithuania	64	3.6	Hungary	63	1.2

Source: EURES. 2013

In 2010, Italy recorded a prevalence rate of 0.5, one of the lowest in Europe, preceded by only Greece (pr = 0.3).

3.2. Femicide in Italy

In Italy, there are no official data on femicide. Since 1923, Istat has carried out a survey on the "causes of death" (i.e., the main source for the evaluation of the health status of the population and for the allocation of health programs and resources). Unfortunately, this survey has not recorded data on the authors of homicide. Since 1995, EURES has collected data on murders in Italy and integrated this information with DEA DB (database of the National Agency of

Press–ANSA) and data from the Criminalpol. The EURES DB does not use a gender approach, but it is possible to obtain this information through crossing some variables in the EURES DB (Iezzi, 2010). Since 2005, refuges have collected data on femicide in Italy, using only press information.

Judicial statistics come mainly from administrative files, so periodical reports on gender crimes, although not in the same year, can be obtained. In 2010, 105,000 gender crimes have been reported to the police: 290 per day—that is one crime every 12 seconds. Each day, 95 women reported suffering from threats; 87, abuses; 64, willful lesions; 19, beating; 14, stalking; and 10, sexual violence (Istat, 2012). When considering intimate partner violence, it is often asked why men use physical force against women with whom they live (Dobash et al., 2007). Domestic violence is very frequent, and intimate partner femicide is the single largest category of femicide, with women often killed by their husbands, partners, ex-husbands, or ex-lovers. Generally, it is tip of the iceberg of domestic mistreatments perpetrated over time.

Table 2 – *Total Femicide in Italy from 1990 to 2011*

Year	Number of femicide	Rate for millions of women
1990	184	6.3
1995	190	6.5
2000	199	6.8
2001	181	6.3
2002	186	6.4
2003	199	6.5
2004	184	6.2
2005	138	4.4
2006	181	5.6
2007	145	4.7
2008	147	4.8
2009	173	5.7
2010	158	5.2
2011	170	5.6
2012	159	5.2

Source: EURES

The victims of some violent crimes, such as sexual violence (90.5%), stalking (77.4%), and injuries (53.4%) are women. The perpetrators of these crimes are almost exclusively men: 98.0% for sexual violence, 85.7% for stalking, 83.5% for bodily harm, 75.1% for beating, 78.7% for threats, and 65.5% for insults. Every two days, a woman is a victim of homicide.

Table 2 shows the time series of femicide occurring in Italy from 1990 to 2012. Over the past 20 years, there have been no substantial changes. It should be noted

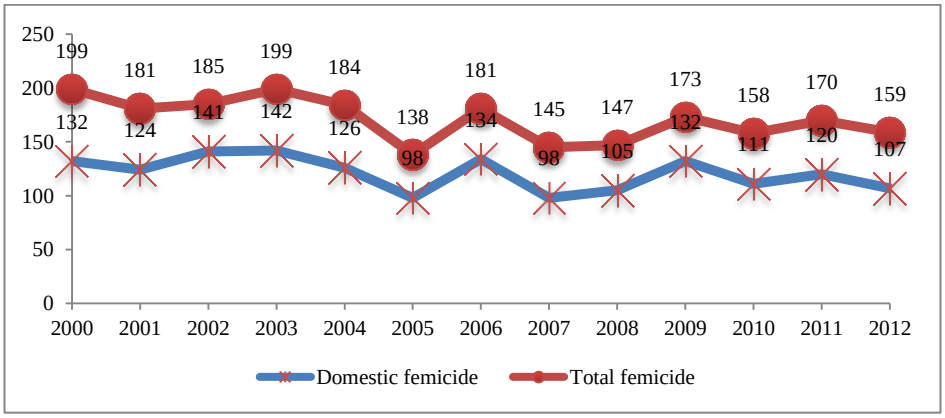
that there is a slight decrease from 2005 to 2008, but it is not statistically significant; instead, there is a drastic drop in the last year (159 cases).

3.2.1. Domestic femicide

From 2000 to 2012, there were 2,220 cases of femicide (mean of 171 victims per year), 1,570 of which occurred at home (70.7%). In 2012, domestic femicides represented 67.3% of the total femicides, and the rate per million women equals 4.0. Italian domestic femicide shows a regularity over the time: it is always about two-thirds of the total phenomenon (see Figure 3).

Italian data corroborate what has already been mentioned in other studies by developed countries that intimate partner homicide often strikes women in their prime of life and at a time when their familial and social responsibilities are at their peak. Intimate partner femicides are most likely to occur at home and are often witnessed by children (Pynoos & Eth, 1984). Straus (1986: 446) underlines that "the public image of homicide tends to focus on the type of wanton killing featured by the press and television—someone shot in the course of a robbery or sadistic killer who attacks a stranger with no apparent motive."

Figure 3 – *Italian femicide (2000–2012)*



Source: Based on EURES DB 2013

In fact, such killings are only a relatively small portion of homicide. In about 80% of the cases, the victims and assailants knew each other before the murder, and in a substantial portion of the cases, they were members of the same family. In Italy, about 70% of femicides at home occurred during the course of a couple's

relationship. Guilty of domestic femicide is mainly the partner, spouse, or ex-partner (about 60%).

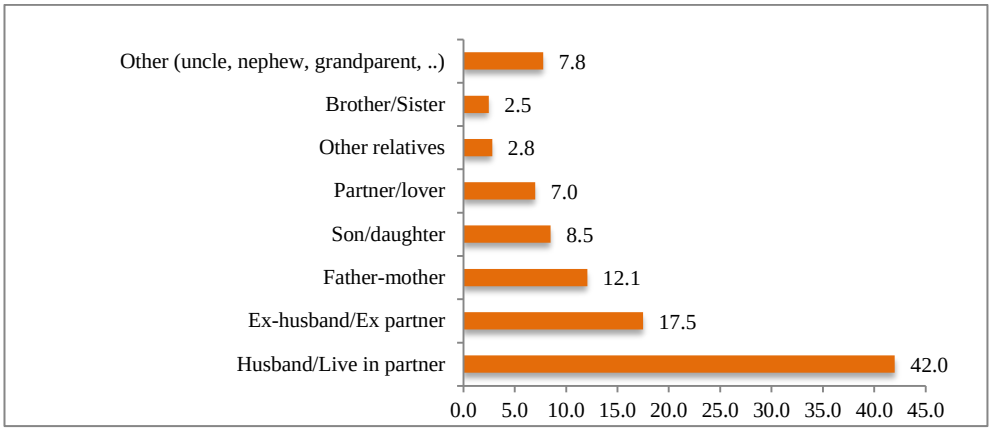
Table 3 – *Regional distribution of domestic femicide*

Regions	Number of femicide	Percentage of femicide (%)	Rate for millions of women
Lombardy	266	16.9	4.3
Veneto	120	7.6	3.8
Emilia Romagna	140	8.9	5.0
Liguria	66	4.2	6.1
Piedmont	136	8.7	4.7
Friuli Venezia Giulia	33	2.1	4.1
Trentino Alto Adige	22	1.4	3.4
Valle d'Aosta	2	0.1	2.5
North	**785**	**50**	**4.4**
Tuscany	106	6.8	4.4
Lazio	126	8.0	3.5
Umbria	27	1.7	4.7
Marche	38	2.4	3.8
Center	**297**	**19.4**	**4.0**
Campania	119	7.6	3.1
Puglia	87	5.5	3.2
Calabria	62	3.9	4.7
Sicily	124	7.9	3.7
Sardinia	40	2.5	3.7
Molise	17	1.1	8.0
Abruzzo	27	1.7	3.1
Basilicata	12	0.8	3.1
South and Islands	**488**	**30.7**	**3.5**

Source: Based on EURES DB 2013

From a geographical point of view, we can note that there is a high percentage of domestic femicide in the northern regions (50%), followed by the southern regions (31.1%), and those in the center (18.9%). In fact, we can see in Table 3 that Lombardy presents the highest number of cases (266 femicides from 2000 to 2012, with 16.9% of total femicides), followed by Emilia-Romagna (140 victims), Piedmont (136 victims), Lazio (126 victims), and Sicily (124 victims). In relative terms, Northern Italy has a prevalence rate significantly higher than other areas of the country (4.4 deaths per million women), followed by Central Italy (3.9), and Southern Italy (3.5). In relative terms, Molise has the highest value (17 cases in 13 years, with pr = 8), followed by Liguria (66 cases, with pr = 6.1), and Emilia-Romagna (140 cases, with pr = 5).

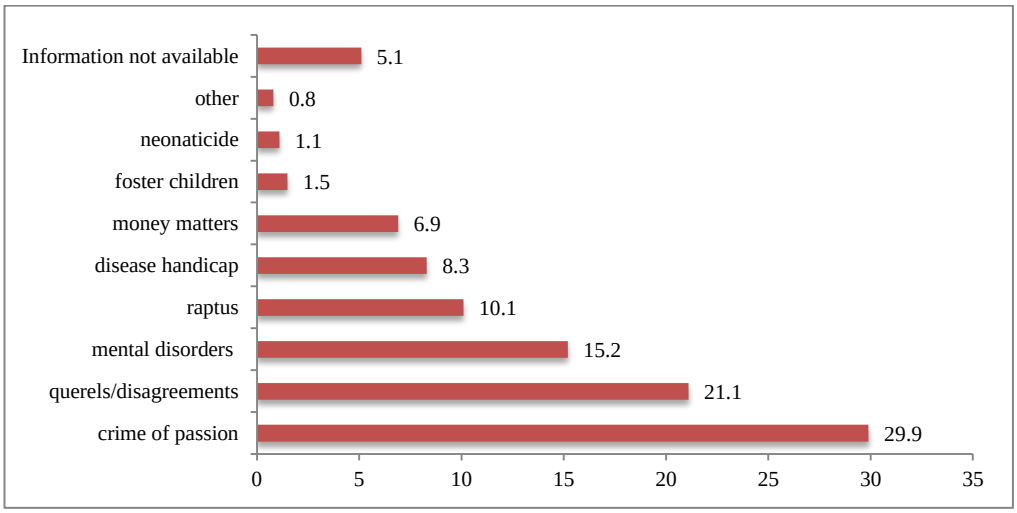
Figure 5 – *Guilty of domestic femicide (%)- Period: 2000-2012*



Source: Based on EURES DB 2013

A total of 92% of the guilty are male, and only 8% are female. The motive of the crime is mainly passion, even if there are no cases of femicide caused by economic reasons (see Figure 6).

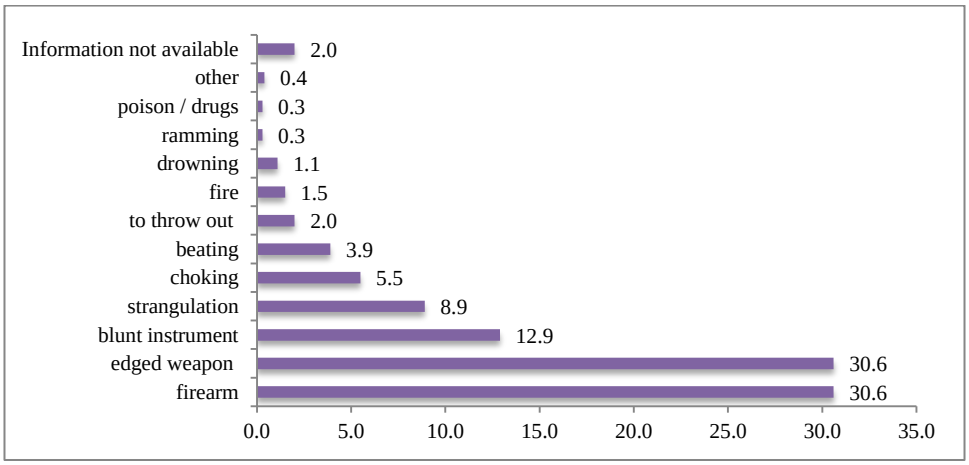
Figure 6 – *Motive of crime (%) (2000–2012)*



Source: Based on EURES DB 2013

The passion motive is generally the core reason among married couples or ex-couples aged 20–55, while for those over 65 years of age, diseases and handicaps of victims or the guilty are risk factors. In fact, women are the major providers of long-term care in Italy, but they also have long-term care needs of their own. Women live longer than men (the life expectancy at birth is 84.4 for women and 79.2 for men), tend to outlive their spouses, and have less access to retirement savings such as pensions (Iezzi & Deriu, 2013). According to Istat (2013), 42.3% of women take care of their family, while only 34.5% of men take charge.

Figure 7 – *Weapon of crime (%)- (2000-2012)*

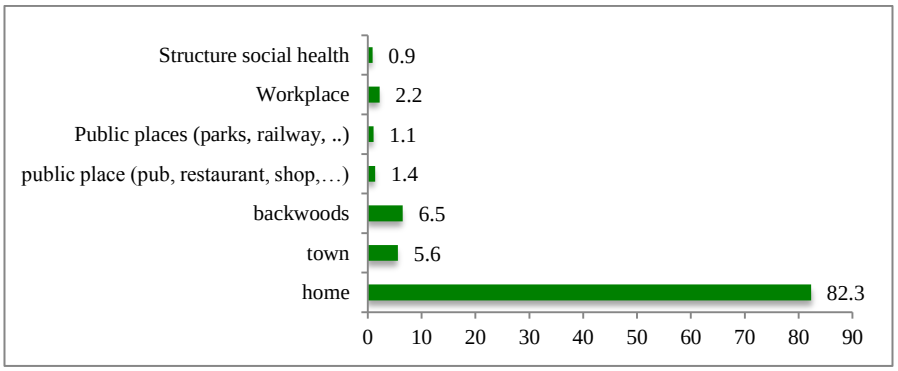


Source: Based on EURES DB 2013

From 2000 to 2012, firearms (30.6%) and edged weapons (30.5%) were the weapons most commonly used by men to murder women in Italy, but blunt instruments (12.9%) were also used to violently lash the victim over and over again (see Figure 7).

About a quarter of the victims are of foreign nationality, with a risk index six times higher than the Italian women for femicide and three times higher than the Italian victims for domestic femicide (see Figure 9).

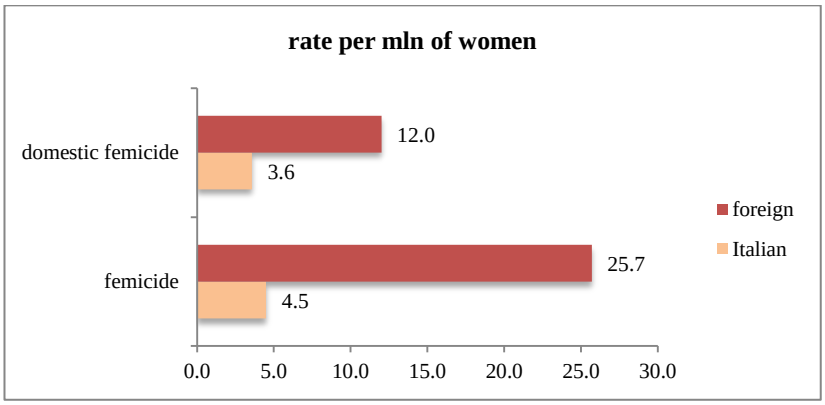
Figure 8 – *Scene of the crime (%)- (2000-2012)*



Source: Based on EURES DB 2013

A total of 82.3% domestic femicides occur at home with the victim usually knowing the perpetrator, and only 6.5% occur in the backwoods (see Figure 8).

Figure 9 – *Nationality of the victims (rate per million of women) (2000–2012)*



Source: Based on EURES DB 2013

4. Text Mining Analysis on ANSA Ads

To explore the mechanism of killing and discuss a method of classifying femicide, we use an unstructured data set. The corpus is composed of 1,000 ANSA ads about Italian femicides, which were published by ANSA from 2000 to 2012.

The preliminary procedure included a lemmatization phase, where we grouped together the different inflected forms. For example, the verb "to tie" was expressed as "ties," "tie," and "tying." We used only the base form, "tie." In this case, we chose lemmatizing instead of stemming because a stemmer operates on a single word without knowledge of the context, therefore not being able to discriminate between words, which have different meanings depending on the part of speech. Moreover, for reducing the input matrix, we selected the keywords and employed synonyms where possible. We replaced, for example, the words "wound" and "injury" with the expression "hurt". We both lemmatized and replaced synonyms, for example, the different modified forms of the verb "to be stabbed (knifed) to death" with "knife." Additionally, I grouped crimes with or without weapons into nine classes: (1) using a firearm (gun, rifle, etc.), (2) using a cutlass (knife, blade, etc.), (3) strangling (with hands, rope, cords, etc.), (4) choking (with cushion, plastic bag, etc.), (5) beating (punching, kicking, using wood or iron rod, etc.), (6) using blunt weapons, (7) poisoning, (8) burning the body, and (9) drowning. The location where the corpse is discovered was classified into 10 clusters: (1) isolated area, (2) workplace, (3) home, (4) rural area (5) town, (6) shop, (7) country road, (8) garden/park, (9) hospital /medical study, and (10) recreation site.

In this way, we wrote a list of base forms for describing femicide; that is, we first built a specific vocabulary for this topic and also selected repeated segments (Lebart & Salem, 1994), for example, "married with children." The age of the victim was classified into seven classes: (1) < 18, (2) 18–24, (3) 25–34, (4) 35–44, (5) 45–54, (6) 55–64, and (7) > 64. This phase was a semiautomatic process, and it allowed obtaining a matrix M with size (198 words × 455 ads), with a sparsity of 24%, starting with the term document matrix T with size (4,469 words × 1,000 ads), with a sparsity of 99% and 2,529 hapaxies.[4]

4.1. Methods

We used four different procedures to classify the ANSA ads in order to identify the method with the best performance (see Table 4). Each text is represented by a vector of weighed terms of the form $d_j = (w_{1j}, w_{2j}, \ldots w_{ij}. \ldots w_{pn})$, where w_{ij} represents the weight for the term t_i, which is attached to document d_j. By joining these vectors, we get the **D** Term Document Matrix (Iezzi, 2012a). In step n.1, we adopted two weighing schemes:

1. Bag of words (BOW), where w_{ij} is the frequency of word type i in a document j ($w_{ij} = n_{ij}$)

[4] A hapax legomenon is a word that occurs only once within a context, either in the written record of an entire language, in the works of an author, or in a single text.

2. Term frequency-inverse document frequency (TF-IDF):
$w_{ij} = \frac{n_{ij}}{\max n_{ij}} \log \frac{N}{n_i}$,

where $\max n_{ij}$ is the maximum frequency of word *i* in a corpus. *N* is the total number of documents, and n_i is the number of documents in which the word *i* appears.

Table 4 – *Steps of the applied procedures*

Method	Step n.1	Step n.2	Step n. 3
M1	*BOW*	Lexical Correspondence Analysis	CLUSTERING ALGORITHMS (Hierarchical, PAM, *k*-means)
M2	*TFiDF*	Principal Component Analysis	CLUSTERING ALGORITHMS (Hierarchical, PAM, *k*-means)
M3	*BOW*	Non metric Multidimensional Scaling	CLUSTERING ALGORITHMS (Hierarchical, PAM, *k*-means)
M4	*TFiDF*	Metric Multidimensional Scaling	CLUSTERING ALGORITHMS (Hierarchical, PAM, *k*-means)

In step n.2, we used lexical correspondence analysis (Lebart & Salem, 1984), principal component analysis (Jollife, 1986), and metric and nonmetric multidimensional scaling (Borg & Groenen, 2006) for reducing the number of attributes (dimensions) of the term document matrix in an attempt to preserve the cluster structure. To perform nonmetric multidimensional scaling, we used cosine similarity[5]

In step n.3, we compared three different algorithms: (1) hierarchical approach (complete method), (2) the *k*-means algorithm, and (3) the Partitioning Around Medoids (PAM) (Iezzi, 2012b). We used these methods because they have different criteria to classify and allow the identification of the best criterion.

In text mining, *k*-means is the most employed method because it is very fast and allows classifying matrices of enormous size quickly. The main steps of *k*-means algorithm are as follows: (1) select *k* point as the initial centroid, (2) repeat form *k* clusters by assigning each point to its closest centroid, and (3) recompute the centroid of each cluster until the centroids do not change. The weaknesses of this method are as follows: (a) parameter *k* must be chosen in advance, or many values must be tried, (b) data must be numerical and must be compared via Euclidean

[5] Cosine similarity is a measure of similarity between two vectors of an inner product space that measures the cosine of the angle between them: $\cos(\vartheta) = \frac{AB}{\|A\|\|B\|}$, where ***A*** and ***B*** are two vectors.

distance, (c) the algorithm works best on data containing spherical clusters (clusters with other geometry cannot be found), and (d) the algorithm is sensitive to outliers, or points that do not belong in any cluster. These can distort the centroid positions and ruin the clustering.

The PAM algorithm is very similar to *k*-means, but it uses median instead of mean. It contemplates the following steps: (1) select *k* data point as the initial medoid, (2) repeat form *k* clusters by assigning each point to its closest medoid, and (3) see if any other point is a "better" medoid until the medoids do not change. Hierarchical methods have a bottom-up approach. In fact, each word starts in its own cluster, and pairs of clusters are merged as one moves up the hierarchy. Complete linkage uses the maximum distance as linkage criterion to merge statistical units. to determine the distance between sets (Everitt et al., 2011).

We have developed an R program for performing the four strategies.

4.2 Results

Methods n.2 and n.4 using the complete hierarchical algorithm give the best performance (see Table 5). The silhouette index[6] (Rousseeuw, 1987) shows that the better cluster number is three.

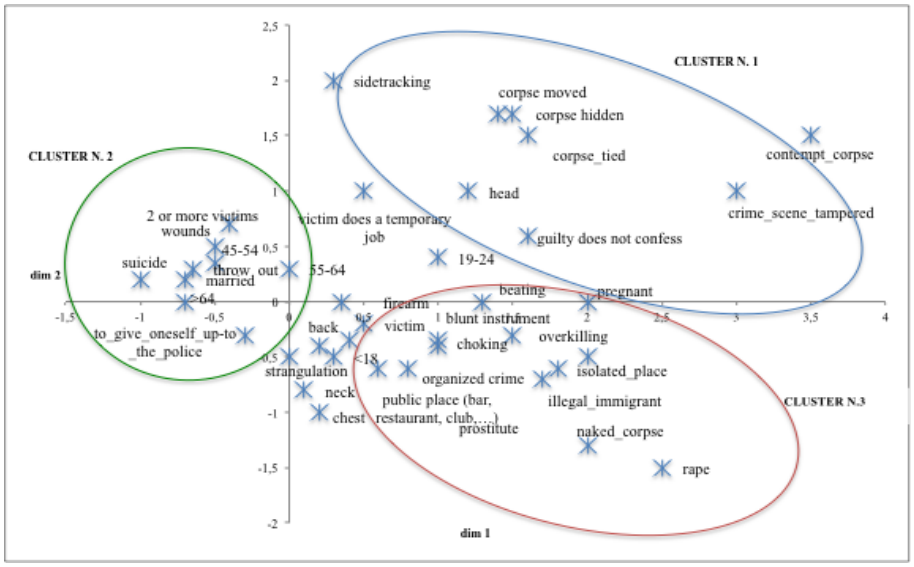
Table 5 – *Results of internal validation from 2 to 6 clusters using 4 methods*

Methods		CLUSTER				
		2	**3**	**4**	**5**	**6**
Hierarchical	***1***	0.7640	0.7517	0.7498	0.7436	0.7427
	2	0.7844	0.8923	0.8078	0.7931	0.7903
	3	0.5453	0.5293	0.5400	0.5295	0.5343
	4	0.7844	0.8923	0.8078	0.7931	0.7903
K-means	***1***	0.7640	0.7517	0.7498	0.7436	0.7174
	2	0.8175	0.8213	0.7910	0.7914	0.7656
	3	0.5453	0.5293	0.5400	0.5295	0.5343
	4	0.8175	0.8213	0.7910	0.7914	0.7656
PAM	***1***	0.2766	0.3672	0.1939	0.2415	0.3008
	2	0.6261	0.8144	0.6374	0.6210	0.6319
	3	0.5453	0.5293	0.5400	0.5295	0.5343
	4	0.6261	0.8144	0.6374	0.6210	0.6319

Figure 9 shows the map of three clusters projected in a two-dimensional Euclidean subspace.

[6] The silhouette index (s(i)) assumes values from −1 to 1. For s(i) to be close to 1, clusters are well matched. Then the datum is appropriately clustered. If s(i) is close to −1, then by the same logic, we see that *i* would be more appropriate if it was clustered in its neighboring cluster. An s(i) near 0 means that the datum is on the border of two natural clusters.

Figure 9 – *Plane of the first two axes from the MCA of words*



ANSA ads detect three types of femicide:

1. **Brutal and unsolved femicide.** In this cluster, there are some cases that are sadly renowned to the public because media talked very much about them, describing the bloody crime scenes. In fact, in recent years, some Italian broadcasts have been devoted to meticulously showing corpses or cadavers of young women. Examples are the cases of Melania Rea, who was killed with 35 stab wounds in a little wooded area near Teramo, and that of Sara Scazzi, whose naked body was in an advanced state of putrefaction in a well located in Avetrana in the south of Italy. In 2011, in 94 out of 100 days, the Italian news focused on crime news, and about 750 of the 6,000 news stories concentrated on a specific case (Diamanti, 2012).

2. **Family femicide.** In this cluster, victims are usually older than 44, married, and guilty killed oneself.

3. **Organized crime femicide.** Victims are young (aged 18–24), illegal immigrants, prostitutes, and are beaten, raped, and killed with a blunt instrument in an isolated or public place (bar, restaurant, pub, etc.).

5. Conclusions

Population-based surveys are used by most countries to estimate violence against women. However, international comparisons are difficult, and often inappropriate, because the surveys are set with different methodologies. A best practice is, for example, a multicounty study conducted by the United Nations between 2000 and 2003 on 15 sites in 10 countries: Bangladesh, Brazil, Ethiopia, Japan, Namibia, Peru, Samoa, Serbia and Montenegro, Thailand, and Tanzania. This research found that 15%–71% of women aged 15–49 reported physical and/or sexual violence by an intimate partner at some point in their lives (WHO, 2005). There are many limitations posed by the available data for intimate partner femicide because of the lack of information on the perpetrator-victim status. In Italy, as in other countries, official mortality data do not record the relationship between the victim and the perpetrator. In Italy, there are women's shelters that provide temporary refuge for women escaping from violent or abusive situations, such as rape and domestic violence, and these shelters also collect data on femicide. Actually, data on this topic come from the web should be collected to gather new information and build a specific vocabulary, but unstructured data require more complex preprocessing to transform unstructured data into structured statistical information. Moreover, data could be encoded in many different ways that may result in significantly different outcomes.

In this paper, we created a vocabulary on this topic to reduce the sparsity of the Term Document Matrix, and we analyzed unstructured data using four strategies. The results showed that TF-IDF is the best input matrix and that the hierarchical approach using complete linkage is the best method. With regard to reducing the number of dimensions both metric multidimensional scaling and principal component analysis gave the same results.

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SUMMARY

In the last 40 years, divorce, abortion, human rights, and equal opportunities have transformed women's lives. Currently, many women are more educated than men and are becoming more determined to gain success in their chosen careers. Despite the positive changes in the lives of women, there are still many who struggle to land a job and have to choose between being a full-time mother or working.. Above all, there are many women who are beaten, abused, and raped by their husbands, boyfriends, partners, and ex-partners. From 2000 to 2012, 1,593 femicides occurred in Italy. However, this represents only the tip of the iceberg of domestic mistreatments perpetrated over time. Gender violence is a cross phenomenon that affects both rich and poor.

In this paper, we analyze femicides in Italy from 2000 to 2012 and explore 1,000 ANSA ads. Using unstructured data collected from the web, we propose a comparison of different clustering algorithms in order to select the one with the best performance.

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METHODS FOR CONSTRUCTING COMPOSITE INDICES: ONE FOR ALL OR ALL FOR ONE?[1]

Matteo Mazziotta, Adriano Pareto

1. Introduction

In last years, the debate on the measurement of multidimensional phenomena has caused, within the worldwide scientific Community, a renewed interest thanks to the publication, in September 2009, of the Stiglitz report and, in March 2013, of the first report on "Equitable and Sustainable Well-being" (BES) by the Committee composed by Istat (Italian National Institute of Statistics) and CNEL (Italian Council for Economics and Labour). It is common awareness that a number of socio-economic phenomena cannot be measured by a single descriptive indicator and that, instead, they should be represented with multiple dimensions. Phenomena such as development, progress, poverty, social inequality, well-being, quality of life, provision of infrastructures, etc., require, to be measured, the 'combination' of different dimensions, to be considered together as the proxy of the phenomenon. This combination can be obtained by applying methodologies known as composite indices (Salzman, 2003; Mazziotta and Pareto, 2011).

This paper addresses the problem of summarizing a set of socio-economic indicators and aims to provide some general guidelines for the construction of a composite index. In particular, the attention is focused on the search of the most suitable method depending on the following factors: type of indicators (substitutable/non-substitutable), type of aggregation (simple/complex), type of comparisons to be made (relative/absolute), type of weights of the indicators (subjective /objective). As is known, in fact, building a composite index is a delicate task and full of pitfalls: from the obstacles regarding the availability of data and the choice of individual indicators, to their treatment in order to compare (normalization) and aggregate them (weighting and aggregation). Despite the problems mentioned, the composite indices are widely used by several international organizations for meas-

[1] The paper is the result of combined work of the authors: M. Mazziotta has written Sects. 1, 2 and 5; A. Pareto has written Sects. 3 and 4.

uring economic, environmental and social phenomena and, therefore, they provide an extremely relevant tool and in the course of evolution (OECD, 2008).

2. Well-being measures and composite indices

In recent years, there has been a lively debate about the use of the most famous indicator of well-being: the "Gross Domestic Product" (GDP). For decades, the economic measure for excellence is not able to represent the well-being or the progress of a society, much less to express the quality of life of a geographical area or a community. This debate has produced worldwide, a considerable literature which can be detected more than a hundred alternative indices, adopted by government organizations (and others), academia and business press (Bandura, 2008), but despite this, it seems that the popularity of GDP has not been minimally scratched.

In fact, the GDP is based on very solid theoretical bases, while many alternative indices guilty of clarity from the stage of definition of the phenomenon; in many circumstances (for example, the Human Wellbeing Index or HWI; Prescott-Allen, 2001), not having a shared theory behind , taking into account dozens of indicators so that all possible aspects are considered. This approach raises a number of important problems related to the allocation of weights and the aggregation of many variables. The only alternative that has been successful, globally, is the Human Development Index or HDI (UNDP, 2010); it is published annually by the United Nations and it considers 3 individual indicators: "Life expectancy at birth", "Education" and "GDP per capita". It is a composite index itself (expressed in absolute form) since the 3 indicators were aggregated, until 2009, through a simple arithmetic mean. This aggregation function has attracted much criticism since the arithmetic mean performs a compensation between indicators that are not-substitutable for each other. In the previous method of calculating the HDI, a high value of the "GDP per capita" could compensate a low value of the "Life expectancy at birth" or vice versa. Since 2010 United Nations Development Programme (UNDP) Report, the index has changed aggregation method: the arithmetic mean has been replaced with a geometric mean. In this way the problems of compensation are solved, but other problems are introduced, for example the case in which there are null values (or very close to zero). A further difficulty is linked to the same nature of the geometric mean, which assumes a multiplicative relationship of the variables rather than an additive, as stated in the assumptions of the HDI calculation.

As regards the measurement of poverty, rather than well-being or progress, in the Human Poverty Index or HPI (UNDP, 2007) a solid theoretical basis is largely respected. The index is based on the capabilities of Sen (1985); for developing countries, 3 non-substitutable indicators are chosen ("Deprivation in longevity",

"Deprivation in knowledge" and "Deprivation of a decent standard of living") and the aggregation function adopted, the mean of order three, does not allow compensation among them.

Many scientists dispute the use of composite indices that lead to the determination of a single value for each geographic area, preferring the so-called dashboard (as in the case of monitoring the state of health of a vehicle: oil level, gasoline, water temperature, etc.). In the case of dashboard, it is possible to identify various dimensions of the phenomenon, all relevant, without that they are further aggregated. From the statistical point of view, it is an incontrovertible choice but from the standpoint of political and media is an heavy limitation. The easy-disclosure in the media and the immediate understanding by the user are certainly the strengths of a unique index.

One of the indices with greater media coverage in Italy is the measure of the Quality of Life (QoL) which, every year, the economic newspaper "Il Sole 24ore" publishes at the provincial level: in this case, 6 relevant dimensions ("Living standard", "Job and business", "Environment and health", "Public order", "Population", "Free time") are identified and, for each dimension, 6 representative indicators are considered for a total, therefore, of 36 individual indicators. After a phase of normalization of the indicators, the arithmetic mean is calculated within each dimension, and thereafter the arithmetic mean between the dimensions. In essence, the final index is calculated as the arithmetic mean of the 36 normalized indicators (Lun *et al.*, 2006).

Also in Italy, since 2003, the "Campaign Sbilanciamoci!" has published the Index of the Regional Quality of Development (QUARS) with the aim of providing a multidimensional measure of the development of Italian regions, based on 41 individual indicators from different sources. The considered dimensions are 7: "Environment", "Economy and labour", "Rights and citizenship", "Health", "Education and culture", "Equal opportunities", "Participation". The composite index is equal to the arithmetic mean of 7 macro-indicators, each of which corresponds to the mean of the standardized values of the indicators that compose it (Gnesi *et al.*, 2010).

The main weakness of the indices mentioned above is the use of a compensatory approach. Not assigning a weight to the indicators and dimensions, each variable has the same importance, so, for example, "Bank deposits", "GDP" and "Cinemas per 100,000 inhabitants" are considered the same way. This constitutes a limit in the moment in which, by calculating the arithmetic mean, it admit a compensation: a low value of "GDP" is compensated by a high value of "Cinemas per 100,000 inhabitants" or vice versa.

As part of partially compensatory or non-compensatory approach, different methodologies have been proposed in the literature, ranging from simple mathe-

matical formulas, such as the Mean-Min function (Casadio Tarabusi and Guarini, 2012), to complex procedures, such as the Multicriteria Analysis (Munda and Nardo, 2009).

In a recent work (De Muro *et al.*, 2010), the authors proposed a non-compensatory composite index, called MPI (Mazziotta Pareto-Index) which consists of an arithmetic mean adjusted by a function of variability that penalizes the geographical areas with a unbalanced distribution of the indicators. In other words, if an Italian province has, as mentioned before, a low value of "GDP", and a high value of "Cinemas per 100,000 inhabitants", then the same province receives a penalty without compensation. The underlying principle is that, in order to obtain a high value of the index, all the individual indicators must assume high values, assuming that the variables themselves have equal importance.

3. Steps for constructing a composite index

Constructing a composite index is a complex task whose phases involve several alternatives and possibilities that affect the quality and reliability of the results. The main problems, in this approach, concern the choice of theoretical framework, the availability of the data, the selection of the more representative indicators and their treatment in order to compare and aggregate them.

It is possible, shortly, to individuate the following steps to tackle (Mazziotta and Pareto, 2012):

1) Defining the phenomenon to be measured. The definition of the concept should give a clear sense of what is being measured by the composite index. It should refer to a theoretical framework, linking various sub-groups and underlying indicators.
2) Selecting a group of individual indicators. Ideally, indicators should be selected according to their relevance, analytical soundness, timeliness, accessibility, etc. The selection step is the result of a trade-off between possible redundancies caused by overlapping information and the risk of losing information. A statistical approach to indicators choice involves calculating correlation between potential indicators and then including the ones that are less correlated in order to minimize the redundancy (Salzman, 2003).
3) Normalizing the individual indicators. This step aims to make the indicators comparable. Normalization is required prior to any data aggregation as the indicators in a data set often have different measurement units. Therefore, it is necessary to bring the indicators to the same standard, by transforming them into pure, dimensionless, numbers. Another motivation for the normalization is the fact that some indicators may be positively correlated with the phenomenon to

be measured (positive 'polarity'), whereas others may be negatively correlated with it (negative 'polarity'). We want normalize the indicators so that an increase in the normalized indicators corresponds to increase in composite index. There are various methods of normalization, such as ranking, re-scaling (or min-max transformation), standardization (or z-scores) and indicization (index number transformation or 'distance' to a reference).

4) Aggregating the normalized indicators. It is the combination of all the components to form one or more composite indices (mathematical functions). Different aggregation methods are possible. The most used are additive methods that range from summing up unit ranking in each indicator to aggregating weighted transformations of the original indicators. Multivariate techniques as Principal Component Analysis (Dunteman, 1989) are also often used.

It is important to emphasize that the theoretical part (definition of the phenomenon and selection of the indicators) is not separate from the statistical-methodological part: so, the choice of the individual indicators is not independent of the choice of the aggregation method.

No universal method exists for composite indices construction. In each case their construction is much determined by the particular application, including both formal and heurist elements, and incorporate some expert knowledge on the phenomenon. Nevertheless, the advantages of composite indices are clear, and they can be summarized in unidimensional measurement of the phenomenon, easy interpretation with respect to a battery of many individual indicators and simplification of the data analysis (e.g., ranking units and comparing their performance over time).

4. A guide for choosing the 'best' method

The main factors to take into account in the choice of the method to be adopted for summarizing individual indicators are as follows:

- type of indicators (substitutable/non-substitutable);
- type of aggregation (simple/complex);
- type of comparisons (absolute/relative);
- type of weights (objective/subjective).

There is not always a 'well-established' solution, and sometimes it may be necessary to renounce to some requirements, to satisfy others.

Type of indicators

It is one of the main factors that affect the choice of the aggregation method. The components of a composite index are called 'substitutable' if a deficit in one

component may be compensated by a surplus in another (e.g., a low value of "People who have participated in religious or spiritual activities" can be offset by a high value of "People who have participated in meetings of cultural or recreational associations" and vice versa). Similarly, the components of a composite index are called 'non-substitutable' if a compensation among them is not allowed (e.g., a low value of "Hospital beds per 1,000 inhabitants" cannot be offset by a high value of "Medical doctors per 1000 inhabitants" and vice versa). So we can define an aggregation approach 'compensatory' or 'non-compensatory' depending on whether it permits compensability or not (Casadio Tarabusi and Guarini, 2012). A compensatory approach involves the use of additive methods, such as the arithmetic mean. For a partially compensatory or non-compensatory approach, non-linear methods are generally adopted, such as the geometric mean or the Multicriteria Analysis.

Type of aggregation

The choice of the 'best' aggregation method also depends on the aim of the work and on the type of 'users' (researchers or the general public). Generally, an aggregation method can be considered 'simple' or 'complex'. We say that an aggregation method is 'simple' when a easily understandable mathematical function is used (e.g., the HDI). On the contrary, an aggregation method is said to be 'complex' if a sophisticated model or multivariate method is used (e.g., Principal Components Analysis).

Type of comparisons

Data normalization firstly depends on the type of space-time comparisons requested: 'absolute' or 'relative'. Standardization or transformation in z-scores permits only to do 'relative' comparisons over time since it is based on the mean and the variance of the indicators at the time of reference (e.g., the QUARS index). Other methods, such as re-scaling and indicization, require that the definition of extreme values or of the base are independent from the data, in order to perform comparisons in 'absolute' terms (e.g., the HDI).

Type of weights

The question of the choice of a system of weights in order to weigh the individual indicators, according to their different importance in expressing the considered phenomenon, necessarily involves the introduction of an arbitrary component.

The easiest (but questionable) solution is to assign the same weight to all the components (equal weighting). In this case, the most suitable normalization method is the standardization that brings all the indicators to have the same variance. Alternatively, 'subjective' weights can be set by a group of specialists (e.g., policy makers) or social surveys about how important individual indicators are to the peo-

ple. Finally, an 'objective' weighting can be used, choosing a methodology that assigns a weight proportional to the variability of the indicator (indicators with a low level of variability will have less weight and indicators with a high level of variability will have much more weight). Note that, although using a simple mean, it is possible to weigh implicitly the indicators through an appropriate normalization function.

Figure 1 shows the flow chart for the choice of the 'best' method in constructing a composite index, with the main possible solutions (normalization, weighting and aggregation) for each 'path' followed (assumptions and requirements).

If the phenomenon to be measured is decomposable into more dimensions, each of them is represented by a subset of individual indicators, it may be more convenient to build a composite index for each dimension (or 'pillar') and then obtain the overall index by means of the aggregation of the partial composite indices. In this case, it is possible to adopt a compensatory approach within each dimension and a non-compensatory or partially compensatory approach among the various dimensions.

The most used aggregation methods for substitutable indicators are the additive ones, such as the simple arithmetic mean or the Principal Component Analysis (PCA). For non-substitutable indicators, non-linear methods are instead used, such as multiplicative functions (partially compensatory approach) or the Multicriteria Analysis (non-compensatory approach).

Focusing on methods based on the use of mathematical functions, the type of normalization depends on the nature of the space-time comparisons to do and on the weight to be assigned to the individual indicators.

For relative comparisons with subjective weighting (equal or different weights), we recommend the rank, z-score or min-max transformation. For assigning objective weights proportional to the variability of the indicators is more suitable a index number transformation where it is assumed as a base the mean, the maximum value or another reference value of the distribution (endogenous base).

For absolute comparisons, it is not possible use ranking or standardization. In the case of subjective weighting, it is necessary to resort to a min-max transformation with minimum and maximum values independent of the distribution (exogenous benchmark), whereas in the case of objective weighting, a indicization with externally fixed base may be a good solution (exogenous base).

In Figures 2a-2d are shown, as an example, the 'paths' followed in the design of the following composite indices: Human Development Index, "Il Sole 24ore" Index, QUARS Index and Mazziotta-Pareto index.

It is noteworthy that each of the 4 composite indices follows a different 'path'.

Figure 1 – *Flow chart for the choice of the 'best' method*

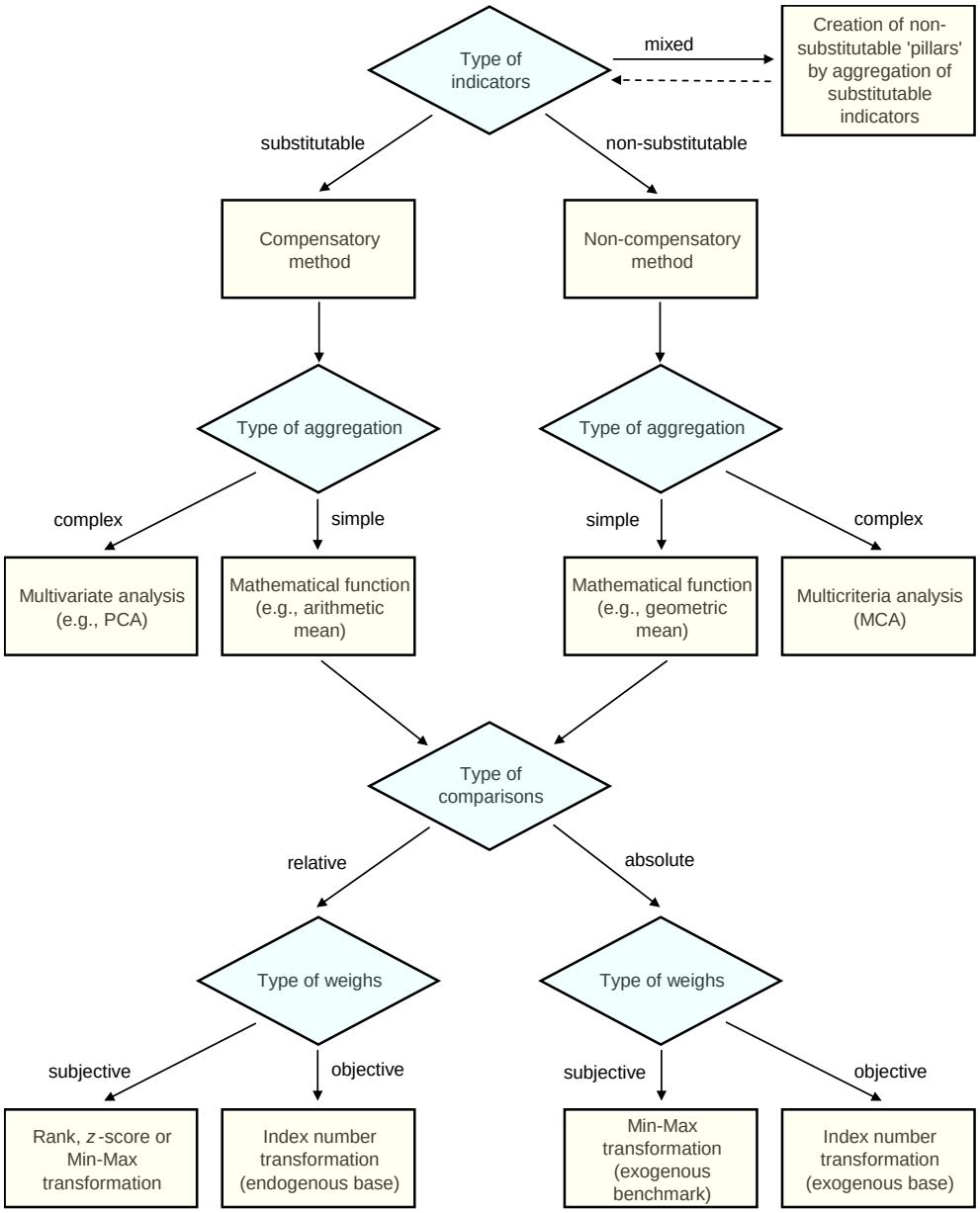


Figure 2a – *The 'path' of the Human Development Index (HDI)*

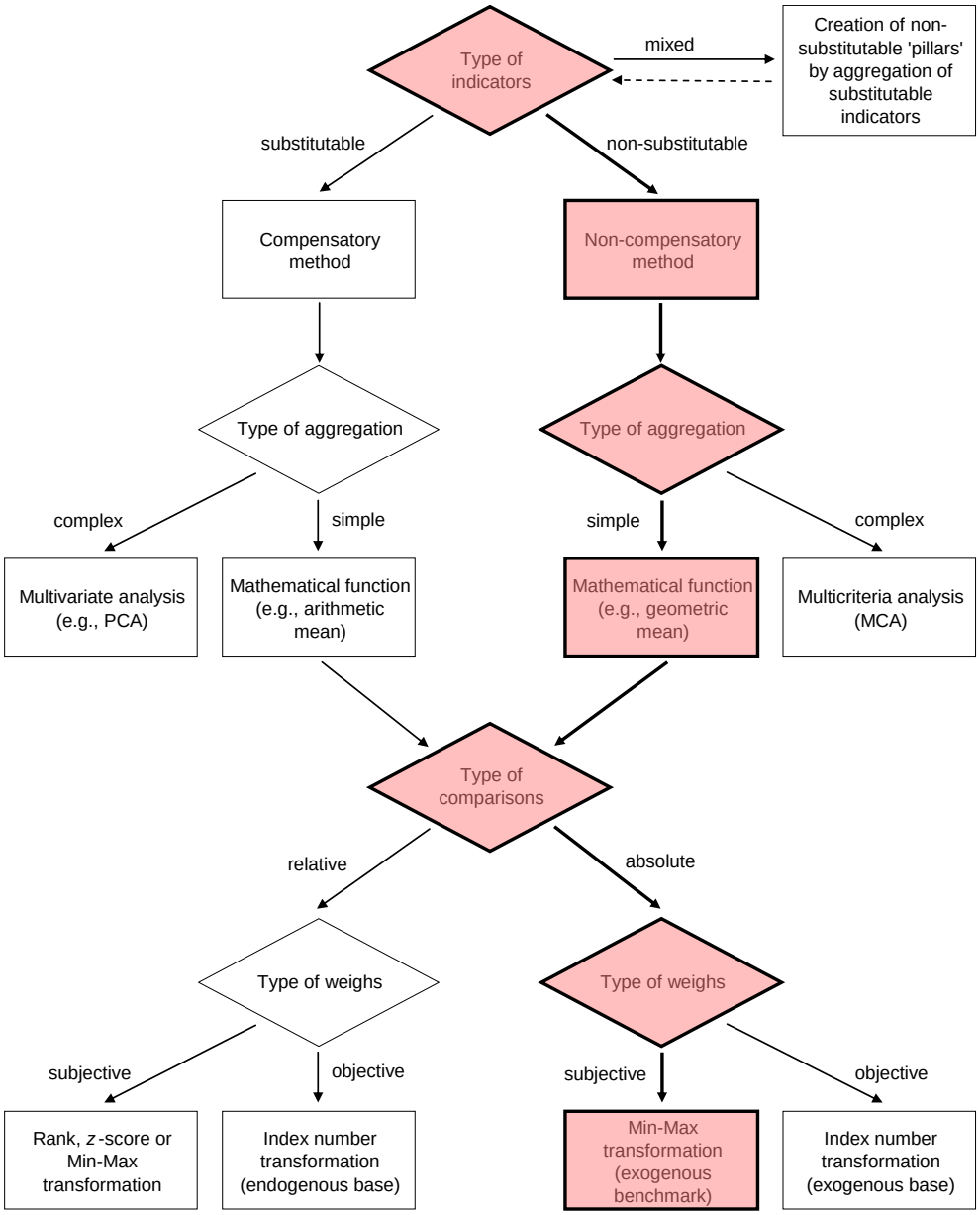


Figure 2b – *The 'path' of the "Il Sole 24ore" Index*

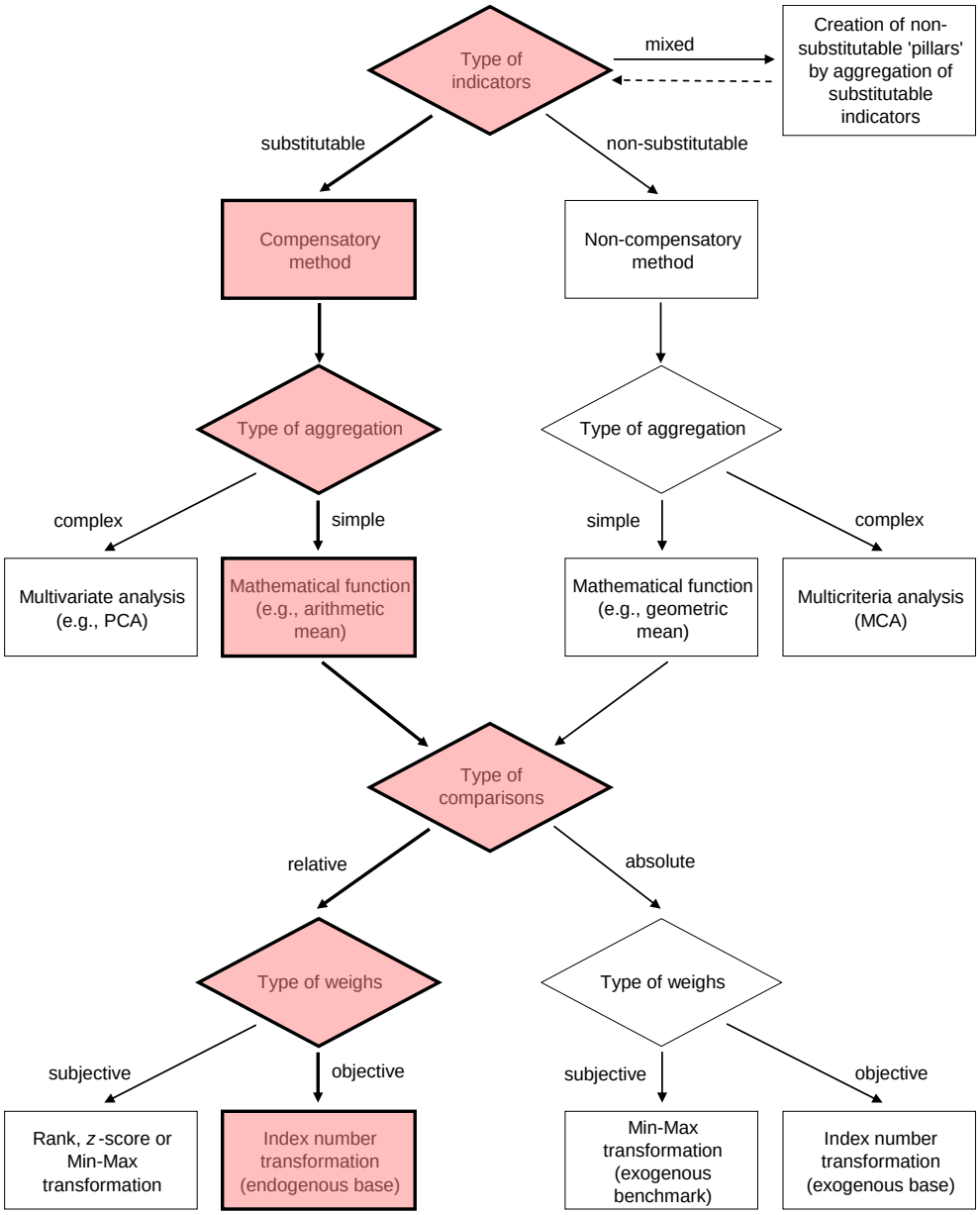


Figure 2c – *The 'path' of the Regional Quality of Development Index (QUARS)*

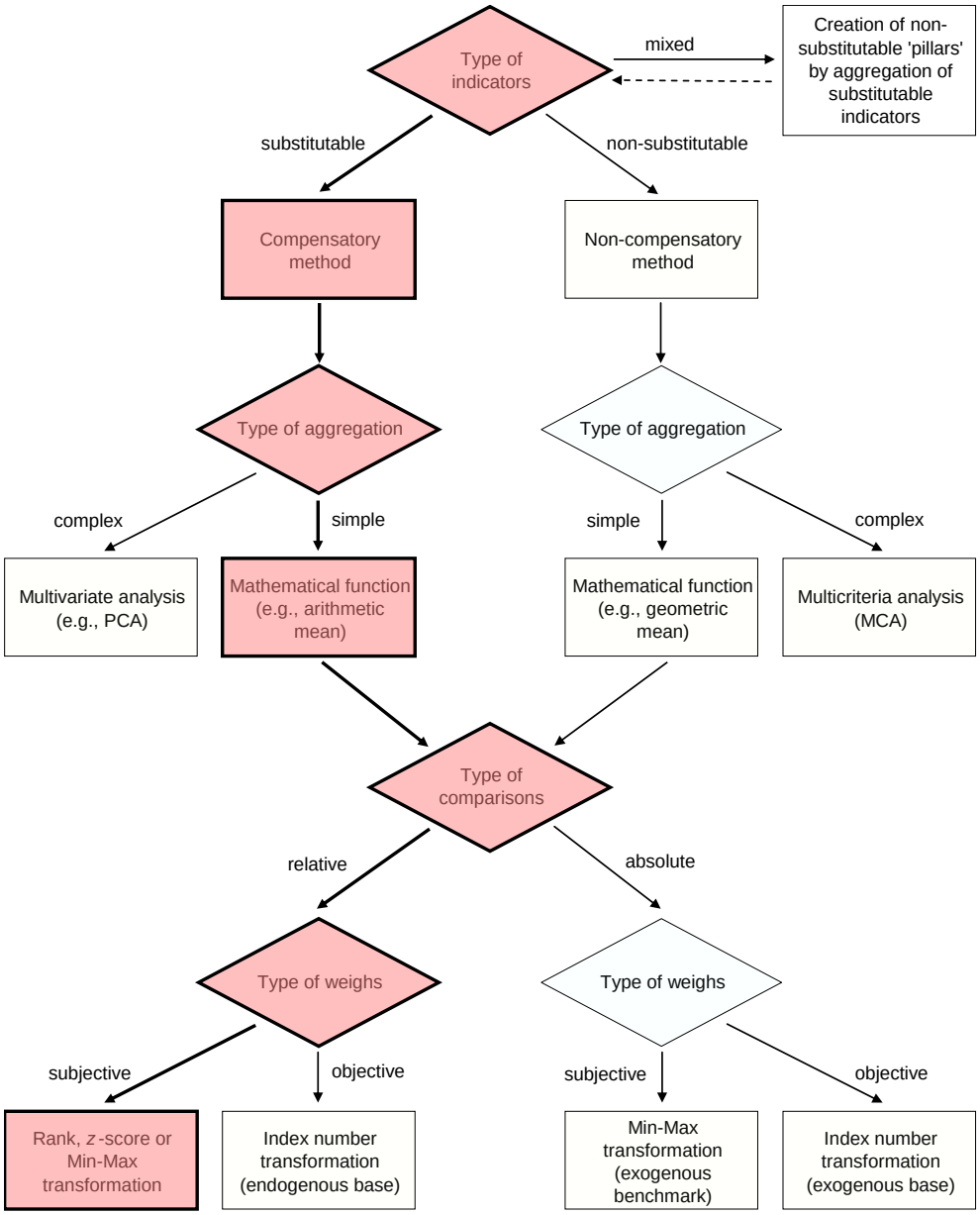
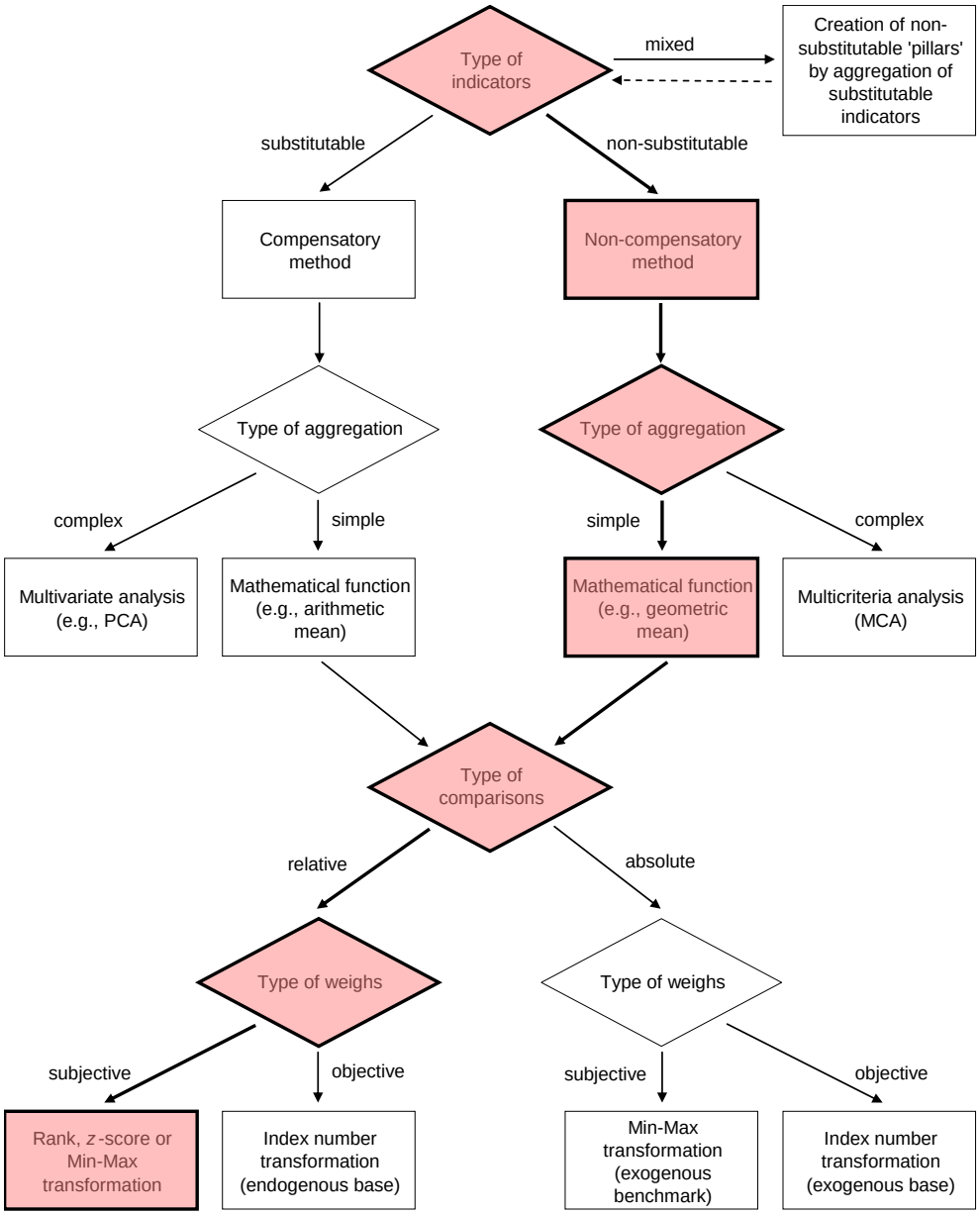


Figure 2d – *The 'path' of the Mazziotta-Pareto Index (MPI)*



5. Conclusions

As is known, the implementation of a composite index is a complex process that involves stages of work well defined, where the arbitrary choices of the researcher has a significant effect on the final results. The heated debate within the scientific Community, over the years, seems to converge towards the idea that there is not a composite index universally valid for all areas of application, and, therefore, its validity depends on the strategic objectives of the research.

In this paper we propose a scheme with some general guidelines to follow for summarizing a set of individual indicators. Beyond the procedure used, the composite indices provide an irreplaceable contribution to simplification; however, they are based on methods that flatten the basic information and they can lead to a myopic reading of reality, especially if not sustained, upstream, from an adequate step of selection and interpretation of the individual indicators.

Therefore, it is considered absolutely essential, in order to obtain valid and reliable results, to support the process of choosing the set of the individual indicators with a theoretical framework that defines the social reality in each of its dimensions (Delvecchio, 1995).

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SUMMARY

The debate on the measurement of multidimensional socio-economic phenomena has had a strong acceleration in recent years thanks to the publication of the Stiglitz report and the first BES report (Equitable and Sustainable Well-being) by Istat and CNEL. The main objective is to find an alternative measure to GDP. Many attempts have been studied over the years but no one has really replaced the GDP. The reason is twofold: on the one hand, the socio-economic theories proposed do not seem to have a solid foundation; on the other hand, the statistical methods used to reduce multidimensionality are not always mathematically rigorous. This paper aims to provide some suggestions for constructing a composite index.

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MEASURING POVERTY: A MATTER OF CHOICE

Cristina Freguja

1. Different concepts responding to different concerns

Within a huge variety of possible approaches, poverty is generally divided into two types, absolute/extreme poverty and relative poverty, depending on the scale or reference used to set the thresholds.

Absolute poverty refers to subsistence below minimum, socially acceptable living conditions, usually established based on nutritional requirements and other essential goods. It measures households/people unable to afford certain basic goods and services.

Relative poverty measures households/people with an equivalent disposable income/consumption expenditure below a certain threshold. It is defined in relation to the overall distribution of expenditure or income in a country that, in their turns, depend on the economic cycle and, in the first case, also on the level and structure of prices. This makes the comparison among indicators complex both in terms of time and of different national realities.

While absolute poverty refers to the resources a person must secure in order to maintain a "minimum standard of living", relative poverty is concerned with how well off an individual is in comparison to other residents in that country, which does not necessarily imply a low standard of living. In theory, therefore, while an absolute poverty line is a measure that could, adjusting for price fluxes, remain stable over time, a relative poverty line is one that could be expected to shift with the overall standard of living in a given society.

The measures of poverty based on monetary variables, expenditure and income, take as their premise that the same level of expenditure/income corresponds to the same level of well-being. In general, the incidence of relative poverty is higher when measured in terms of disposable income rather than consumption expenditure. The distribution of income is more concentrated than that of consumption expenditure: the household may decide to save part of its income or to purchase goods and services that do not fall among the consumption expenditures; in addition, by falling back on capital of household or thanks to

economical support of informal networks, low levels of disposable income may not result in levels of consumption expenditures similarly low.

Income may also present significant fluctuations over time (as it happens to the income of self-employed or seasonal workers), which do not reflect a similar variability in terms of available resources. In fact, at any given time, the standard of living of a household depends more on permanent income than the current one. In addition, the levels of consumption are also affected by the decisions regarding the allocation of income and preferences in different stages of the family life cycle.

The choice between consumption and income as point of reference for the analysis of poverty therefore remains partly open, and it is quite the comparison between the two aggregates that provides the most informative contribution. The availability of statistical sources and their characteristics then become crucial to properly analyze the phenomenon (Freguja, Pannuzi, 2007).

1.1 Relative poverty

In Italy estimates of relative and absolute poverty are available every year since 1980 and 1997[1] respectively, thanks to the availability of a robust statistical information provided by the household budget survey (Coccia, Pannuzi, 2002).

The relative expenditure-based poverty measure is based on the International Standard Poverty Line (Ispl) which is the limit of demarcation between the poor and non-poor. The poverty threshold is defined for a two-members household that is considered poor when its level of expenditure is lower than that reached, on average, by a single person (Istat, 2013).

For households of different sizes an equivalence scale known as Carbonaro equivalence scale (1985)[2] is used. The values of the equivalence scale[3] represent the coefficients with which the expenditure of a household of a certain size is divided in order to be made equivalent to that of a household of two components (with coefficient equal to 1).

According to the methodology, the effect of economies of scale is introduced only after the determination of the poverty line which, in fact, is calculated on the not equivalent distribution of consumption expenditure. In other words, the

[1] Since 2005, a new methodology for the measure of the absolute poverty was launched (Istat 2009a).

[2] It is based on a simple double logarithmic function between consumption expenditures and size of the household (De Santis, 1996). The scale was estimated on the household budget survey data 1981-1983.

[3] 0,60 for a single member; 1,0 for two household members; 1,33 for three household members; 1,63 for four household members; 1,90 for five household members; 2,16 for six household members; 2,40 for seven household members or more.

threshold value (the consumption expenditure per capita) is the value of the consumption of a single person, obtained without taking into account the characteristics and size of the household they belong to.

Since 2004, Istat also provides statistics on relative poverty that are income-based and harmonized at European level; the data source is the Income and living conditions survey (EU-SILC - Regulation EC n.1177/2003).

The methodology of Eurostat sets the at-risk-of-poverty threshold at 60% of median equivalent income (European Commission, 2010). The modified OECD scale is used to calculate the equivalent income. This equivalence scale gives a weight of 1.0 to the first adult in the household, 0.5 to any other household member aged 14 and over and 0.3 to each child below 14.

1.2 Absolute poverty

The absolute poverty threshold corresponds to the minimum expenditure required to purchase the basket of goods and services that are considered essential, in the Italian context and for a given household, to attain the "minimum acceptable" standard of living (Grassi, Pannuzi, 2009). The basket is made of a food and drink component and a housing component. The food and drink component was defined considering the individual calories needed to carry out the usual daily activities. As for the evaluation of the housing segment, the availability of the place and the necessary facilities equipment was taken into account.

In order to complete the picture of individual and household needs, regarding health, education, transport and clothing, a lump-sum was defined (residual component). As the residual expenditures strongly depend on individual characteristics and less on scale economies in respect with housing expenditure, it has been hypothesized that this component depends on the household typology similarly to the food and drink component.

The basic needs are considered homogenous all over the nation (despite few differences due to external factors as the climate on determining the heating need), but their costs differ.

Therefore, the basket monetary value and the poverty threshold vary by geographical area and residence municipality size. The poverty thresholds are calculated for each single household, depending on number and age of its components. Over time the value of the basket is updated taking into account the single good and service price dynamics by geographical area so that it does not depend on the variations in the distribution of consumption or income and on the economic trends.

Households with monthly expenditure equal to or below the threshold (which varies according to household size and age composition, to geographical area and demographic scale of the municipality of residence) are classified as poor in absolute terms. In 2012, for a household made up of two adult members (aged 18-59) in a small municipality the absolute poverty threshold was 1013.19 euros, if resident in the North, and 779.66 euros if in the South and Islands area; it decreases to 946.27 euros and 721.99 euros, respectively, if one of the two members was aged over 74 (Istat, 2013).

2. Extreme poverty

Relative and absolute measures of poverty capture the condition of poverty that refers to people living in private households. This means that they do not take into account the most severe forms of poverty and social exclusion: housing deprivation and homelessness. Researches and analysis on this domain are still very limited because of the great difficulties in collecting information on the population group affected by this issues (Grassi, Pannuzi, Siciliani, 2010).

Only few countries have developed methodologies to regularly produce statistics on homelessness. The main experiences are currently conducted in the United States, Australia, Netherlands and Sweden. In 2001, the French National Institute of Statistics (INSEE) carried out a homelessness country-wide survey to estimate the users of shelters and hot meal distribution services.

Among relevant Italian experiences on this domain, a country-wide data collection conducted by the Commission on Social Exclusion together with the Zancan Foundation of Padua and a survey of the Veneto Region and University of Padua are worthwhile to be mentioned.

The homelessness research[4] - under an agreement between Istat, the Italian Ministry of Employment and Social Policy, the Italian Federation of Associations for the Homeless (fio.PSD) and the Italian Caritas organization, is the first Italian experience involving the statistical institute with the aim of providing reliable estimates of the homeless services and of the people who enter in contact with them.

Consistently with the European Typology on Homelessness and Housing Exclusion (Ethos classification) adopted by Feantsa[5] organization, the definition of homeless assumed in the research includes each person suffering a condition of intense housing hardship, referring to the impossibility/incapacity of independently

[4] Homeless not using services during the reference period were not included in the survey.
[5] FEANTSA is the European Federation of National Organizations working with the Homeless.

finding or maintaining a house in a strict meaning. It includes people living: i) in public spaces (streets, barracks, abandoned cars, caravans, warehouses); ii) in a night shelter and/or obliged to spend several hours during the day in a public space; iii) in hostels for homeless without any temporary house or accommodation; iv) in accommodation provided by the social support system (for singles, couples or groups of people). On the other side, it excludes people living in overcrowding, in illegally occupied accommodation or in structured camps and people receiving hospitality from friends or relatives.

The research has been conducted on 158 municipalities, including all the municipalities with over 70,000 inhabitants, the provincial capitals with more than 30,000 inhabitants, and the municipalities bordering on the municipality with more than 250,000 inhabitants.

The operational phases of the project were the followings:

1) a census of the organizations and services addressed to homeless people, in order to draw a map of their offer: supports for primary needs (food, clothes, drugs, personal hygiene, economical help), night and day shelter, social secretariat, social support measures (counseling, medical assistance and others);
2) a census of the service providers in order to collect information, both quantitative and qualitative, about their users (detailed interview referring to the main characteristics of the organization and services, the employed human resources, contacts network, users typologies, data storing, access type and users participation);
3) a survey on homeless people benefitting from a select sample of the services enumerated in the second phase.

The census has been conducted by CATI and CAPI techniques and has involved 1,625 organizations or institutions. The organizations' list has been derived from different archives already available at the beginning of the research (belonging to Fio.PSD, Italian Caritas, other organizations at local level, and Istat itself). Starting from these information, the database has been updated and completed by adding new organizations, reported by the already interviewed organizations, with a snowball technique, in order to catch the maximum number of centers, even informal, supplying services to the homeless.

In 2010, 727 organizations and institutions directly provided services to homeless people in the selected 158 Italian municipalities. One third of the services provides supports for primary needs (food, clothes, personal hygiene), 17% provides night shelters and 4% day shelters. More widespread are the social secretariat and the social support measures services (24% and 21%, respectively) (Istat, 2011).

Canteens and night shelters surveyed in the second step has been selected and, from each of them, a systematic random sample of the users (from a list, if available, or randomly selected people in a queue or according to the order users pass a specific point, as the entrance or the exit). The probability of being selected for a single person is directly proportional to the time spent in services, so the weighting system has taken into account the number of times the person uses the services during the reference period.

Between November and December 2011, 47,648 homeless people (confidence interval between 43,425 and 51,872) used canteens or night-time accommodation service at least once in the 158 Italian municipalities in which the survey was conducted (27.5% live in Milano; 16.4% in Rome) (Istat, 2012).

3. Material Deprivation

To integrate the information summarized in poverty indicators, by looking at more "absolute" material deprivation measures, other indicators are available every year thanks to the Income and Living Conditions survey data (EU-SILC). They are defined as a forced lack of a combination of items depicting material living conditions, such as housing conditions, possession of durables, and capacity to afford basic requirements (Eurostat, 2005).

The definition of material deprivation is based on the inability to afford a selection of items that are considered to be necessary or desirable, in particular: having arrears on mortgage or rent payments, utility bills, hire purchase installments or other loan payments; not being able to afford one week's annual holiday away from home; not being able to afford a meal with meat, chicken, fish (or vegetarian equivalent) every second day; not being able to face unexpected financial expenses; not being able to buy a telephone (including mobile phone); not being able to buy a color television; not being able to buy a washing machine; not being able to buy a car; or not being able to afford heating to keep the house warm.

The material deprivation rate is defined as the proportion of persons who cannot afford to pay for at least three out of the nine items specified above, while those who are unable to afford four or more items are considered to be severely materially deprived.

3.1 Poverty and material deprivation during the economic crisis

The expenditure-based relative and absolute poverty indicators have remained stable over the years of economic crisis, till 2011, at around 10-11% and 4-5%

respectively. The large gap between North and South has remained unchanged, too: in the northern regions the poverty rate was 4.9% in 2011 while in the southern regions it was 23.3% (Istat and Cnel, 2013).

In fact, households softened the effect of the gradual erosion of purchasing power by falling back on their capital, saving less and, in some cases, running into debt. In addition, the percentage of people in households who received financial or other aid from non-cohabiting relatives, friends, institutions or other sources rose from 15.3% in 2010 to 18.8% in 2011, and the percentage of indebted households rose from 2.3% to 6.5% in the first nine months of 2012. In this phase government transfers to workers (unemployment benefits and salary integration) and the contribution of households support networks helped to mitigate the impact of the difficulties on the labor market.

As the crisis continued, the situation deteriorated considerably in 2012. The percentage of relative poor households rose from 11.1 to 12.7% and that of the absolute poor households from 5.2 to 6.8%. The increase is evident in all the areas of the countries.

This trend is confirmed by the rise in indicators of material deprivation: severe deprivation increases from 11.1% to 14.3% between 2011 and 2012, while in 2010 the risk of poverty achieves 19.6% (+1.4 points) and increases from 13.6% to 15.1% in Central Italy and from 31% to 34.5% in the South. Moreover, income inequalities rose too: the ratio between the income owned by the top 20% earners and the lowest 20% rose from 5.1 in 2008 to 5.6 in 2010.

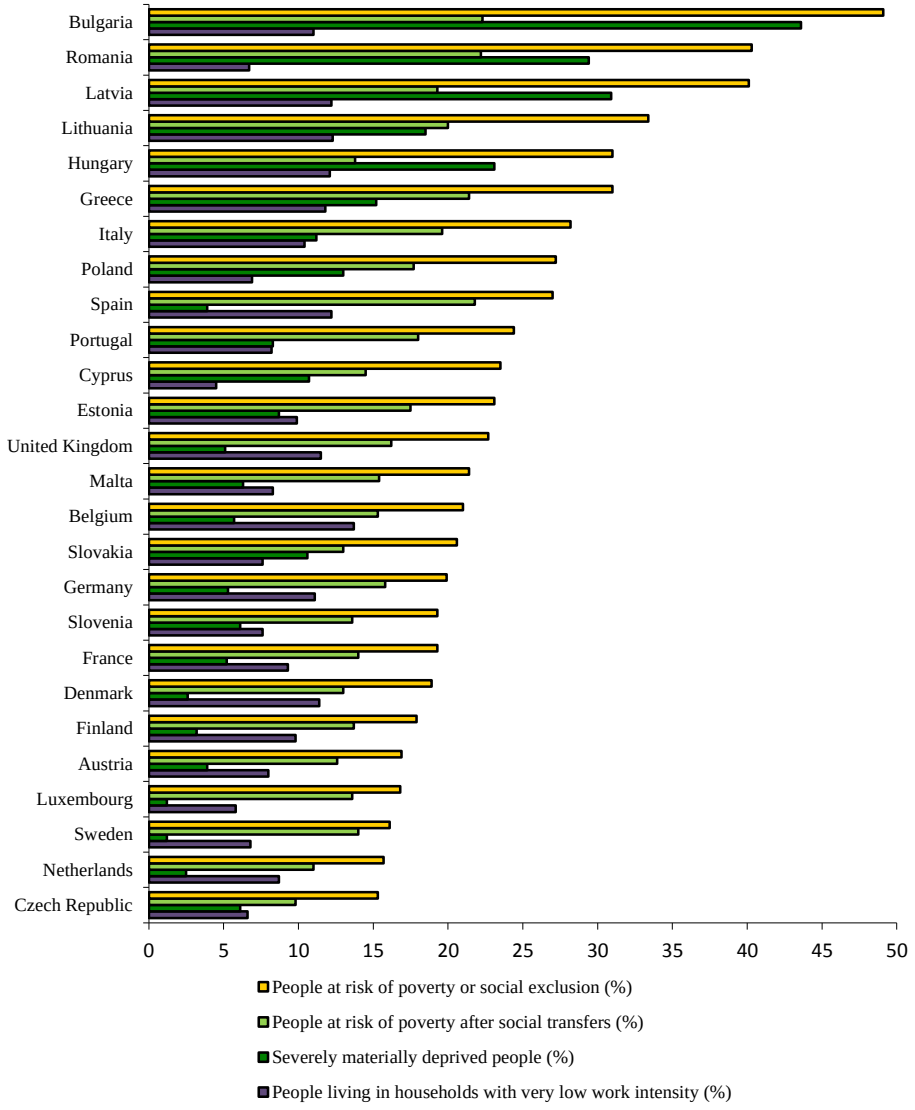
4. At risk of poverty or social exclusion

The fight against poverty and social exclusion is a key part of the Europe 2020 strategy for smart sustainable and inclusive growth. With more than 120 million people in the EU at risk of poverty or social exclusion, EU heads of state and government are committed to relieve at least 20 million people of the risk of poverty and social exclusion by 2020.

To reach this goal, Member States have to set national targets in line with EU aims and adopt measures to meet them. The European poverty and social exclusion headline target has been set on the basis of three combined indicators: the number of people i) at risk of poverty, ii) living in households with very low work intensity, iii) severely materially deprived. These indicators cover the various features of poverty and exclusion across Europe and the differing situations and priorities among Member States. People whose equivalent disposable income is less than 60% of the median for their country are considered to be at risk of

poverty. This is a relative measure of poverty, linked to income distribution and taking account of all sources of monetary income.

Figure 1 – *Population at risk of poverty and social exclusion by single component (EU 2020 indicators) and Country – year 2011 (percentage values).*



Source: Author's calculations, EU-SILC data

The indicator "persons living in households with low work intensity" is defined as the number of persons living in a household having a work intensity below a threshold set at 0.20.

The work intensity of a household is the ratio of the total number of months that all working-age household members[6] have worked during the income reference year and the total number of months the same household members theoretically could have worked in the same period.

This indicator describes the situation of people who live in households in which nobody works (or in which household members work very little), but who are not necessarily living on a very low income.

People who cannot afford to pay for at least four out of the nine items that are considered essential for a decent life in Europe (cfr. Par. 4), are defined as severely materially deprived. This indicator reflects both distribution of resources within a country as well as differences in living standards and GDP per capita across Europe.

The indicator "at risk of poverty or social exclusion", abbreviated as AROPE, refers to the situation of people either at risk of poverty, or severely materially deprived or living in a household with a very low work intensity. The AROPE rate, that is the part of the total population which is at risk of poverty or social exclusion, is the headline indicator to monitor the EU 2020 Strategy poverty target.

The measure originally developed at European level (risk of poverty), based on income distribution, is then extended to cover a non-monetary dimension of poverty and to include situations of exclusion from the labor market. In this way, in 2011, 120 million people were at risk of poverty or exclusion approximately in the 27 EU countries (Figure 1); among these, 74 million lived in one of the 17 euro area countries and 17 million resided in Italy. Each Member State is free to choose the most appropriate indicator to reach its goal. In its NRP (National Reform Program) Italy states that will be able to contribute with a reduction of 2.2 million of people at risk of poverty and exclusion (Istat, 2012a).

5. The Italian situation in the European context

In Italy, almost a fifth of the population (19.6%) was at risk of poverty in 2010[7]. This value was higher than the European average (16.9% for both the euro-

[6] A working-age person is a person aged 18-59 years, with the exclusion of students in the age group between 18 and 24 years. Households composed only of children, of students aged less than 25 and/or people aged 60 or more are completely excluded from the indicator calculation.

[7] The EU-SILC survey conducted in 2011 (income year 2010) is the latest available for all European countries.

area countries and EU 27). The highest proportions of population at risk of poverty were observed in Bulgaria (22.3%), Romania (22.2%), and Spain (21.8%), while the lowest values were recorded in the Republic Czech (9.8%) and the Netherlands (11.0%). Greece (21.4%), Lithuania (20.0%); the Latvia (19.3%) and Portugal (18.0%) are more similar to the Italian situation but with lower values of median income.

Table 1 – *Population at risk of poverty and social exclusion by single component (EU 2020 indicators) and country – years 2007, 2009, 2010 e 2011 (percentage values).*

	People at risk of poverty after social transfers				Severely materially deprived people				People living in households with very low work intensity				People at risk of poverty or social exclusion			
COUNTRIES	2007	2009	2010	2011	2007	2009	2010	2011	2007	2009	2010	2011	2007	2009	2010	2011
Austria	12	12	12.1	12.6	3.3	4.8	4.3	3.9	8.1	7.2	7.7	8	16.7	17	16.6	16.9
Belgium	15.2	14.6	14.6	15.3	5.7	5.2	5.9	5.7	13.8	12.3	12.6	13.7	21.6	20.2	20.8	21
Bulgaria	22	21.8	20.7	22.3	57.6	41.9	35	43.6	15.9	6.9	7.9	11	60.7	46.2	41.6	49.1
Cyprus	15.5	16.2	-	14.5	13.3	7.9	-	10.7	3.7	4	-	4.5	25.2	22.2		23.5
Denmark	11.7	13.1	13.3	13	3.3	2.3	2.7	2.6	9.9	8.5	10.3	11.4	16.8	17.4	18.3	18.9
Estonia	19.4	19.7	15.8	17.5	5.6	6.2	9	8.7	6.2	5.6	8.9	9.9	22	23.4	21.7	23.1
Finland	13	13.8	13.1	13.7	3.6	2.8	2.8	3.2	8.7	8.2	9.1	9.8	17.4	16.9	16.9	17.9
France	13.1	12.9	13.5	14	4.7	5.6	5.8	5.2	9.5	8.3	9.8	9.3	19	18.4	19.3	19.3
Germany	15.2	15.5	15.6	15.8	4.8	5.4	4.5	5.3	11.4	10.8	11.1	11.1	20.6	20	19.7	19.9
Greece	20.3	19.7	20.1	21.4	11.5	11	11.6	15.2	8	6.5	7.5	11.8	28.3	27.6	27.7	31
Ireland	17.2	15	16.1	-	4.5	6.1	7.5	-	14.2	19.8	22.9	-	23.1	25.7	29.9	-
Italy	**19.9**	**18.4**	**18.2**	**19.6**	**6.8**	**7**	**6.9**	**11.2**	**10**	**8.8**	**10.2**	**10.4**	**26.1**	**24.7**	**24.5**	**28.2**
Latvia	21.2	25.7	21.3	19.3	24.9	21.9	27.4	30.9	6.1	6.7	12.2	12.2	36	37.4	38.1	40.1
Lithuania	19.1	20.6	20.2	20	16.6	15.1	19.5	18.5	6.4	6.9	9.2	12.3	28.7	29.5	33.4	33.4
Luxembourg	13.5	14.9	14.5	13.6	0.8	1.1	0.5	1.2	5	6.3	5.5	5.8	15.9	17.8	17.1	16.8
Malta	14.3	15.1	15.5	15.4	4.2	4.7	5.7	6.3	9.2	8.4	8.4	8.3	19.1	20.2	20.6	21.4
Netherlands	10.2	11.1	10.3	11	1.7	1.4	2.2	2.5	9.5	8.3	8.2	8.7	15.7	15.1	15.1	15.7
Poland	17.3	17.1	17.6	17.7	22.3	15	14.2	13	10	6.9	7.3	6.9	34.4	27.8	27.8	27.2
Portugal	18.1	17.9	17.9	18	9.6	9.1	9	8.3	7.2	6.9	8.6	8.2	25	24.9	25.3	24.4
United Kingdom	18.9	17.3	17.1	16.2	4.2	3.3	4.8	5.1	10.5	12.6	13.1	11.5	22.8	22	23.1	22.7
Czech Republic	9.6	8.6	9	9.8	7.4	6.1	6.2	6.1	8.6	6	6.4	6.6	15.8	14	14.4	15.3
Romania	24.8	22.4	21.1	22.2	36.5	32.2	31	29.4	8.4	7.7	6.8	6.7	45.9	43.1	41.4	40.3
Slovakia	10.5	11	12	13	13.7	11.1	11.4	10.6	6.4	5.6	7.9	7.6	21.3	19.6	20.6	20.6
Slovenia	11.5	11.3	12.7	13.6	5.1	6.1	5.9	6.1	7.2	5.6	6.9	7.6	17.1	17.1	18.3	19.3
Spain	19.7	19.5	20.7	21.8	3	3.5	4	3.9	6.3	7	9.8	12.2	23.1	23.4	25.5	27
Sweden	10.5	13.3	12.9	14	2.2	1.6	1.3	1.2	5.9	6.2	5.9	6.8	13.9	15.9	15	16.1
Hungary	12.3	12.4	12.3	13.8	19.9	20.8	21.6	23.1	11.3	11.3	11.8	12.1	29.4	29.9	29.9	31
Ue 27	16.7	16.3	16.4	16.9	9.1	8.1	8.1	8.8	9.7	9	10	10	24.5	23.1	23.5	24.2
Euro Area (17 countries)	16.1	15.9	16.1	16.9	5.3	5.6	5.6	6.5	9.6	8.9	10.2	10.5	21.7	21.2	21.6	22.6

Source: Author's calculations, EU-SILC data

In 2011, the indicator of material deprivation confirms the worst condition of the population living in Latvia and Romania, and especially in Bulgaria, where more than two-fifths of the population lives in conditions of severe deprivation. Similarly, the good situation of households is confirmed in the Czech Republic having a lower value than the European average. In other countries, a high value of the risk of poverty associated with a reduced value of that of severe deprivation

indicates a marked inequality in income distribution, but decent standards of living for the poorest people. This is the case of Spain, Sweden and the United Kingdom. In contrast, a reduced value of the risk of poverty associated with high deprivation (Hungary) reports a slight inequality in income distribution, but considerable difficulties for people with lower incomes. In the case of Italy in 2011 people are seriously deprived: 11.2%, a value higher than the European average (6.5% for the euro-area countries, 8,8% for EU27) .

Finally, the indicator of exclusion from the labor market indicated that, in Italy in 2011, 10.4% of people aged under 60 years (7.6% of the total population) lived in a household with low work intensity , the value is close to the European average (10.5 and 10.0% respectively for the euro area and the EU 27). Values similar to the Italian one are observed in Germany (11.1%), Bulgaria (11.0%), Estonia (9.9%) and Finland (9.8%). The highest levels are recorded in Belgium (13.7%), Lithuania (12.3%), Spain and Latvia (12.2%). In addition, only in 6 EU countries the incidence of the indicator is low (less than 7%), with Cyprus and Luxembourg in the best positions.

The Italian AROPE rate shows a value (28,2%) higher than the European average: values close to the Italian are recorded for Spain (27.0%) and Poland (27.2%), but also for Greece and Hungary (31.0%). The best situation is observed in the Czech Republic (15.3%) and in the countries of Northern Europe (in the Netherlands, Sweden, Luxembourg and Austria the values do not exceed 17%). France (19.3%), Germany (19.9%) and the UK (22.7%) have a better situation than Italy.

Over the last few years (Table 1), in Italy, the percentage of people at risk of poverty has remained stable at approximately 19% (with variations not statistically significant) while increasing from 18.2% to 19.6% between 2009 and 2010. An even more marked increase is observed for the index of severe deprivation passing from 6.9 to 11. 2% between 2010 and 2011. On average, in the EU27 countries and in the euro area countries the economic conditions of the households seem to be more stable: the increase of population at risk of poverty and in conditions of severe deprivation do not reach one percentage point.

Among the population at risk of poverty or social exclusion - 28.2% - some subgroups that differ depending on the type and severity of the condition of difficulty can be distinguished (Table 2). In general, the risk of poverty is the most prevalent component and, in most cases (11.5% of the population, corresponding to about 7 million individuals), it is not associated with the other two considered.

The proportion of people living in households at risk of poverty and also deprived (3.6%, 2 million 207 thousand individuals) or with a low work intensity (2.8%, 1 million 717 thousand individuals) is in fact very small.

On the other hand, the diffusion of households only in severe deprivation (5.4%, 3 million 266 thousand people) or with only a very low work intensity (2.7%, 1 million 617 thousand people) is rather limited. The percentage of individuals living in deprived households with very low work intensity (352,000 individuals) is equal to 0.6%. Finally, the 1,6% of the population (944,000 people) live in a household simultaneously at risk of poverty, deprived and with very low work intensity.

5.1 Territorial differences

The South and the Islands are the Italian areas with the highest rates of poverty and exclusion: the proportion of people who have all the **components** is greater than 2% (approximately 469,000 individuals), while the population that has at least one is equal to 44.4% in the Islands (49.3% in Sicily) and to 38.7% in the South (42.7% in Campania).

In the South - inhabited by a third of the population - resides 57% of the people with at least one component, and 77% of those with three of them (respectively, 8 million 479 thousand and 469 thousand individuals).

The most pronounced regional disparities are observed in terms of risk of poverty, as the only component recorded (the South stood at 18.1%) and the Islands at 18.9%, compared to the national average of 11.5%, or associated with deprivation (6.9% and 9.3%, respectively, versus 3.6%) or the low work intensity (4,4% and 5,9% versus 2.8%).

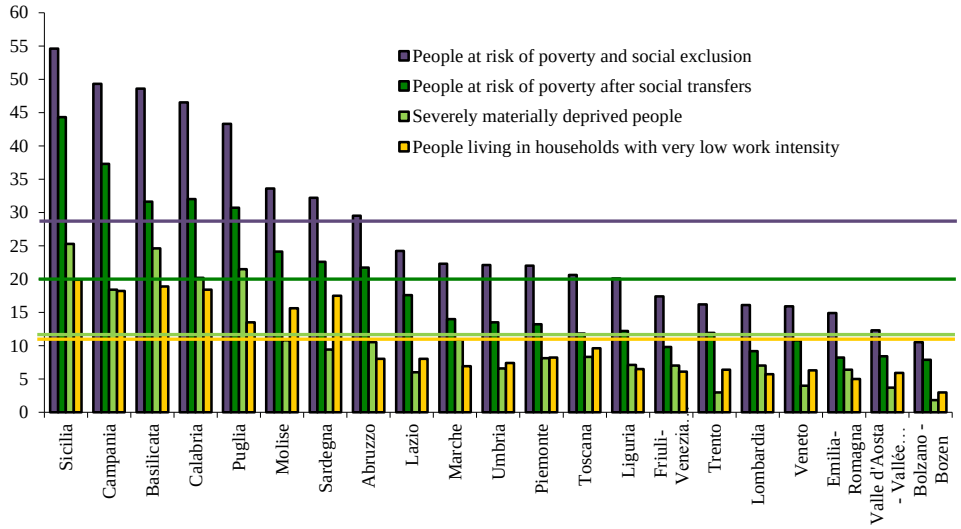
Table 2 – *Population at risk of poverty and social exclusion by single component (EU 2020 indicators) and geographical area – year 2011 (percentage values).*

MACRO AREAS	At least one component	Only one component			Two components			All three components
		At-Risk-of-Poverty Rate	Severe Material Deprivation	Very Low Work Intensity (a)	At-Risk-of-Poverty Rate and Severe Material Deprivation	At-Risk-of-Poverty Rate and Very Low Work Intensity (a)	Severe Material Deprivation and Very Low Work Intensity (a)	
North-West	18.1	6.7	5.1	2.2	1.7	1.9	0.3 (b)	0.2 (b)
North-East	15.5	6.9	3.4	2.3	1.0	1.2	0.2 (b)	0.5
Centre	22.7	10.6	4.4	2.7	1.7	2.0	0.6 (b)	0.7
South	44.9	18.1	7.8	3.4	6.9	4.4	1.1	3.1
Islands	49.0	18.9	6.3	2.8	9.3	5.9	1.0 (b)	4.7
Italy	28.2	11.5	5.4	2.7	3.6	2.8	0.6	1.6

Source: Author's calculations, EU-SILC data

Note: (a) In order to quantify the intersection of the indicators, the incidence of "very low work intensity" is considered, for consistency with the other indicators, on the total population.
(b) Estimate corresponding to a sample size between 20 and 49 units.

Figure 2 – *Population at risk of poverty and social exclusion by single component (EU 2020 indicators) and region – year 2011 (percentage values)*



Source: Author's calculations, EU-SILC data

About 60% of people at risk of poverty and of those severely deprived live in the South and in the Islands; in addition, in this area 56% of people in households with low work intensity reside. The most serious situations are once again in Sicily with the maximum values for all three indicators: the 39.9% of residents is at risk of poverty, 18.8% is in severe deprivation and 15.7% is in a household with low work intensity. High values even in Calabria and Campania, while we note a difficult situation for Puglia in terms of severe deprivation (10.7%) and Basilicata with regards to low-intensity work (14%).

At the other extreme, the North, especially the Northeast, is less exposed to the risk of poverty: the population with at least one of the considered indicators is equal to 14%; the proportion of people at risk of poverty is equal to 7,5%, in case of being the only component, and 0.9% if associated with one of the other two (respectively 858,000 and 105,000 individuals). The best situations are observed in Trentino-Alto Adige and Valle d'Aosta, where the share of the population with at least one component amounts to 11,1 and 13.4%, respectively (Figure 2).

5.2 Categories with the highest risk

In Italy, the elderly who live alone, the population living in households with three or more children, people who live in households with aggregate members (persons not related by ties of child-parent or spouses) or where there is a single parent are those that present the highest risk levels of poverty and exclusion: more than one third of these group members have at least one of the considered components. Specifically, the portion that has all three components is greater than 4% among households where several generations live together, and stands at 2.8% in the case of single parents, and 2.9% for households with three or more children (Table 3).

Table 3 – *Population at risk of poverty and social exclusion by single component (EU 2020 indicators) and type of households - 2011 (percentage values).*

HOUSEHOLD TYPE	At least one component	Only one component			Two components			All three components
		At-Risk-of-Poverty Rate	Severe Material Deprivation	Very Low Work Intensity (a)	At-Risk-of-Poverty Rate and Severe Material Deprivation	At-Risk-of-Poverty Rate and Very Low Work Intensity (a)	Severe Material Deprivation and Very Low Work Intensity (a)	
One-person household	34,1	15,4	7,4	2,1	4,7	2,6	0,6	1,2
-under 65	33.4	10.9	6.5	4.2	3.1	5.2	1.1 (a)	2.4
-65 or over	34.8	20.0	8.4	_	6.4	_	_	_
Couples without children	21.0	8.2	5.1	3.4	2.3	0.9	0.5	0.6
-r.p. (a) under 65	21.8	6.1	4.1	5.7	2.5	1.6	0.8 (a)	1.1 (a)
-r.p. (a) 65 or over	19.9	11.0	6.5	_	2.0	_	_	_
Couples with children	26.6	11.6	4.4	2.2	3.7	2.6	0.5	1.5
-One child	22.3	7.6	4.2	3.5	2.8	2.4	0.8	1.0
-Two children	25.9	13.3	4.1	1.3	3.1	2.3	0.2 (a)	1.6
-Three or more children	41.4	17.7	6.0	1.3	8.4	4.2	0.9 (a)	2.9
Single parents	39.4	10.2	7.6	5.2	4.6	7.9	1.1 (a)	2.8
Other households (b)	38.3	15.7	8.5	2.8	3.1	3.6	_	4.1
All Households	28.2	11.5	5.4	2.7	3.6	2.8	0.6	1.6

Source: Author's calculations, EU-SILC data

Note: (a) Estimate corresponding to a sample size between 20 and 49 units;
(b) Households with aggregate members where different generations cohabit.

The situation of elderly people living alone is mainly due to the high incidence of poverty, affecting 20.0% of people over 64 years, considering it as the only component, and an additional 6.4% if combined with severe deprivation (respectively, 749 000 and 240 000 individuals). In addition, elderly people living alone and those living in households with aggregate members, are mostly affected by severe deprivation (14.8% and 15.7%, respectively).

The three indicators considered by the Europe 2020 strategy capture situations of poverty and exclusion only partially overlapping. The risk of poverty and severe deprivation are both indicators that pertain to economic difficulties and have, therefore, a strong association. Nevertheless, 5.4% of the population is in a condition of severe deprivation, but not at risk of poverty or low work intensity; in most cases, they are individuals belonging to households close to the poverty line, i.e., people who live in situations of budget constraints similar to those of poor households. Nearly half (49,6%) of deprived people (not at risk of poverty or low work intensity) lives in a household whose income falls in the first two-fifths of the distribution. These people often live in jobless households (28,3%) or with a single employed (44.5) or a household having an employee income (55%) or pension (34,2%) as the main source of income.

The indicator of very low work intensity, when not associated with the risk of poverty, or severe deprivation, identifies a population group (2.7%, about 1 million 617 thousand people) distinguished by situations where low work intensity is associated with income levels close to the poverty line; the absence of overt symptoms of economic difficulty hiding aspects of vulnerability related to the fact that young people are protected from the risk of poverty by the income of older generations (with obvious weaknesses in terms of sustainability over time); the non-participation in the labor market of one or more components is associated with high income perceived by others.

The indicator of low work intensity, when not associated with the risk of poverty, nor with the severe deprivation, identifies a population group (2.7%, about 1 million 617 thousand people) in which the low work intensity is often associated with levels of income close to the poverty line, and the absence of overt symptoms of economic difficulty may hide the vulnerability of disadvantaged people (eg young unemployed maintained by the income of the parents).

The majority of these people (59,2%) lives in households with incomes that fall in the fourth or fifth quintile of the income distribution. Three quarters (76,5%) are in a jobless household and a further 20,9% in a household where only one person works. In 76.7% of cases the main income is represented by a pension or other type of social benefits; the household is mainly a couple with children (45,3%) and single-parent household (17,4%), where the difficulty to access the labor market by the younger members is not always associated with the risk of

poverty or economic deprivation, thanks to pensions and relatively high incomes of the other household members.

6. Conclusion

The different methods and data sources used for the analysis of poverty in our country help to provide a clear structural characterization of poverty: a phenomenon especially prevalent in the South, among households with a large number of components and with a more limited access to the labor market, often as a result of a modest human capital.

The analysis of subjective indicators of deprivation confirms the poverty profiles defined on the basis of the analysis of income and consumption, in some cases expanding or reducing the distances between groups of population. This highlighted that the subjective perception may change depending on the context with which we are confronted, or to the different costs of goods and services in the various areas of the country (north-south, rural-city, big-small towns). Until now, the lack of indicators produced annually did not allow an adequate response to this problem. However, the possibility of taking into account the different purchasing power of money in different areas of the country (as already done for the absolute poverty), through the revaluation of the national poverty line, is definitely a future priority for official statistics.

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SUMMARY

Poverty is a phenomenon with many possible definitions (relative, absolute, subjective, etc..) which, in turn, identify sets of poor only partially or not at all overlapping. Depending on the adopted point of view and the aspects that need to be highlighted, different poverty analyses can be carried out.

Data sources, definitions and methodological criteria adopted to measure this phenomenon have a significant impact on estimates and on the profiles of poverty. Different indicators have different and complementary uses in the identification of poverty and planning of social policies.

The measures that Italian National Institute of Statistics (Istat) provides every year permit to monitor the dynamics and characteristics of the phenomenon in Italy. This work aims to provide an overview of these measures under a defined angle, the one that relates to the scarcity of money and material deprivation. The analysis, not intending to be exhaustive, will attempt to provide an integrated view of information from different sources and different estimation methods.

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MEASURING CHRONIC POVERTY IN ITALY[1]

Luigi Fabbris, Irene Sguotti

1. Chronic poverty measurement

In this study we address the problem of measuring poverty using longitudinal data, that is, data that is repeatedly measured for the same units (individuals, families) in a particular time span. Although our results could apply to more general data collection methods, we will specifically refer to a multi-annual panel of households surveyed on an annual basis.

Two adjectives related to poverty recur in the paper, chronic and transient. Referring to lack of resources, the adjectives specify that poverty is not uniquely defined and manifests in various forms. *Chronic* poverty affects units (individuals, families or communities) for a long period of time; *transient* poverty affects units for a certain period of time but not for long, and *recurrent* poverty affects units in fluctuating spells around the poverty line[2], a situation that is occasionally termed 'churning'. Thus, at a certain point in time, the poor may be either suffering from chronic or transient poverty and the correlates of entries to and exit from poverty may differ from those of cross-sectional poverty (see, among others[3], Bane and

[1] This work was pursued as part of a 2008 project of Padua University (CUP CPDA081538) entitled "Effectiveness indicators of tertiary education and methodological outcomes of the research on University of Padua graduates", coordinated by L. Fabbris. The authors share responsibility for the paper as a whole; in detail, Luigi Fabbris wrote Sections 1, 3 and 5 and subsections, and Irene Sguotti wrote Sections 2 and 4 and subsections.

[2] With reference to a particular period, the poverty line is the lowest annual income a person would need to achieve the same welfare level as he or she could if undertaking inter-period income transfers subject to his or her budget constraints (Aaberge & Mogstad, 2007). Similarly, a minimum sustainable consumption may be defined as the minimum income transfers required to achieve constant consumption levels over time. According to Rodgers and Rodgers (1993), *permanent income* is the maximum sustainable annual consumption level an individual can achieve with a given stream of real income. The empirical estimation of the poverty line depends on national or international conventions.

[3] The definition of chronic poverty differs according to authors' social and political perspectives towards the measurement of poverty. For example, Aaberge & Mogstad (2007) define the *chronically poor* as those with persistent inability to pursue welfare due to lack of economic means.

Ellwood, 1986; Devine et al., 1992; Chaudhuri and Ravallion, 1994; Nord, 1997; Baulch and McCulloch, 1998; Stevens, 1999; Jalan and Ravallion, 2000; Chronic Poverty Research Centre, 2001; Headey and Warren, 2008).

There are two strategies for defining the poverty line, relative and absolute. The former refers to earning less income than a certain proportion of the mean or median of the population, while the latter refers to the insufficiency of the available income to obtain a set of durables or services that are believed to be essential in the community that the units belong to (Citro and Michael, 1995; Lipton, 1997; Istat, 2009).

In this study we present and discuss some indicators of chronic poverty that pertain to the income distribution of a given population and that could apply, *mutatis mutandis*, to consumption distribution. In addition, we consider an index of material deprivation (Townsend, 1987; Whelan et al., 2004; Whelan and Maître, 2007; Eurostat, 2012a) that refers to a state of economic strain and the impossibility of acquiring a certain set of durables and services.

What is interesting in the material deprivation approach is the possibility of comparing two individuals, households or western communities on the objective basis of a set of dichotomous variables and define the unit that is unable to obtain a certain basket of the involved goods/services[4]. We refer to Eurostat EU-SILC (European Union – Statistics on Income and Living Conditions) data, in which the examined items are nine and a family is considered "deprived" if it does not get three items and "severely deprived" if the missing items are four. The concerned goods and services are: the enforced inability to pay unexpected expenses; afford a one-week annual holiday away from home; eat a meal involving meat, chicken or fish every second day; afford adequate heating of a dwelling; durable goods such as a washing machine, colour television, telephone or car; and being confronted with payment arrears, such as mortgage or rent, utility bills, hire purchase instalments or other loan payments.

The observational rationale for chronic poverty is the repetitiveness of poverty measures. We analysed Italian EU-SILC data on households collected for three panels of Italian households for four consecutive years beginning 2004, 2005 and 2006, respectively, thereby making easy to obtain annual data on a household's

[4] *Mutatis mutandis*, Alkire and Santos (2010) propose a similar approach to measure multidimensional poverty. The authors also assume that the data may be collected from the same survey. The considered items, which are believed to be appropriate for developing countries, may not apply to the analysis of living standards in an OECD country. A common set of indices could be used for the analysis of poverty in both developed and developing countries only if aspects of deprivation are given weights that differentiate their importance in various countries. Moreover, the problem of compensability of various aspects must also be considered; for example, the possession of a commodity should not be used to compensate infant mortality.

equivalised income[5]; from this it was possible to establish if and when the household is to be considered poor. Precisely, one cohort of households began in 2004 and ended in 2007, a second began in 2005 and lasted till 2008, and a third began in 2006 and lasted till 2009.

The principles adopted for constructing the new indices were: (a) use all the data collected to measure the annual estimates, to make the longitudinal index smooth and representative of the entire period it represents, (b) recognise the meaning ascribed to the index by analysts accustomed to work on poverty indicators, (c) ensure that it is as easy to construct and understand as possible so that even laymen can compute and use it, (d) if possible, ensure that it is a continuous numerical variable, rather than a simple in or out of chronic poverty; (e) ensure that it makes sense if compared across years, OECD countries and (Italian) sub-populations, and (f) ensure that it would be of help to orientate policy-makers who are willing to eradicate poverty or mitigate its effects.

The remainder of this paper is organised in the following manner. In Section 2, we systematically describe the current and new types of measures of chronic poverty. In Section 3, we provide certain criteria to evaluate the quality of the proposed indices. In Section 4, we present an application of the new indices to Italian households with reference to EU-SILC data, and in Section 5 we present the conclusions.

2. New measures of chronic poverty

To ascertain poverty duration, households or individuals have to be observed at length. Poverty duration is relevant in defining a unit as being either chronically poor or merely transitionally poor. Corcoran (1995) and Alber (2001) suggest a five-year survey for ascertaining the type of poverty, but the time horizon can be shorter or longer depending on measurement purposes. In technical terms, the observation interval must be sufficiently long to be able to evaluate either individual spans of poverty from fall to end, or detect spans that are long enough to enable researchers to estimate the parameters of the poverty-periods distribution.

In a perspective framework, the poverty duration can be measured by observing the condition of the same set of families/individuals on a regular basis. The EU-SILC data collection is conducted on an annual basis, that is, every year a panel of families is observed with a common methodology to evaluate their economic and social conditions and detect if these conditions represent a cross-sectional state of poverty. A series of poverty spells permit the researcher to surmise the continuity

[5] The equivalent income is computed starting from the total income entering a household and changing it depending on the number of adults and children belonging to the household.

of the phenomenon, while a variety of states makes it evident that observational units fluctuate around the poverty threshold; moreover, a repeated assessment that units never fall below the poverty line highlights the most favourable condition of units being free from economic uneasiness during the period under analysis.

The extent to which recurrent spells of poverty can be considered as a form of chronic poverty is important. For instance, at what point does a change in welfare shifts from being transitory to being a part of the norm, that is, a permanent component of poverty? Even people who 'churn' during a particular period of time may be a component of poverty because this may imply that they are unable to escape poverty (Hulme et al., 2001).

To analyse the dynamics of poverty, it is necessary to distinguish between the 'spells' and the 'components' approach. The former approach is appropriate for identifying the chronically poor, the latter to understand the causes of chronic poverty (Hulme et al., 2001; Yaqub, 2000). In fact, the spells analysis focuses on transitions between welfare states, while the components analysis aims at highlighting the relative contributions made by structural factors and events to a household in poverty. In all countries, a quota of people whose mean income drops below the poverty line ('components approach') is also chronically poor in all the years that the household is below the poverty line ('spells approach').

In the following sections, we propose indices of chronic poverty diffusion (Section 2.1), chronic poverty severity (Section 2.2), income inequality (Section 2.3) and chronic deprivation among the poor (Section 2.4).

2.1. Diffusion of chronic poverty

A unit can be classified into one of the following three categories according to the number of times it falls below the poverty line in a particular period:

- *never poor*, if the household income was systematically above the poverty line in the four survey occasions;
- *temporary*, or *transient poor*, if the household income fell below the poverty line during one or two survey periods, not necessarily consecutive;
- *chronically poor*, if the household income was below the poverty threshold for three years, not necessarily consecutive, or for all four survey occasions. If the unit's income was below the poverty line for three years, it is considered as chronically poor since three years is the majority of the surveyed time; this implies that the mean income during the four years of

survey was in general below the poverty line[6]. If the surveyed unit was poor for all survey occasions, it is possible to assert that is was poor for at least four years, the poverty span being a censored period[7].

Household j belonging to the n^*-sized sample (n* is the number of sampling units who respond in all four survey occasions) is considered poor if its income, y_{ij}, falls below the stated poverty threshold at least three times out of four survey occasions. For occasion i (i=1, …, 4), the 'head count ratio' is

$$H_i = \sum_{j}^{n^*} \frac{y_{ij}}{n^*} = \frac{q_i^*}{n^*} \tag{1}$$

This index is analogous to that suggested in Eurostat (2012a). It takes any value between zero and one: it is zero if there are no chronically poor households in the population and one if the entire population lives in chronic poverty conditions.

Our index permits us to distinguish between chronic and transient forms of poverty according to the number of survey occasions for which the units have endured an insufficient annual income. The rationale of this index may be referred to as the 'spell approach' (Bane and Ellwood, 1986; Stevens, 1994; Cappellari and Jenkins, 2004). The basic principle of this approach is that income can be transferred within a year, but not between years (Rodgers and Rodgers, 1993); this may conflict with empirical evidence that households undertake inter-temporal income transfers (savings and borrowings) to smoothen their consumption style (Browning and Crossley, 2001) and also that poverty depth as well as inequality in the distribution of income among the poor remain hidden within measures (see Sections 2.2 and 2.3).

[6] In Jalan and Ravaillon (2000) four classes of poverty are hypothesised. Hulme et al. (2001) use the following five categories: (i) *always poor*, if income or consumption in each period below the poverty line; (ii) *usually poor*, if mean expenditures over a period are below the poverty line, but not always poor; (iii) *churning poor*, if mean expenditures are close to the poverty line but occasionally below and other times above the line; (iv) *occasionally poor*, if mean expenditures over a period are above the poverty line but below in at least one period; and (v) *never poor*, if mean expenditures are always above the poverty line. Further, a threefold categorisation is also possible: (a) *always severely poor*, combining classes (i) and (ii), (b) *vulnerable to poverty* with reference to the churning class, and (c) *wealthy non-poor* obtained by combining classes (iv) and (v). The indicator known as "persistent risk-of-poverty rate (60% median)", suggested by the EU as a measure of social exclusion (Atkinson et al., 2004), is constructed in the same manner as ours.

[7] Both three or four years of poverty make the emergence from poverty very unlikely: Yaqub (2000), analysing the poverty in the United States, found that those who have been in poverty for over four years have a 90% probability of remaining poor the rest of their lives.

2.2. Severity of Chronic Poverty

The severity of chronic poverty can be measured using several indices, all of which refer to the relative mean distance of poor households from the poverty threshold. The mean distance from the poverty threshold z_i, in year i (i=1, …, k), relative to the threshold itself, is a measure of the severity of poverty. The formula can be written in the following manner:

$$P_i = \frac{1}{q_i}\sum_{j}^{q_i}\frac{z_i - y_{ij}}{z_i} = E_j\left[\frac{z_i - y_{ij}}{z_i}\right] \tag{2}$$

where q_i is the number of units whose income is below the poverty line and $E_j(.)$ denotes the expected value of the argument pertaining to poor units. The index belongs to the class of ratios between a distance and its maximum value:

$$P_i = E_j\left[\frac{z_i - y_{ij}}{z_i}\right] = E_j\left[\frac{d_{ij}}{\max(d_{ij})}\right]. \tag{3}$$

Index P_i ranges between zero and one, where zero is the case in which all units equal the threshold and one is the case when all incomes below the threshold are null. Hence, the index –also known as the 'income gap ratio' or 'intensity of chronic poverty'– measures 'how poor are the poor', that is, the distance of the average income of chronically poor units from the poverty line. In fact, the numerator of the index is the amount of economic resources that must be invested for all poor units to achieve the threshold income. This is why this index is particularly sensible if applied to the measurement of absolute poverty.

Applied to a multi-annual period, the gap estimate is the weighed average of the annual indices for q^* chronically poor units, $P = \sum_i P_i / k = E_i(P_i \mid q^*)$.

Intense poverty may make income mobility of the poor and, in general, their exit from poverty more difficult, given the reinforcing nature of the different dimensions of deprivation. In fact, the longer the duration of poverty, the more difficult it is for the poor to emerge from chronic poverty independently.

It may be opportune to use a different indicator, based on the product of the diffusion, H_i, and the severity of poverty, P_i:

$$PG_i = H_i P_i = \frac{1}{n_i}\sum_{j}^{q_i}\frac{z_i - y_{ij}}{z_i} = \frac{q_i}{n_i}\left(1 - \frac{\bar{y}_i}{z_i}\right) \qquad (i = 1, ..., k) \tag{4}$$

which becomes the income gap computed over n_i units, instead of q_i. This index is also termed 'poverty gap of the poor'.

The *PG* index, computed as an average of *k* annual PG_i indices, is at all similar to *P*: $PG = \sum_i H_i P_i / k = E_i(P_i \mid n_i)$. It is easy to show that both *P* and *PG* indices can be negative if the temporarily poor units are considered, while it is, in general, positive for chronically poor units but could be negative for 'churning' units.

Foster *et al*. (1984) suggested an even more general index of poverty based on the average power of the argument of the income gap:

$$_{\alpha}PG_i = \frac{1}{n_i}\sum_{j}^{q_i}\left(\frac{z_i - y_{ij}}{z_i}\right)^{\alpha} \quad \alpha \geq 0 \qquad (i = 1, ..., k) \tag{5}$$

This index, called 'poverty aversion' by Foster and co-authors, coincides with the diffusion index H_i (formula 1) for $\alpha = 0$ and the poverty gap PG_i (formula 4) for $\alpha = 1$. Values of α greater than one imply that lower incomes become more important in evaluating the poverty gap. The authors suggest computing the gap by squaring the relative distance of the poor units from the threshold, thereby ascribing greater importance to units with very low or null income. All indices based on formula (5) vary between zero and one and can be interpreted as the parallel index *PG*.

We propose to compute the quadratic index of chronic poverty gap as the simple average of the *k* annual estimates, that is, $_2PG = E_i(_2PG_i)$.

2.3. Income Inequalities and Poverty

Sen (1976) proposes an index that is based both on the average income and on Gini's inequality measure of income distribution (Gini, 1912) below the poverty line. Indexing the units in a non-decreasing order of income ($y_{ij} \leq y_{i,j+1}$), the Gini index is computed in the following manner:

$$G_i = \frac{2}{q_i^2}\sum_{j}^{q_i} j\,\frac{y_{ij} - \bar{y}_i}{\bar{y}_i} \qquad (i = 1, ..., k) \tag{6}$$

where $\bar{y}_i$ denotes the mean of the incomes below the poverty line. The Gini index, as a measure of the concentration of the incomes of the poor, is invariant with respect to scale transformation of income distributions and ranges between zero

and one: the null value is the case in which all units below the poverty line earn the same income and the unit value is the opposite case in which all the income below the poverty line is obtained by a single unit and everyone else has zero income.

Further, Sen's index is constructed in the following manner:

$$S_i = H_i[P_i + (1-P_i)G_i] = PG_i[1+G_i(P_i^{-1}-1)] \quad (i=1, ..., k) \tag{7}$$

where all symbols are known. All components of the index assume values between zero and one and the composite index varies between zero and one, too. The composite index is null if all poor units possess the same income and this income equals the threshold, and one if all q poor people have no income. Moreover, if $G_i = 0$, then $S_i = PG_i$.

The multi-annual index of poverty and income inequalities is given by the simple average of k annual estimates, that is, $S=E_i(S_i)$.

2.4. Chronic Deprivation and Poverty

The concept of deprivation is analogous to that of absolute poverty, as both concepts imply the difficulty for families to obtain a basket of durables and services that are identified as necessities in a reference community. Whether multiple deprivations are to be considered a direct measure of poverty or merely risk indicators, is a matter of scientific debate and cultural tension (Watts, 1968; Ringen, 1988; Atkinson, 1998; Tsui, 2002; Bourguignon and Chakravarty, 2003; Berthoud et al., 2004; Duclos et al., 2006; Alkire and Foster, 2007; Ravallion, 2011).

Measures of deprivation severity can be constructed as lack-of-income ones presented in Section 2.2. The 'diffusion of material deprivation' can be estimated with EU-SILC data by applying either the formula:

$${}_\alpha D_i = {}_\alpha E_i\left(\frac{x_{ij}-\min(x_{ij})}{\max(x_{ij})-\min(x_{ij})}\right)^\alpha = \frac{1}{n_i}\sum_j^{n_i}\left(\frac{x_{ij}}{9}\right)^\alpha \quad \alpha \geq 1 \quad (i=1, ..., k), \tag{8}$$

which applies to the entire sample of n_i (i=1, …, k) units, or the formula:

$$ {}_{\alpha}D_i = {}_{\alpha}E_i\left(\frac{x_{ij}-\min(x_{ij})}{\max(x_{ij})-\min(x_{ij})}\right)^{\alpha} = \frac{1}{q_i}\sum_{j}^{q_i}\left(\frac{x_{ij}-B}{9-B}\right)^{\alpha}$$

$$\text{in which} \qquad (9)$$

$$\alpha \geq 1 \quad B = 3,\ 4 \quad (i = 1,\ ...,\ k)$$

which applies to the sample of q_i (i=1, …, k) poor units defined as people who lack either three ('deprived') or four ('very deprived') goods or services (according to Eurostat taxonomy).

Both indices described with formulae (8) and (9) vary between zero and one, where zero is the case of null deprivation and one represents complete deprivation. Let us consider index (9) that is a more relevant representation of poverty[8]. If α = 1, the index describes the 'intensity of deprivation' analogous to index P_i (described with formula 2 with reference to income) and if α = 2, the index represents the intensity of deprivation but ascribes much more importance to units that possess much less than the other deprived units, which is similar to the quadratic index given by Foster et al. (1984) and described in Section 2.2.

The multi-annual index of severity of deprivation is given by the simple average of k annual estimates, that is, D=E_i(D_i).

The diffusion of chronic deprivation, H_D, is to be defined through a procedure that is similar to that of chronic poverty diffusion discussed in Section 2.1. That is, it depends on the number of (annual) occasions on which statistical units lacked the threshold number of attributes, or more, from among the complete list of considered attributes. In relation to these k dichotomous outcomes in the four years of analysis, units may be classified into one of the following three categories:

- *never deprived*, if the unit was always below[9] the deprivation line;
- *temporary deprived*, if the unit happened to be deprived in some years but not in the majority of survey occasions;
- *chronically deprived*, if the unit was more often above than below the deprivation threshold, that is, in a four-year span, it was above the deprivation line for three years.

This classification may be considered an empirical consequence of Friedman's theory (Friedman, 1957) that the richness and poverty of people are concepts that

[8] Also DWP for the UK (2003: 14) considered the units whose deprivation indices were *above* the deprivation line (deprivation is an opposite concept than income, thus the deprived are those *above* the deprivation line) for three out of the four years as severely deprived.

[9] One method to capture complete spans of poverty through surveys is collecting retrospective data and analysing life histories with qualitative focuses on multidimensional, relational aspects of social exclusion and material deprivation.

refer to their expected income over a lifetime or a large proportion thereof. This implies that durable goods may remain available for many years and thus the diffusion index of chronic deprivation reflects the length of possibly censored deprivation periods.

3. Criteria for index selection

The poverty indicators proposed in Section 2 can be classified as either possessing or not possessing certain mathematical properties, also called axioms (Sguotti, 2013). Let us denote the income of a population of N units with y, its poverty line with z and a measure of chronic poverty with $P(y; z)$, function of y and z. Poverty indicators could possess one or more of the following properties:

a) *Linear invariance*. This implies that indices should not vary if income is measured either in a different currency or using indirect scales. Thus, any linear transformation of the income of the j-th unit $x_j = a + by_j$, with positive b, maintains the order of income owners and, in particular, both the proportion and the severity of poverty are equal to those of y: $H(y;z) = H(x;a+bz)$ and $P(y;z) = P(x;a+bz)$. *Mutatis mutandis*, this property is similar to that of 'population invariance', as described in Baldini and Toso (2004), that entails the invariance of both the frequency and severity indices that can be obtained by replicating t times ($t > 1$) the initial distribution, y, of incomes below the poverty line. If only the incomes below the poverty line are considered, any decrease in income of one or more of these units should increase the severity of poverty. If, for example, $x_j = y_j - k$, with $k > 0$ and $j = 1, \ldots, q$, then $P(y;z) = P(x;z)$. Sen (1976) terms this latter property *monotonicity*.

b) *Additive decomposability*. Suppose the population is divided into G groups and a poverty index is computed for each. An indicator is additively decomposable if it can be obtained through a weighed average of group poverty indices. Suppose w_g denotes the weight of group g (g=1, …, G) and $P(y_g; z)$ its poverty index, the decomposable population index is given by: $P(y;z) = \sum_{g}^{G} P(y_g;z)\, w_g$.

c) *Anonymity*, or *symmetry*, implies that poverty indices are indifferent to units' identifiers. Thus, if units j and k ($j \neq k = 1, \ldots, q$) swap their incomes, the index of poverty frequency does not vary after the swap if the units are either both below or above the poverty line, or if they are one

above and the other below the line: $H(y;\ z) = H(x;\ z)$, where *x* denotes the income distribution of newly-labelled units[10]. The same holds for measuring the severity of poverty for units below the poverty line: $P(y;\ z) = P(x;\ z)$.

d) *Transfer sensitivity*. This implies that if a quota *c* of the unit *j* income, y_j, is transferred to another unit *k*, which has a greater income ($y_j < y_k \leq z$; $x_j = y_j - c$; $x_k = y_k + c$; $j \neq k = 1, \ldots, q$), the measure of poverty of the former unit increases and so should do the overall measure of poverty intensity: $P(y;\ z) < P(x;\ z)$. The symmetric expression of this property is the *identification axiom*, as described in Baldini and Toso (2004), which claims the invariance of the measure of poverty to any monetary re-distribution among units that are above the poverty line and remain above it after re-distribution:

$$P(y;z) = P(x;z);\ \ x = (y_j, .., y_l - k; .., y_m + k ...);\ (x_l, x_m) > z\,.$$

In the following account, the indicators of the classes *H*, *P*, *PG*, *G* and *S*, as presented in Section 2, will be defined according to the aforementioned properties. In particular, in Section 3.1 the indices based on the head count of the poor are examined, in Section 3.2 linear and the quadratic measures of chronic poverty intensity are examined, and in Section 3.3 measures of the intensity of chronic poverty and the Gini inequality measure among the poor are juxtaposed.

3.1. Head Count Measures of Chronic Poverty

The indicators of chronic poverty based on the headcount of those who possess a given characteristic, that is, *H* (formula 1) and H_D (Section 2.4), require a count of the units with insufficient income and materially deprived, respectively.

With reference to the three categories of never, temporary or always poor/deprived, both longitudinal indicators possess the properties of anonymity, insensitivity to linear variation of the basic (annual) data, and also among-group additivity, provided we confine the statistical analysis to units with valid values at any survey occasion and maintain a single poverty line. The indicators are insensitive to any intra-year between-units transfer of income/durables that occurs above the poverty line. They are also insensitive to income transfers below the poverty line unless it permits the poor during one or more survey occasions to cross the poverty line.

[10] See also Baldini and Toso (2004) for comments on anonymity.

The possibility of decomposing a longitudinal index into group indices qualifies it as a malleable measure of poverty diffusion. Since total poverty is a weighted average of subgroup levels, a decrease in the poverty level of a subgroup should lead, *ceteris paribus*, to less poverty in the population as a whole. According to poverty-reduction policies, it is then possible to anticipate the level of poverty in the entire population.

3.2. Linear and Quadratic Intensity of Chronic Poverty

The indices based on the relationship between either the absolute distance or the quadratic distance from the poverty line –that is the indices $P_1 = PG$ (formula 4) and P_2 (formula 5) for a standard comparison– in general provide similar indications even though their values differ.

Both linear and quadratic indices of chronic poverty possess, at the very least, the properties of the class of decomposable indices of poverty proposed by Foster et al. (1984). They possess the properties of anonymity of units and insensitivity to income transfer that occur above the poverty line. Since they are also invariant to positive linear transformations of (basic) annual data, the following identities are found: $P(y_{ij}; z_i) = P(x_{ij};\ a + b\, z_i)$ and $P(y_{ij}; z_i)^2 = P(x_{ij};\ a + b\, z_i)^2$, where $x_{ij} = a + b\, y_{ij}$ and z_i is the poverty line of year i ($i = 1, \ldots, 4$).

Linear and quadratic indicators are also additively decomposable into group indicators if the population is stratified into groups, provided the poverty line of a given annual distribution is fixed. It is worth noting that measures relying on rank-order of the population units (as Sen's measures do) fail to satisfy the basic condition that an increase in subgroup poverty must increase total poverty.

3.3. Intensity of Chronic Poverty and Inequality among the Poor

Using a similar notation to ease understanding, Sen's index contains the intensity of poverty and the Gini inequality index proportional to $P + G - P \times G$, where P is the intensity of poverty (formula 2) and G is the Gini inequality index among the poor (formula 6).

What sets apart the Gini inequality index from both linear and quadratic measures of lack-of-income severity is that inequality is computed as the distance from a distribution mean and not from a poverty line. This implies that most severity measures are negatively correlated with inequality measures. Moreover, inequality is a mean of individual income values multiplied by the rank order of

that value in the income distribution. This implies that we can expect a good correlation between the Gini index and quadratic measures of severity, as expressed in formula (5) with $\alpha = 2$.

Measures defined by formula (5), for $\alpha = 1$ or 2, retain the property of group decomposability if a common set of units, *n**, is followed up during the observational period. Instead, group decomposition of inequality measures involves a 'between-group' term to account for the differences among group mean incomes (also see Bourguignon, 1979; Shorrocks, 1980).

4. Chronic poverty in Italy

The indicators proposed as measures of chronic poverty have been applied to EU-SILC data collected for various years in Italy. The data pertain to three cohorts of Italian families (2204, 2005 and 2006 samples), each one followed up for four years. Incomplete observational periods have been excluded. The sample size of the three cohorts is 12,260 families. Out of this large sample, 3,652 families fell below the poverty line referred to the 'relative' distribution of income, and 1,487 fell below the 'absolute' poverty line of the same sample distribution at least one.

The distribution of income is characterised by a moderate variability in time. Tables 1, 2 and 3 show that a large proportion of income earners remain within the same distributional quintile, but it is much more likely that they remain within the lowest quintile (with a 64% probability, four years apart) or within the highest quintile (64.8% probability) than within intermediate quintiles (46.3%). In other words, it is much more likely that the poorest proportion of the population remains the poorest and that the richest remains the richest.

Table 1 – *Transitions between income quintiles of EU-SILC panels of Italian families at first* and last** survey occasion (sample size of 2004, 2005 and 2006 cohorts of households: 12,260).*

	Last occasion					Total
First occasion	I	II	III	IV	V	
I	64.0	21.5	8.8	3.5	2.2	100.0
II	20.3	48.4	19.5	8.6	3.2	100.0
III	8.8	18.7	44.0	20.3	8.2	100.0
IV	4.1	7.8	19.9	46.6	21.6	100.0
V	2.9	3.5	7.9	21.0	64.8	100.0

Note: (*) Q_1=8655.7 Q_2=12212.4 Q_3=16145.0 Q_4=21680.6
(**) Q_1=9629.4 Q_2=13557.7 Q_3=17753.0 Q_4=23851.4

Table 2 – *Transitions between income quintiles of EU-SILC panels of the Italian poor at first* and last** survey occasion (sample size of 2004, 2005 and 2006 cohorts of households that fell at least once below the "relative" poverty line: 3,652)*

	Last occasion					Total
First occasion	I	II	III	IV	V	
I	40.2	16.8	9.3	15.8	17.9	100.0
II	17.6	33.1	11.7	17.3	20.3	100.0
III	9.2	18.3	33.3	20.5	18.7	100.0
IV	14.9	16.3	23.2	30.1	15.5	100.0
V	18.3	15.6	22.2	16.3	27.6	100.0

Note: (*) Q1=5350.8 Q2=7072.0 Q3=8292.2 Q4=11091.5
(**) Q1=6256.2 Q2=7908.0 Q3=9200.6 Q4=12295.6

A similar 'absorbing' effect can be observed if the analysis is confined to families that fell at least once below the poverty line: the poorer families among the poorest ones are much more likely to remain poor for the entire observational period than families who churn around the poverty line. The phenomenon is more evident if a broader (i.e. 'relative') definition of chronic poverty is adopted: the lower quintile of the relatively poor can be found in the same distributional quintile four years apart with a 40.2% probability, while the quintile close to the poverty line is stuck to the same position with 27.6% probability (Table 2). This phenomenon is confirmed, although it is less evident, for the absolute poor (Table 3).

Table 3 – *Transitions between income quintiles of EU-SILC panels of the Italian poor at first* and last** survey occasion (sample size of 2004, 2005 and 2006 cohorts of households that fell at least once below the "absolute" poverty line: 1,487)*

	Last occasion					Total
First occasion	I	II	III	IV	V	
I	32.9	13.1	11.4	19.8	22.8	100.0
II	14.5	24.9	18.5	22.9	19.2	100.0
III	8.9	17.0	29.7	21.5	22.9	100.0
IV	20.6	25.6	24.3	19.9	9.6	100.0
V	23.2	19.1	16.1	15.8	25.8	100.0

Note: (*) Q1=4229.6 Q2=5980.0 Q3=7072.0 Q4=10529.1
(**) Q1=5047.3 Q2=6948.7 Q3=8406.9 Q4=11936.0

The estimates of the chronic poverty indices and chronic deprivation indices are presented in Tables 4 (relative poverty approach) and 5 (absolute poverty approach). It is evident that:

Table 4 – *Indices of relative chronic poverty and chronic material deprivation (missing 3 items) in Italy by cohort (EU-SILC data)*

	2004-2007	2005-2008	2006-2009	All samples
Chronic poverty diffusion	14.83	14.83	15.33	14.99
Severity of chronic poverty	23.00	25.52	25.14	24.54
Poverty gap index	3.41	3.79	3.85	3.68
Sen's chronic poverty index	6.06	6.49	6.55	6.36
P_2 index of chronic poverty	3.15	3.14	3.43	3.24
Transitory poverty diffusion	14.87	14.88	14.63	14.80
Severity of transitory poverty	-28.16	-25.75	-27.44	-27.44
Chronic deprivation diffusion	22.73	23.56	20.15	22.16
Severity of chronic deprivation	12.82	11.83	11.41	12.06
P_2 index of chronic deprivation	1.36	1.21	1.16	1.25

- Chronic poverty is much less frequent than cross-sectional poverty and even than chronic deprivation. Chronic poverty involves approximately 15% of the Italian families, while material deprivation exhibits larger figures (approximately 22%). Of course, we can surmise that the material deprivation index also includes transitory poverty, which involves approximately another 15% of the families. The indicators of severity of chronic poverty differ slightly from those of chronic deprivation and Sen's index after standardisation by sample size: the poverty gap index is 3.7% on average *versus* 12.1% of deprivation and 6.4% of Sen's index, the latter aimed at indicating both lack of income and income inequality.

Table 5 – *Indices of absolute chronic poverty and severe chronic deprivation (missing 4 items) in Italy by cohort (EU-SILC data)*

	2005-2008	2006-2009	All samples
Chronic poverty diffusion	5.89	6.08	5.98
Severity of chronic poverty	30.63	29.06	29.84
Poverty gap index	1.80	1.77	1.79
Sen's chronic poverty index	3.15	3.15	3.15
P_2 index of chronic poverty	1.92	1.85	1.89
Transitory poverty diffusion	12.05	12.90	12.47
Severity of transitory poverty	-34.21	-37.80	-36.27
Severe chronic deprivation diffusion	9.57	9.73	9.07
Severity of chronic deprivation	-11.48	9.46	10.16
P_2 index of chronic deprivation	0.71	0.57	0.61

- All figures concerning measures of chronic poverty in absolute terms are lower than those representing relative poverty. Hence, absolute poverty indices tend to assume values that are more similar to each other, but differences are still important: the diffusion of poverty is approximately 6% with reference to lack of income and approximately 9% with reference to material deprivation. The severity of lack of income is 1.8%, Sen's index 3.2% and the severity of material deprivation of the poor is 10.2%. Some estimates of severe chronic deprivation have a *negative* sign. This implies that a measure of the diffusion of chronic material deprivation cannot be taken as a substitute of a measure for lack of income if the chronic poverty of families is to be ascertained.
- Quadratic indices of severity of lack of income are similar in value or lower than the linearly constructed ones: this implies that the poorest of the poor are not that poor and, similarly, the poorest of the poor are not that deprived (of course, the quadratic form is always positive).

To focus on differences between lack of income and deprivation, we attempted a cross-comparison of their distributions with reference to the relative and absolute poverty of families. The results are presented in Tables 6 and 7.

Table 6 – *Cross-tabulation of EU-SILC 2004, 2005 and 2006 cohorts of Italian families according to relative poverty and severe (4 items) material deprivation in 4 survey occasions (n=12,260)*

	Materially deprived			
Relatively poor	Never	Transitory	Chronically	Total
Never	58.5	8.5	3.2	70.2
Transitory	9.5	3.5	1.8	14.8
Chronically	6.1	4.8	4.1	15.0
Total	74.1	16.8	9.1	100.0

Table 7 – *Cross-tabulation of EU-SILC 2005 and 2006 samples of Italian families according to absolute poverty and severe (4 items) material deprivation in 4 survey occasions (n=8058)*

	Materially deprived			
Absolutely poor	Never	Transitory	Chronically	Total
Never	65.5	11.1	4.9	81.5
Transitory	6.7	3.6	2.2	12.5
Chronically	2.2	2.1	1.7	6.0
Total	74.4	16.8	8.8	100.0

A majority of poor families show greater symptoms of deprivation than better-off families. Nevertheless, there are substantial exceptions: some households experience low income and no sign of deprivation, while others experience higher income and signs of material deprivation. Hence, the correlation between income and material deprivation with reference to the entire sample is less that expected: in fact, the correlation coefficient between the number of episodes of poverty and the mean number of material items families were deprived in four years is 0.35 for the absolute poor and 0.45 for the relative poor.

Then why households with low incomes occasionally experience periods where they can enjoy high living standards? A similar result was also found by Berthoud et al. (2004) who hypothesise that it may depend on families with a very low interest in material consumption, on other families with temporary shortage of income that had previously accumulated durables –for example household goods– and also on respondents who under-stated their income to interviewers.

Table 8 – *Correlation coefficients between indices of severity of chronic poverty from EU-SILC 2005 and 2006 samples of Italian families according (relative poverty coefficients above the main diagonal, n=12260; absolute poverty below the diagonal, n=8058; only severe material deprivation is considered)*

	Severity of poverty (I)	Quadratic severity (P_2)	Gini inequality (G)	Severe deprivation (D)	Quadratic deprivation
Severity of poverty (P_1)	=	-0.56	-0.89	0.33	-0.06
Quadratic severity of poverty (P_2)	0.32	=	0.78	-0.14	0.10
Gini inequality (G)	-0.90	0.82	=	-0.31	0.11
Severe deprivation (D)	0.31	-0.17	-0.31	=	=
Quadratic severe deprivation (D_2)	-0.06	0.13	0.14	=	=

Finally, we computed the correlation among indices. Since correlation coefficients can be evaluated merely on common units, the indices of diffusion have been excluded from this analysis. The results, presented in Table 8, show that

- the correlation coefficient between indicators based on linear intensity measures is high, in particular, the correlation is –0.9 between the P_1 severity index and Gini inequality index, irrespective of whether the entire set of relatively poor families or just the absolutely poor ones are included in the computation. The inequality index is also highly correlated (approximately 0.80) with P_2, the quadratic measure of severity of chronic poverty.

- Linear and quadratic measures of the severity of poverty measured with reference to income and the analogous measures of the severity of deprivation measured with reference to a set of nine goods or services are mildly correlated (approximately 0.30).

5. Conclusions

In this study we suggested a set of indicators for measuring the diffusion and severity of chronic poverty in a community. The indicators were evaluated using a set of mathematical properties that revealed that both the indicators of diffusion and those of severity of chronic poverty do not depend on the scale adopted for measuring income, consumption or deprivation. Moreover, these indicators enable a researcher to differentiate the estimates for subgroups of units and are sensitive in representing the effects of interventions for eradicating poverty in the entire population or parts of it.

We examined two classes of chronic-poverty diffusion indicators and three classes of measures of severity of poverty among the poor. The diffusion indicators referred to the income necessary to reach the poverty line and assess the economic possibility for them to attain a given basket of durables and services. We verified that the two aspects of poverty, lack of income and material deprivation, are not equivalent. In fact, the two measures are mildly correlated.

Hence, an effort should be made to create a greater overlap between the concept of chronic monetary poverty and short-to-medium-term spending capacity of families. Some scholars started a European research in connection with Eurostat (2012b) to fill this need by evaluating much a larger number of items to make material deprivation a more meaningful dimension of poverty. Moreover, we put forward that other attempts should be realised at the national level to make the overlap between the monetary and material deprivation independent of local cultures.

A measure of severity based on Gini inequality index was compared to the two above-mentioned dimensions and this yielded rather interesting results: the inequality measure was found to substantially correlate with lack of income but not with material deprivation. This is a further proof that severe material deprivation does not represent the same social phenomenon as severe lack of income.

The high correlation between monetary and material deprivation may depend on the fact that the lack of income and the Gini inequality index both deal with income data, although the product of the individual income and its rank order within the distribution of incomes, on which the Gini index is based, is not the same as the population of just incomes. Moreover, since the data for the estimation of the two

indices are confined to the lowest portion of the income distribution, the distances (both linear and quadratic) between individual incomes and the poverty line are comparable (though with opposite sign) to Gini-type inequalities that are weighted distances from the mean.

The application of these indicators to the Italian context highlighted that measures of chronic poverty yield more robust figures than annually measured poverty. In fact, the chronic poor belong to the lowest portion of the distribution of incomes, which is so far from the poverty line that indices based on repeated lack of income are more stable than indices based on cross-sectional, episodic lack of income. The instability of cross-sectional measures depends on those units that transient poverty is composed of. This implies that all measurement criteria of chronic poverty indicate a group of poor that is, at the utmost, socially relevant.

If poverty measures were based only on income, it would be taken for granted that one dimension is sufficient to describe poverty. However, poverty is a multidimensional concept, since an income below the poverty line could be associated with house and durables possession, preparing own food, good health, literacy, security, and social participation, so positive effects of other dimensions could mitigate the effect of a low income. Conversely, a sufficient income does not guarantee that individuals consider themselves non-poor if they struggle because of other social problems[11]. However, multidimensional poverty and chronic poverty are related phenomena. Chronic poverty reflects a persistently low income, which is the most deprived situation that might entail moving in and out of other forms of uneasiness.

Chronic poverty makes it difficult to collect data on those who suffer from multiple disadvantages. This, in turn, implies that survey data on these units could be underestimated and also that the representation of the multiplicity of poverty may be inadequate. Instead, understanding people's perceptions and strategies is vital; through data collection on the poor, it may be possible to develop multi-

[11] In this study, the possibility of representing the multi-dimensionality of poverty was not a priority. We also did not consider the fact that deprivation may be transmitted across generations through economic, social and cultural isolation and that the stigma attached to living in a 'place of the poor' could add vulnerability to the poor (Bird et al., 2001; Cattell, 2001). Readers interested in multidimensional approach can consult, among others, Layte et al. (2000), Yeo (2001); MDS (2002), Kuklys (2004), Dewilde (2004), Haase and Pratchke (2005), Jenkins and Cappellari (2007), Tomlinson et al. (2007), and Whelan and Maître (2007). Further, Ringen (1988) and Atkinson et al. (2007) argue that a low income is merely an indirect measure of poverty and that a direct measure of social exclusion is necessary. It may be worth adding that here one-dimensionality or multi-dimensionality does not refer to the outcomes of a statistical testing of the dimensions that describe the multivariate status of the population (see, among others, Kirishi et al., 2001), but to the perspectives from which poverty is considered.

dimensional indicators of the width and severity of sources and consequences, drawing when possible upon existing qualitative research (Hulme et al., 2001).

Finally, it could be interesting to evaluate the conjoint measurement of poverty since, as Nolan and Whelan (1996), Layte et al. (2000), Perry (2002), Bradshaw and Finch (2003) and Berthoud et al. (2004) argue, it is not safe to rely on one measure of poverty alone. The overlapping dimensions that must be considered to obtain a reliable result include: lacking socially perceived necessities, being subjectively poor and having a relatively low income. In other words, a poor is a person who also perceives him/her as deprived.

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SUMAMRY

Academic researchers, national statistical offices, the Eurostat and the international organisations concerned with fighting poverty globally have proposed various measures of poverty. Some measures address cross-sectional or short-interval poverty; others represent long-lasting poverty. In this study, we suggest indices to measure the diffusion and severity of medium-to-long-lasting deprivation of units in a developed community. The indices we suggest refer to income insufficiency and material deprivation and to the consequences of economic and social distress on the poor with the hidden purpose of identifying groups that are at risk of chronic poverty. Further, the severity of poverty in a community is evaluated according to certain technical properties, particularly the substitutability and discriminatory capability of the indices.

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OVEREDUCATION OR ASYMMETRIC INFORMATION?[1]

Piero Cipollone, Andrea Cutillo

1. Introduction

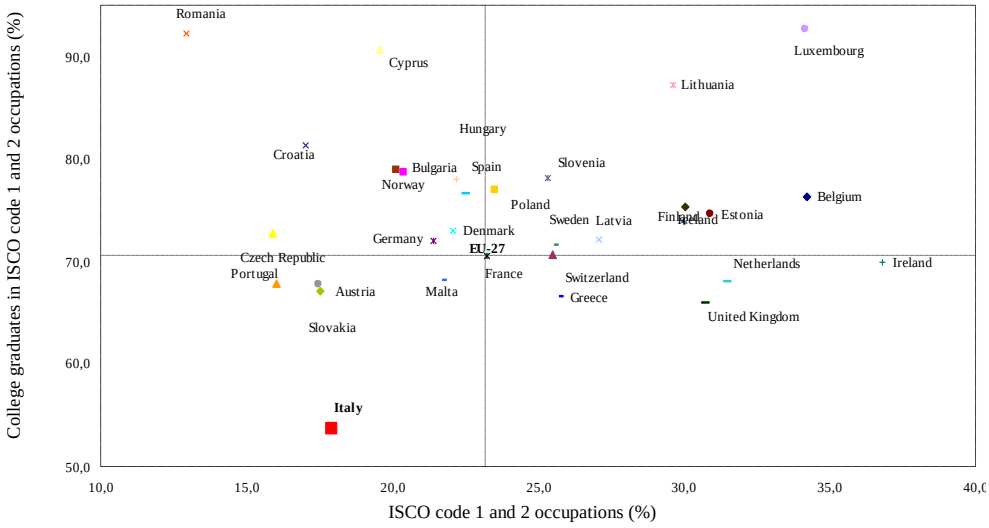
A common Italian government policy is to encourage participation in higher education. The aim of such a policy is twofold. On one hand, education is one of the main instruments in order to ease social mobility and to reward individual skills. On the other hand, a more educated labour force can increase economic growth and support the overall efficiency of the economic system. In this context, several reforms of the educational system took place. Among the others, we remember the 1962[2] reform (compulsory education to 14 years); the 1999 reform (compulsory education to 15 years); the 2003 reform (compulsory education to 16 years and compulsory training or education to 18 years). Concerning the university participation, in 1969 students from technical and vocational schools have been allowed to easily access university (subject to the completion of a five year high school cycle); in 1999, the 3+2 reform shortened the horizon for achievement a first-order university cycle, aiming to increase the university enrollment as well as to decrease the university drop-out. Such reforms granted an increase of high school graduates as well as college graduates, leading to an increase of highly educated population across the years and the generations (ISTAT, 2012). Nevertheless, Italy still shows a lower share of university degree holders compared to the other EU and OECD partners, and the gap is still increasing among the youngest generations. This fact leads to a paradoxical situation: given the relatively low supply of college graduates, the rewards for university studies should be high, but it is not the case (Cipollone and Sestito, 2010; Visco, 2009). For example, in Italy only half of the highly qualified occupations (i.e., ISCO classification 1 and 2) are occupied by college degree holders, the lowest share in EU (graph 1). Moreover, the demand of college graduates has not kept up with the supply, as the

[1] The opinions expressed in this paper do not necessarily represent those of the institutions to which the authors are affiliated.

[2] The years refer to the law ratification.

highly qualified occupations are only 18%, a much lower value than almost all the EU partners.

Graph 1 – *ISCO code 1 and 2 occupations and college graduates in ISCO code 1 and 2 occupations; individuals 25-64 years old, year 2010.*



Source: Eurostat

The depicted figures imply high levels of skill mismatch and, consequently, high levels of overeducation. The Italian case is a particular one, as the highly educated labour supply still lags behind that of European partners while the incidence of overeducation is above the European average (Croce, 2011). Moreover, the overeducation phenomenon widely afflicts young college graduates (Cutillo and Di Pietro, 2006; Caroleo and Pastore, 2012). The presence of overeducation obviously leads to low wage returns for university degree holders.

The low returns for university graduates (Italy also have one of the lowest employment rates among university graduates) are leading to a decrease in the university enrollment. Indeed, many families decide not to spend time and money in the university studies of their children.

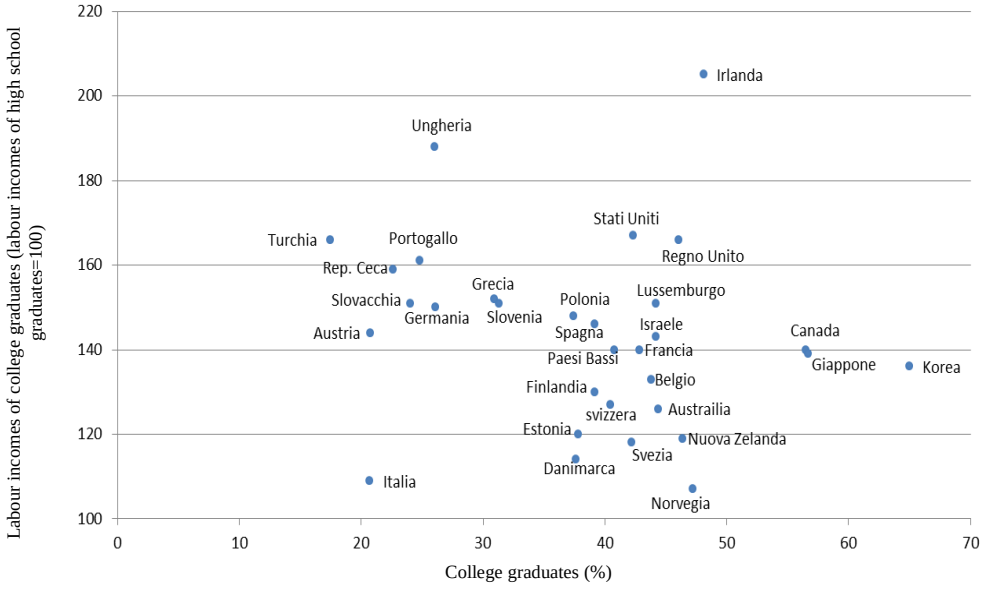
In this paper we analyze the trend of demand and supply of university graduates and the wage premium for college graduates, as well as their effects on the university enrollment, with respect of three aspects: the role of the Public Administration employment across the years; the influence of the relationship between technical changes, supply of college graduates and wages of high/low skill workers; and the quality of the university studies.

The paper is organized as follows: section 2 presents some evidences from the labour market; section 3, 4 and 5 consider the effects of the three aspects previously listed: the role of the Public Administration employment; the relationship between technical changes, supply of college graduates and wages; and the quality of the university studies, respectively; conclusions are in section 6.

2. Some evidences

Graph 2 presents the share of university graduates and the wage gap between university graduates and high school graduates among the 25-34 years old population in the OECD Countries. The scatter plot indicates that the higher the share of university graduates, the lower are their wages. Hungary and Ireland are important outliers, as the wage premium for college graduates is significantly higher than the one of other Countries with similar amount college graduates. On the contrary, Italy a low wage premium, even though the amount of college graduates is quite small.

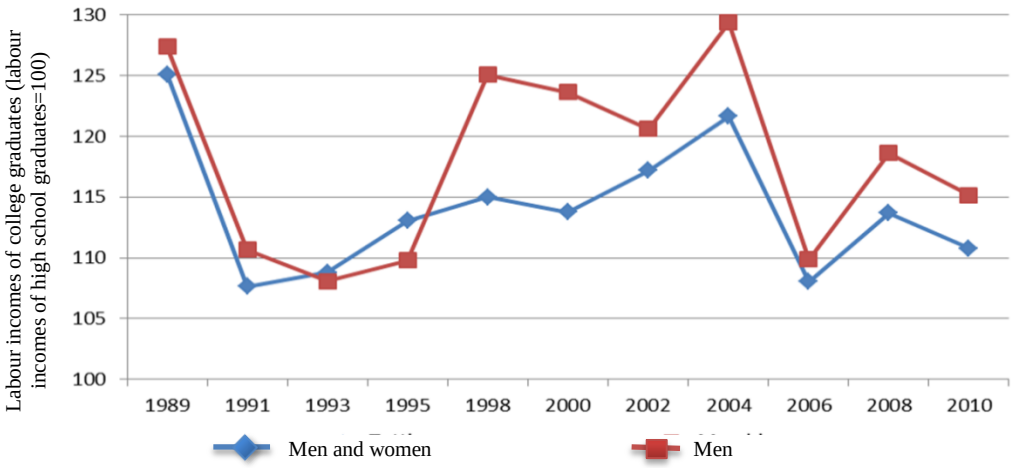
Graph 2 – *Labour incomes of college graduates compared to those of high school graduates (=100) and share of college graduates; individuals 25-34 years old, year 2010.*



Source: OECD

Graph 3 shows the situation in a single year (2010). Such a situation (low number of college graduates with low incomes) would not be a serious concern for Italy if we observed an increasing trend of wage over the years, as well as an increasing amount of college graduates. However, the labour income trend does not show a positive slope (graph 4). The ratio between incomes of college graduates and those of high school graduates ranges from 108 (in 1991) to 122 (in 2004), falling to 111 in 2010.

Graph 3 – *Ratio between labour incomes of college graduates and labour income of high school graduates (=100); individuals 25-34 years old; years1989- 2010.*

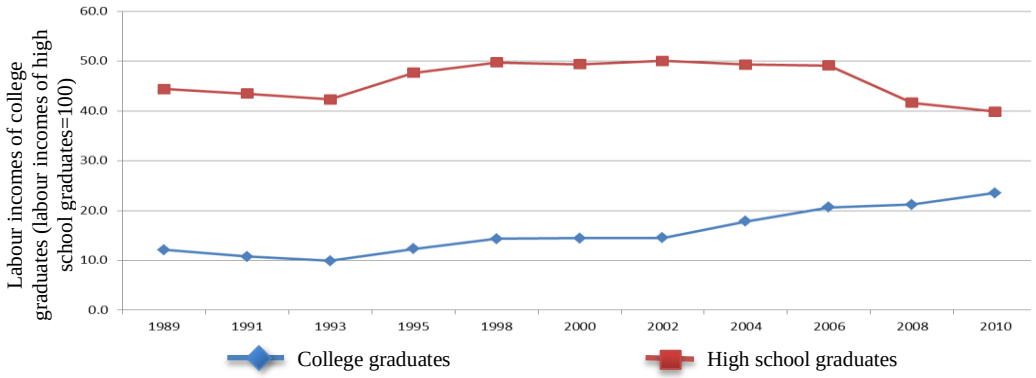


Source: Our elaborations on Survey on Household Income and Wealth (Bank of Italy)

Thus, the wage premium for university graduates, both in terms of level and in terms of trend, does not encourage to invest in human capital. However, the mentioned reforms led an increasing amount of population to achieve high educational degrees over the past 20 years. Graph 4 shows the growth of university degree holders among the 25-34 years old population, from about 10% in the first years of 90's to more than 20% starting from 2006. As a consequence, even the relative supply of university graduates compared to high school graduates has grown.

Nevertheless, Italy still shows an overall significant disadvantage compared to its partners. Indeed, even though graph 4 showed an increasing share of college graduates among the 25-34 years old generation, the gap with European and OECD partners is still high. Moreover, the gap progressively widens among the youngest generations.

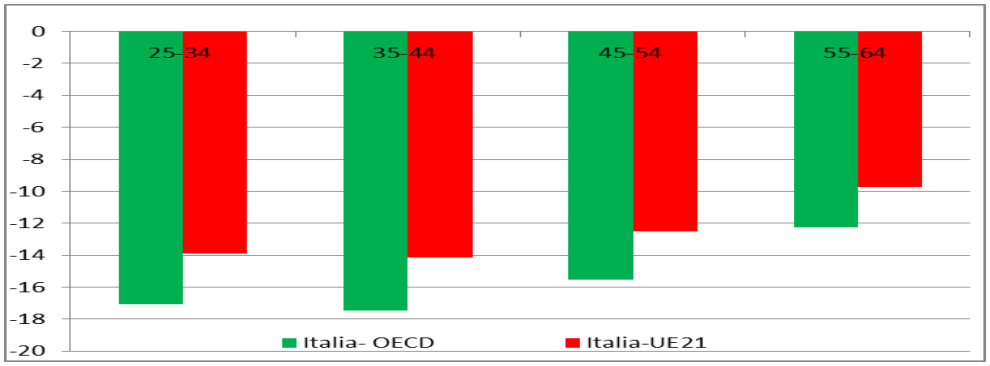
Graph 4 – *Share of college graduates and high school graduates among the population; individuals 25-34 years old; years1989- 2010.*



Source: Our elaborations on Survey on Household Income and wealth (Bank of Italy)

The difference in the share of college graduates between Italy and the OECD average is 12% for individuals 55-64 years old, about 15% for individuals aged 45-54 years old, about 17% for individuals aged 25-44 years old. The same increasing gap, at a lower level of absolute distance, is observed when comparing Italy to the EU average.

Graph 5 – *College graduates, differences between Italy, EU average and OECD average; year 2012.*



Source: OECD and EUROSTAT

The gap will further enlarge in next years, as the Italian university enrollment is nowadays decreasing (table 1). Indeed, after the 2001 university reform (*Riforma del 3*+2), university enrollment increased for a few years, and has decreased since

2004. Moreover, in the last years the enrollment decrease is also affected by the behavior of the youngest individuals (18-21 years old).

Table 1 – *University enrolment by age and year; years 2000-2012.*

Academic year	Absolute values			Percentage variation compared to the academic year 2000-2001		
	College freshmen	College freshmen 18-21 years old	College freshmen 22+ years old	College freshmen	College freshmen 18-21 years old	College freshmen 22+ years old
2000-2001	284,142	238,527	45.615			
2001-2002	319,264	255,604	63.660	12.4	7.2	39.6
2002-2003	330,802	262,000	68.802	16.4	9.8	50.8
2003-2004	338,036	266,800	71.236	19.0	11.9	56.2
2004-2005	331,893	267,642	64.251	16.8	12.2	40.9
2005-2006	323,930	257,326	66.604	14.0	7.9	46.0
2006-2007	308,185	254,479	53.706	8.5	6.7	17.7
2007-2008	307586	259,864	47.722	8.3	8.9	4.6
1008-2009	295,518	257,805	37.713	4.0	8.1	-17.3
2009-2010	294,382	256,293	38.089	3.6	7.4	-16.5
2010-2011	288,286	248,669	39.617	1.5	4.3	-13.1
2011-2012	278,866	250,823	28.043	-1.9	5.2	-38.5

Source: Italian Ministry of Education

How can we explain the figures exposed thus far? Why the wage returns for Italian college graduates are low? And why university education is not an attractive choice for young Italians? The simplest and most obvious explanation relies on the enterprises behavior. According to this simple explanation, the Country's productive system is not able to fully utilize the skills provided by the education system. Italian college graduates are widely employed in occupations that do not require a university degree, and this fact generates the phenomenon of overeducation and low returns on wages. In such a situation, families hypothesize a bias on the demand side (lack of demand for skilled labour, inefficient recruitment system, the particular Italian productive structure…) and decide not to spend time and money in high education studies.

Certainly, the demand side of the labour market is problematic. But we also try to take into consideration three additional key-factors which can affect the framework. First, the role of the Public Administration employment across the years. Secondarily, the influence of the relationship between technical changes and wages of high/low skilled workers on the demand and supply of college graduates. Finally, the quality of university studies.

3. The role of the Public Administration

Table 2 shows the evolution of demand and supply of labour in recent years. The stocks are evaluated as percentage variation compared to the 1995 population.

Table 2 – *Demand and supply of labour; individuals 25-44 years old; percentage variations compared to the 1995 population; year 2012.*

	DEGREE			TOTAL
	At most lower secondary school	High school	University	
Supply (population)	-20.4	10.5	10.8	0.9
Demand (employment)	-13.0	7.8	8.1	2.9
Public Administration	-2.8	-2.7	1.3	-4.1
Employees	-2.8	-2.7	1.0	-4.4
Employees with fixed term contract	0.0	0.2	0.7	0.9
Private Sector	-10.2	10.5	6.8	7.1
Employees	-5.4	9.4	4.7	8.7
Employees with fixed term contract	0.7	2.2	1.0	3.9

Source: Our elaborations on Survey on Household Income and wealth (Bank of Italy)

On the supply side, the 25-44 years old population increased by 0.9% between 1995 and 2012. High school degree holders increased by 10.5% and university degree holders increased by 10.8%.

On the demand side, the employed population grew by 2.9%, two points more than the total supply. At the same time, the number of high school degree holders with an employment grew by 7.8%, while the number of university degree holders with an employment grew by 8.1%. The total growth of high educated individuals in employment was therefore lower than the total growth of high educated individuals (approximately 2.7%).

However, if we split the productive structure in Private Sector and Public Administration, the private sector employment increased by 7.1%, while the Public Administration employment decreased by 4.4%. If we look at the university degree holders, they only marginally grew in the Public Administration (1.3 point, mainly with fixed-term contract). At the opposite, college graduates increased by 6.8 points in the private sector, a great part of the total 10.8 point increase.

If we look at the same stocks, evaluated in terms of composition, the share of college graduates in the population has doubled in the period 1995-2012, from 8.9% to 19.5%. A similar trend is observed among the employed population (from 10.5% to 21.6%). The private sector demand has tripled the share (from 5.9% to 16.7%), while the Public Administration demand has less than doubled (from 25.8% to 46.8%). These trends, along with the overall increase of the Private

Sector employment and the overall decrease of the Public Administration employment, led the share of graduates employed in the Private Sector to grow from 34.4 in 1995 to 50.0 in 2012 and the share of graduates employed in the Public Administration to drop from 45.1 per cent in 1995 to 27.1 in 2012 (table 3).

Table 3 – *University graduates by professional condition; 25-44 years old population; years 1995 and 2012.*

	Public Administration	Private sector	Unemployment and inactivity	Total
1995	45.1	34.4	20.5	100.0
2012	27.1	50.0	22.9	100.0

Source: Our elaborations on Survey on Household Income and wealth (Bank of Italy)

To conclude this depiction, the private sector has significantly contributed to employ the supply of college graduates[3]. Among what weakened their situation on the labour market may have actually had a role the reduction of job opportunities for university graduates in the Public Administration, as a consequence of the financial restriction in government expenditures in the past years.

According to our depiction, the private demand of graduates has grown up in a consistent manner with the supply. Hence, at least in terms of hiring, the Private Sector does not show bias on the demand side.

In order to investigate the reasons entailing low wage premia for college graduates, we have to consider the relationship between technical changes and wages of high/low skill workers over the years.

4. The relationship between technical changes and wages

The relative demand for skills is linked to technical changes, that in turn are presumed to be biased in favor of college graduates (Tinbergen, 1974). Hence, the relative demand for skill labour has increased over the years because any increase in technology is better assimilated by skilled workers.

If we adopt a production function CES (*Constant Elasticity of Substitution*), we can study the skill premium through the equation:

$$\ln\left(\frac{W_H}{W_L}\right) = cons + \frac{\sigma-1}{\sigma}\ln\left(\frac{A_H}{A_L}\right) - \frac{1}{\sigma}\ln\left(\frac{H}{L}\right) \quad (1)$$

[3] To the best of our knowledge the first to note this phenomenon were Schivardi and Torrini (2011).

where H e L represent the total supply of high and low skill labour, respectively; W_H and W_L are the wages of skilled and unskilled workers; A_H and A_L are factor-augmenting technology terms; and σ is the elasticity of substitution between high skill and low skill labour. In such a model, the wage premium for skilled labour depends on changes in the skill-bias of technology (reflected in the evolution of $\frac{A_H}{A_L}$) and changes in the relative supply of skills (reflected in the evolution of $\frac{H}{L}$). For a given value of $\left(\frac{H}{L}\right)$, an increase of the skill bias of technology in favour of skilled workers increases the skill premium with an elasticity of $\frac{\sigma-1}{\sigma}$. For a given skill bias of technology $\left(\frac{A_H}{A_L}\right)$, an increase in the relative supply of skills $\left(\frac{H}{L}\right)$ reduces the skill premium with an elasticity of $\frac{1}{\sigma}$. If we introduce the factor *time*, we can study *The race between Education and Technology* (Goldin and Katz, 2008): if the relative supply of high skill labour grows faster than the rate of skill-biased technical change, the skill premium falls, and vice versa.

To deal with the fact that $\frac{A_H}{A_L}$ is not observed over the years, it is generally assumed a log-linear trend increase in the demand for skills over time. Therefore,

$$\ln\left(\frac{A_{H,t}}{A_{L,t}}\right) = \gamma_0 + \gamma_1 t \tag{2}$$

where *t* is the calendar time. Rearranging equation (1), we obtain:

$$\ln\left(\frac{W_{H,t}}{W_{L,t}}\right) = cons + \frac{\sigma-1}{\sigma}\gamma_0 + \frac{\sigma-1}{\sigma}\gamma_1 t - \frac{1}{\sigma}\ln\left(\frac{H}{L}\right) \tag{3}$$

Equivalently,

$$\ln w_t = \alpha + \beta \mathrm{t} - \delta \ln\left(\frac{H}{L}\right) \tag{4}$$

where $w_t = \left(\frac{W_{H,t}}{W_{L,t}}\right)$; $\alpha = cons + \frac{\sigma-1}{\sigma}\gamma_0$; $\beta = \frac{\sigma-1}{\sigma}\gamma_1$; and $\delta = \frac{1}{\sigma}$.

In this paper, we run equation (4) by comparing college graduates (hence, H=college graduates) and high school graduates (hence, L=high school graduates)[4].

[4] Acemoglu and Autor (2012) observe that it may be useful to make the distinction between high, medium and low skill workers rather than just between two levels of skills. We prefer not to further complicate the analysis, as we want to compare the college wage premium in respect of the immediately preceding degree.

In such a way, the equation basically states that the wage premium for skilled workers depends on a trend (t), representing the evolution of technology, and on the relative supply of university graduates vs. high school graduates.

Katz and Murphy (1992) firstly estimated the equation on U.S. data for the period 1963-1987. They found β equal to 0.027 and δ equal to 0.612. Hence, technology increased relative wages of college graduates by 2.7 percent per year, while each point of increase in the supply of college graduates relative to high school graduates reduced the wage premium by about 0.6 percent.

Our estimates on data of the Bank of Italy (Survey on Household Income and Wealth, years 1989-2010) show a contribution of the technical progress to relative wages of college graduates by about 1 percent per year (β=0.01); a point of growth in the relative supply of college graduates reduced their wages by about 0.2 percent (δ=0.2) (Table 4).

Table 4 – *Regression estimates of the production function for the wage premium of college graduates; years 1998-2010.*

	Coef.	S.E.
Constant	-15.98	7.04
Trend (t)	0.01	0.00
Relative supply of labour ($\ln\left(\frac{H}{L}\right)$)	-0.20	0.10
R^2	0.399	

Source: Our estimates on Survey on Household Income and wealth (Bank of Italy)

Even if our estimates are rough calculations (we have only 11 surveys in the considered time period), we can try to use them to predict movements in the relative wages between 1995 and 2010 (table 5).

Table 5 – *Estimated effects of technology and relative supply of college graduates on wage premium for college graduates from 1998 to 2010.*

	Total	Only Private Sector
Relative supply of college graduates (ln)	0.47	0.62
Effect on wages due to the relative supply of college graduates (ln)	-0.09	-0.12
Effect on wages due to the trend (ln)	0.12	0.12
Total effect on wages (ln)	0.03	-0.01

Source: Our estimates on ISTAT and Bank of Italy data

According to the ISTAT Labour Force Survey, the supply of graduates rose by 0.47 log-points. This would have resulted in a decline in relative wages by 0.09 log-points, more than offset by the effect of technology, equal to 0.12. If we remove the Public Administration employment, the relative supply increased by about 0.62 log-points wages, and the effect on wages (-0.12) is almost completely offset by the one of the trend (0.12).After all, the absence of a trend in the wage premium for college graduates is consistent with the trend in the relative supply of labour. In brief, a standard model of supply and demand explains what has happened in Italy over the past 20 years.

5. The quality of university education

The third key-factor we analyze concerns the quality of university education. The conclusions made so far assume a relationship between years of schooling and acquisition of skills. However, this relationship can be non-linear, as it can be different in the different school levels or unstable over the time. Unfortunately, it does not exist a survey comparing the Italian university system to the ones of the other Countries. Consequently, we use three different surveys assessing the skills of students in the years of school.

Table 6 shows the scores of Italian students in 3 different surveys (PIRLS, TIMSS and PISA). The results concern the scores in reading, mathematics and science at the fourth year of primary school, at the third year of lower secondary school and when 15 years old. The results are comparable between different years of the same survey. A score of 500 represents the average of the other Countries participating in the surveys.

Table 6 – *Average students score in reading, mathematics and science at different school levels; years from 1999 to 2011 (500=average of the other Countries participating in the survey).*

	Fourth year of primary school			Third year of lower secondary school		15 years old students		
	Reading[a]	Maths[b]	Science[b]	Maths[b]	Science[b]	Reading[c]	Maths[c]	Science[c]
1999				479	493			
2000						487		
2001	541							
2003		503	516	484	491	476	466	
2006	551					469	462	475
2007		507	535	480	495			
2009						486	483	489
2011	541	508	524	498	501			

Note: [a] PIRLS survey; [b] TIMSS survey; [c] PISA survey

The scores of the Italian students at the elementary school are higher than the average of the other Countries in the survey, and they are substantially stable over the time. This is true in the three editions of the PIRLS survey (reading), as well as in the three edition of the TIMSS survey (mathematics and science).

A substantial stability over the time is also observed for the students in the lower secondary school. However, the absolute level of the Italian students is now lower than the average. Hence, in Italy the lower secondary school increases the levels of learning less than what happens in the other Countries.

At the upper secondary school (actually, among 15 years old students), Italy shows much lower scores than the average of the other Countries. The scores decrease until 2006 and grow up in the 2009 survey.

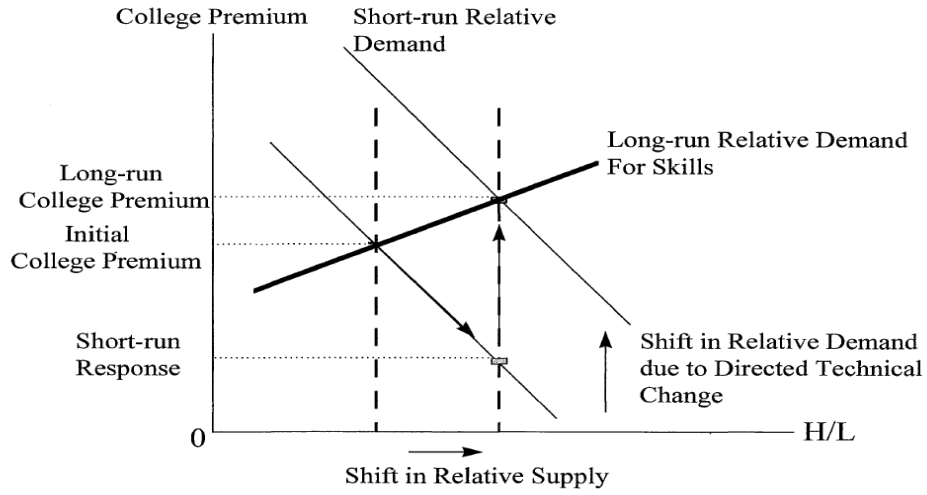
If we assume that learning is a cumulative phenomenon, it is likely that the gap with the other Countries increases in the university studies. In such a context, the wage premium for college graduates may be low because there is not large difference in their skills compared to the ones of high school graduates, as several college graduates enter the labour force without marketable skills.

In other words, many college graduates could not be endowed with the skills required by enterprises, they are hired in overeducated positions and the overall wage premium results low. This fact generates an asymmetric information context, as families take educational decisions by looking at the returns of education, while entrepreneurs pay for marketable skills. If the years of education are not rewarded, families can hypothesize a bias on the demand side (lack of demand for skilled labour, inefficient recruitment system, the particular Italian productive structure…) and can be discouraged from investing time and money in the universities studies of their children. We have already seen the first signals of this trend in graph 6. But if the skills acquired in the university studies were higher, the price that enterprises would pay for skills might be not much different from what happens elsewhere.. College campuses granting greater effectiveness on the labour market (in terms of wages, employment rate, length of unemployment, quality of occupation…) should be better signaled to let the families choose the best opportunities. Mariani, Montanaro, Paccagnella (forthcoming) utilizes three different university rankings and show increasing enrollment for the high quality universities, even though in recent years the overall enrollment has decreased. A greater publicity of the universities quality could also imply a better competition between the different universities and, in turn, it could raise the overall quality of the university system and the rewards for college graduates.

The decreasing trend in the university enrollment can result in a vicious circle and imply a loss of efficiency of the overall economic system. Acemoglou (1998) observes that technology depends on the skills supply on the labour market. Entrepreneurs develop technologies that can promote either skilled or unskilled

workers as a function of two factors: the relative price of skills (substitution effect) and the amount of skilled workers (quantity effect). Under some light hypotheses, he also shows a positive slope for the long-run relative demand for skilled labour. Hence, the long-run wage premium may increase along with the increasing of the relative supply of college graduates (graph 7).

Graph 7 – *Directed technical changes and dynamics of college premium.*



Source: Acemoglu (1998)

6. Conclusions and discussion

In this paper we analyzed the trend of demand and supply of university graduates and the wage college premium, as well as their effects on the university enrollment. In order to deal with these issues, we considered the effects arising from three key-factors: the role of the Public Administration employment across the years; the influence of the relationship between technical changes, supply of college graduates and wages of high/low skilled workers; and the quality of the university studies.

Several conclusions arise from the analysis. First, the Private Sector demand of college graduates has grown up in a consistent way with the rise of the supply. At the opposite, the Public Administration has highly reduced employment opportunities for university degree holders, resulting in a weakening of their

situation on the Italian labour market. Thus, the bias on the demand side is mainly due to the financial restrictions in public expenditures over the last 20 years.

Second, the absence of a positive trend in the wage premium for college graduates is consistent with the trend in the relative supply of labour. The rise in the relative supply of university degree holders has reduced the premium, while the changes in technology, better assimilated by high educated workers, has increased the gap, and the two effects show about the same strength.

Third, the low college premium on wages may be related to the quality of the university education. If university studies do not grant high skills (or marketable skills), entrepreneurs do not pay wage premia. In other words, entrepreneurs pay for the skills, not for the degree. This fact is also leading to a decrease in university enrollment, as families and enterprises move in a context of asymmetric information. Families want their children to be rewarded as college graduates, while entrepreneurs pay for the marketable skills. If the skills are low, overeducation grows up and the college-premium on wages goes down. As a consequence, families prefer not to spend time and money for the university studies. Actually, many graduates are only apparently overeducated (or formally overeducated, as their occupations do not match with their degree) but as a matter of fact their skills do not match with the skills required for high qualified occupations, and their wages are a consequence of this fact.

In order to increase the college graduates skills and their wage premium, as well as the efficiency of the overall economic Italian system, our results lead to threefold conclusions. First, university quality should be better pointed out. Nowadays, Italy is moving towards an evaluation system of the universities. Increasing amounts of money are given to the different campuses based on a ranking made by ANVUR (Agenzia Nazionale di Valutazione del Sistema Universitario e della Ricerca). However, so far it has been done not enough to let the families choose the best opportunities for their children. The ANVUR ranking only marginally addresses the effectiveness of the universities on the labour market. It should be better shown which universities grant the best positions, hence in which universities the skills grow with the years of schooling. Mariani, Montanaro, Paccagnella (forthcoming) show increasing enrollment for the high quality campuses, even though in recent years the overall enrollment has decreased. A greater promotion of the universities quality could also imply a better competition between the universities and, in turn, could even raise the overall quality of the university system and the rewards for college graduates.

Second, to weaken the supply/demand mismatch on the labour market, universities should be "opened" to the enterprises. The achievement of the degree should be subject to compulsory stages and training programs, as a support of the

canonical university studies. In such a way, the universities could better identify which are the skills required from the labour market.

Third, the economic college rewards could be improved through a tax rate reduction policy given to those enterprises that hire college graduates. The loss in financial revenues could be, at least partially, compensated by the graduates employment rising.

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SUMMARY

This paper analyzes the trend of demand and supply of university graduates and the wage college premium in Italy, as well as their effects on the university enrollment. We consider the effects arising from three key-factors: the role of the Public Administration employment; the relationship between technical changes, supply of college graduates and wages; and the quality of the university studies.

Several conclusions arise from the analysis. First, the Private Sector demand of college graduates has grown up in a consistent way with the rise of the supply. At the opposite, the Public Administration has highly reduced employment opportunities for university degree holders. Second, the absence of a positive trend in the wage premium for college graduates is consistent with the trend in the relative supply of labour. The rise in the relative supply of university degree holders has reduced the premium, while the changes in technology has increased the gap, and the two effects show about the same strength. Third, the low college premium on wages could be related to the quality of the university education. If university studies do not grant high skills, entrepreneurs do not pay wage premia. This fact leads to a decrease in university enrollment, as families and enterprises move in a context of asymmetric information. Families want their children to be rewarded as college graduates, while entrepreneurs pay for the marketable skills. Actually, many graduates are only apparently overeducated but as a matter of fact their skills do not match with the skills required for high qualified occupations, and their wages are a consequence of this fact.

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MEASURING LABOUR MARKET INTER-TEMPORAL MOBILITY IN ITALY: THEORY AND EVIDENCE

Chiara Gigliarano

1. Introduction

Mobility is an important concept in social sciences and economics. It usually refers to the evolution over time of a given socio-economic status of individuals or families in a society. Most of the studies focus on mobility in the following status: income, wealth, wage, education and social class (see, among others, Maasoumi, 1998; Fields and Ok, 1996, 1999; Van de gaer et al., 2001; Van Kerm, 2004; D'Agostino and Dardanoni, 2009; Cowell and Flachaire, 2011). As a consequence, the measurement of mobility has been addressed from different approaches.

Two are the main approaches developed in the measurement of mobility: either (i) in terms of individual status or (ii) in terms of individual position in the status distribution. In the former case, individual mobility depends only on the individual's status over time. The latter concept of mobility, instead, involves also the society and the individual's relationship to the society (Cowell and Flachaire, 2011; Dardanoni, 1993); it is the so-called rank mobility, according to which status is an ordinal concept (positions rather than levels of the variable of interest are used to evaluate individual status). However, the measures that follow this second approach are not decomposable by sub-groups (Cowell and Flachaire, 2011).

Another important distinction in the mobility measurement is between intergenerational and intragenerational mobility. In the former case, a comparison is made between a parent and his/her child, monitoring how the distribution of the individual status of interest changes between different generations in a given society. In the latter case the same individual is compared at two (or more) different dates, and the changes in the distribution of the individual status are measured over a given period of his/her lifetime; see, among others, Van de gaer et al. (2001).

Focusing, in particular, on income mobility, Fields (2007) provides an interesting taxonomy of the different mobility concepts used in the literature. Measuring income mobility means measuring income movements, and five are the different types of movements considered in the literature: (i) positional movements,

that are movements of individuals among various positions in the income distribution (also referred as rank mobility); (ii) share movements, that are income's rises or falls in comparison to the mean; (iii) non-directional movements, which capture the extent of fluctuation in individuals' income; (iv) directional movements, which "gauge the extent of fluctuation in individuals incomes" when "the observer cares not only about the amounts of the income changes but also about their direction" (Fields, 2007, p.3); (v) mobility as an equalizer of longer-term status, focusing on the effect of individual income changes on income inequality.

Typically, mobility analysis refers to two-period mobility, and few are the analysis involving a longer span of time.

Aim of the paper is, therefore, to extend the concept of mobility towards an inter-temporal framework, by looking at the history of the individuals for more than two periods of time.

A new class of indices of inter-temporal intragenerational mobility is here proposed, according to which individual mobility depends only on the individual's status over time (both directional and non-directional movements).

Therefore, the novelty of the paper is to look at non-directional movements as well as at the direction of individuals outcome path, defining as inter-temporal mobile those individuals whose condition is changing over time. In particular, both up-ward and down-ward movements are taken into account.

The new class of indices can be considered an inter-temporal generalization of some of the existing indices of mobility; in particular, when focusing on two-period analysis, the index proposed can be traced back to the family of the Fields and Ok (1996, 1999)'s mobility indices.

Also, introducing individual comparisons with own history, the issue of how to discount past positions arises. In fact, when an individual compares his/her current situation with his/her past, memory plays an important role, and an individual is usually less affected by a remote experience then a more recent one. Time-discounting results in valuing past outcomes less than the same level in the present or without discounting.

In particular, the paper will analyze the inter-temporal mobility of the occupational status in the Italian labour market, through an application of the new class of indices to Italian Compulsory Communications data.

Most of the existing studies on mobility measurement in the labour market focus on macro-level analysis, mainly based on labour market transition matrices (see, e.g., Formby et al. 2004). Muffels and Luijkx (2008) for example propose an analysis of contract mobility, which measures the mobility between different types of contracts weighted by the share of workers. Analysis at micro-level involves

mainly wage mobility. Thus, the approach proposed in this paper constitutes a novelty in the literature.

The paper is organized as follows: Section 2 presents a new class of individual inter-temporal mobility indices and its properties. Section 3 sums up the individual indices in an aggregate inter-temporal mobility index. Section 4 illustrates a special case of the new measures, that captures the persistence in unemployment. Section 5 illustrates the new indices through an empirical application based on the Italian labour market. Section 6 concludes.

2. An individual inter-temporal mobility index

Three are the main ingredients for measuring mobility: (i) a time frame of two or more periods; (ii) a measure of an individual's status within society; (iii) an aggregation of changes in individual status over the time frame. See Cowell and Flachaire (2011).

Referring to point (i), this paper considers non-standard multi-periods of time (not only two periods).

Moving to the second ingredient, the notion of status is important and it can be defined in several ways, depending on the focus of interest of the mobility study.

For point (iii), I follow Cowell and Flachaire (2011)'s approach in underlying the separation of the status concept from the aggregation method. The aggregate mobility for a given society will be described in terms of individual mobility.

2.1. Framework

The individual status is represented as an ordinal variable X (in the empirical application, it will be the occupational status) that takes values in the ordered set $\mathsf{S} = \{s_1, s_2, ..., s_K\}$ of cardinality *K*, with $s_k \leq s_{k+1},\ k = 1,2,...,K-1$.

Consider a population of individuals *i=1, 2, …, n*, $n \in \mathrm{N}$ over periods of time $t_i = (T - p_i, .., T-1, T)$ of length $(p_i + 1)$, where $T \in \mathrm{N}$ refers to today and $p_i \geq 1$ integer. Note that the length of the period of times may vary across the individuals.

Let $x_t^i \in \mathsf{S}$ be the status of individual i at time t and let $z_i = (x_{T-p_i}^i, ..., x_T^i)$ be the status profile of individual i over his/her period of times of length $(p_i + 1)$. Each status profile may have different length. Moreover, let *Z* be the set of the individuals' status profiles.

2.2. An individual inter-temporal mobility index

The degree of mobility of individual *i* will be evaluated starting from his/her status profile z_i through a function $m_\alpha(z_i) = m_\alpha(x^i_{T-p_i},...,x^i_T)$ such that $m_\alpha : Z \to \mathsf{R}$.

Mobility arises on pair-wise comparisons between individual i-th status at time t and at time $t-1$. I denote these comparisons by $\delta_{it} = \delta_{it}(x^i_t, x^i_{t-1})$. Comparisons can be defined in different ways, according to the type of mobility that we want to monitor: non-directional (or overall) mobility, upward mobility, downward mobility. For example, comparisons can be defined as follows:

$$\delta_{it} = \begin{cases} \dfrac{|\, x^i_t - x^i_{t-1}\,|}{s_K - s_1} & \textit{for} \quad \textit{non-directional mobility} \\ \dfrac{max(x^i_t - x^i_{t-1}, 0)}{s_K - s_1} & \textit{for} \quad \textit{upward mobility} \\ \dfrac{max(x^i_{t-1} - x^i_t, 0)}{s_K - s_1} & \textit{for} \quad \textit{downward mobility} \end{cases} \tag{1}$$

I propose to measure the mobility of individual *i* by considering the following family of *individual inter-temporal mobility indices*:

$$m_\alpha(z_i) = \frac{1}{p_i} \sum_{t=T-p_i+1}^{T} (\delta_{it})^\alpha \cdot w(t), \tag{2}$$

where $\alpha \geq 0$ is a parameter for the *sensitivity to mobility* and $w(t)$ is a discount factor that gives more relevance to the recent years than to the older ones.

A possible choice of *discount factor* $w(t)$ may be the following:

$$w(t) = \left(\frac{1}{1 + \beta \cdot (T-t)} \right)^{\frac{\gamma}{\beta}} \tag{3}$$

where parameters $\gamma \geq 0$ and $\beta > 0$; see Yi et al. (2006).

Obviously, other specifications are possible for the discount factor and for its parameters.

Under the special case when $\alpha = 0$ and $\delta_{it} = | x_t^i - x_{t-1}^i |$, the mobility index (2) becomes

$$m_0(z_i) = \sum_{t=T-p_i+1}^{T} \frac{1(x_t^i \neq x_{t-1}^i)}{p_i} \cdot w(t), \tag{4}$$

that is the *headcount ratio of inter-temporal overall mobility*, which counts the incidence of changes in the individual's status, regardless of the size of the changes.

Indices of headcount ratio of inter-temporal upward or downward mobility can be obtained analogously.

For $\alpha > 0$, the index $m_\alpha(z_i)$ is affected also by the intensity of the inter-temporal changes.

For a particular choice of the parameters, that is if $p_i + 1 = 2$, $\alpha = 1$ and $w(t) = 0$, the index proposed in (2) reduces to the Fields and Ok (1996, 1999) family of mobility indices.

The following simple example will help clarify better the index proposed.

Example 1. Let $K = 3$, $S = \{1,2,3\}$, $p_i = 4, \forall i$ and $\alpha = 1$. The individual overall intertemporal mobility may take the following values. If scenario is $z_1 = (1,3,1,3)$ or $z_2 = (3,1,3,1)$ then $m_1(z_1) = m_1(z_2) = 1$. If scenario $z_3 = (1,3,3,1)$ then $m_1(z_3) = 2/3$. If scenario $z_4 = (1,1,1,1)$ then $m_1(z_4) = 0$.

Let us now move to discuss some of the main properties that the individual inter-temporal mobility index satisfies.

1. *Continuity*. The index $m_\alpha(z_i)$ is a continuous function.
2. *Normalization*. The index is normalized, which means that it ranges in [0,1]. The lower bound, $m_\alpha(z_i) = 0$, is reached when an individual never change his/her status over time, that is if $x_t^i = x_{t-1}^i, \forall t = 1,...,T_i$. The upper bound, $m_\alpha(z_i) = 1$, can be obtained if an individual has changed status in every period.
3. *Path-dependence*. The index depends on the relative distance between each status. The path is also relevant for the index, as recent years are evaluated differently from less recent ones (because of the discount-factor).

3. An aggregate inter-temporal mobility index

Synthetic information about the intensity and incidence of inter-temporal mobility in a given country or group is essential to address effective policies; therefore, the aggregation step is crucial, as underlined in Sen (1976).

Here I assume an additive structure, and proceed to evaluate aggregate mobility by taking one person at a time. The aggregate inter-temporal mobility index that I propose is the following:

$$M_\alpha = \frac{1}{n}\sum_{i=1}^{n} m_\alpha(z_i), \tag{5}$$

where $m_\alpha(z_i)$ is the individual inter-temporal mobility index defined in (2).

Let us discuss some of the main properties that the aggregate inter-temporal mobility index satisfies.

1. *Normalization*. The index is normalized, which means that it ranges in [0,1]. The lower bound is reached when all individuals never change their status over time. The upper bound can be obtained if all individuals change status in every spell.
2. *Monotonicity*. All things being equal, if one individual experiences higher inter-temporal mobility of his status, the societal index increases.
3. *Anonimity*. Any exchange among individual inter-temporal mobility profiles, by which the same mobility sequence moves from one person to another, does not affect the aggregate index.
4. *Independence*. Individual mobility profiles provide an independent contribution to the aggregate inter-temporal mobility index.
5. *Population proportionality*. If two or more identical populations are gathered, the aggregate index does not change, i.e. the index is independent from the population size.
6. *Decomposability*. The aggregate index can be expressed as weighted mean of subgroup mobility indices (M_α^g, with $g = 1,2,...,G$), in which the weights correspond to the size of the groups:

$$M_\alpha = \sum_{g=1}^{G} \frac{M_\alpha^g \cdot N_g}{\sum_{g=1}^{G} N_g}$$

7. *Subgroup consistency*. If inter-temporal mobility increases within a given subgroup and other subgroups remain unchanged, then the aggregate index must increase.

4. Special case: an index of unemployment persistence

The inter-temporal mobility index $m_\alpha(z_i)$ defined in (2) can be computed for any ordinal status; the particular focus of this paper is the occupational status. Suitable choices of the assumptions for the index $m_\alpha(z_i)$ may lead to an index of persistence in unemployment.

Consider *X* as a dummy variable for the unemployed status, that is $x_t^i = 1$ if individual *i* is unemployed (or has lost his job) at time *t* and $x_t^i = 0$ if individual *i* is employed at time *t*.

Also consider the comparison function $\delta_{it} = \max(x_t^i - x_{t-1}^i; 0)$. Therefore, comparison δ_{it} is an indicator variables equal to 1 only when the individual enters the status of unemployed at time *t* while s/he was employed at time *t-1*, otherwise it takes zero value.

One may want to allow for a scenario in which assuming that being unemployed for a number of consecutive periods has a worse effect than moving in and out of unemployment over time. A choice of the discount factor $w(t)$ that allows for such a scenario is the following:

$$w(t) = \frac{(D_t(z_i))^2}{p_i} \tag{6}$$

where $D_t(z_i)$ be the maximal number of consecutive periods including t in per-period unemployment status. See Bossert et al. (2012). The following example will help clarify the definition of the function $D_t(z_i)$.

Example 2. Let $T = 7$. Consider the individual *i*'s profile $z_i = (0,1,1,0,0,1,0)$. The length of the first employment spell is one: $D_1(z_i) = 0$. The following is an unemployment spell of length two: $D_2(z_i) = D_3(z_i) = 2$. The next two are periods in employment: $D_4(z_i) = D_5(z_i) = 0$. Period 6 is a single period in unemployment: $D_6(z_i) = 1$. The final is a one-period out of unemployment spell: $D_7(z_i) = 0$.

Therefore, choosing as discount factor the function in (6) and as sensitivity parameter α=0, the inter-temporal mobility index $m_\alpha(z_i)$ becomes a measure of individual unemployment persistence, as follows

$$u(z_i) = \sum_{i=T-p_i+1}^{T} \frac{(D_t(z_i))^2 \cdot \delta_{it}}{(p_i)^2}, \tag{7}$$

with δ_{it} equals 1 if individual enters unemployment status.

The index ranges between 0 (case of absence of unemployment in each spell) to 1 (unemployed status in each spell of the period under consideration).

The following example shows how the measure $u(z_i)$ works.

Example 3 Let us compare the two following individual status profiles: $z_1 = (0110)$ and $z_2 = (0101)$, where 0 means employed status and 1 means unemployed status. The first individual experiences unemployment for two consecutive periods of time, while the second individual moves in and out of unemployment. The former scenario is evaluated as worst than the second one; therefore, our measure will take higher value in the first than in the second case. In fact, $u(z_1) = 0.44$, while $u(z_2) = 0.22$.

In order to evaluate the overall persistence in unemployment in a given society the aggregate index proposed is the following:

$$U = \frac{1}{n}\sum_{i=1}^{n} u(z_i), \tag{8}$$

where $u(z_i)$ is the individual index of persistence in unemployment defined in (7).

5. Empirical application

The class of indices of inter-temporal mobility proposed in (5) and of persistence in unemployment defined in (8) are now applied to the context of occupational mobility in Italy.

The empirical illustration is based on a sample of the Compulsory Communications ("Comunicazioni Obbligatorie") data provided by Italian Ministry of Labour and Social Policies.

The Compulsory Communications (henceforth, CC) data includes all activations, transformations, fixed-term extensions, early anticipated terminations of a working relationship, either public or private.

The sample refers to all Italian workers born on 15 January, 15 April, 15 July and 15 October of any year. Our database therefore includes about 1 out of 91 of all workers who have been involved in the CC system over the period between January 2009 and June 2012.

The population of interest are the 18-35 aged workers who activated a contract in 2009. Individuals who entered the CC database for the first time after December 31, 2009 are excluded from the analysis.

The CC data have as unit of observation the contract ("contratto di lavoro"), defined as a working relationship between an employer and an employee and characterized by a starting date. However, in the context of mobility analysis, the key concept is the worker rather than the contract; therefore, the worker's history needs to be reconstructed starting from the original CC data, so that the observation unit becomes the individual.

For more details on the data preparation and cleaning process I refer to Lilla and Staffolani (2011), while further information on the methodology for joining different contracts corresponding to same individual can be found in Picchio and Staffolani (2013).

CC data provides lots of information: one could follow the individual occupational status even daily. Here for simplicity a monthly unit of time is considered, and for each month he *prevalent* contract is selected (according to type and length of contract).

The variable of interest is the occupational status. Four are the types of occupational status considered, that are ordered as follows: (1) *not in employment*, (2) *temporary contract* (including fixed-term contract- "contratto a tempo determinato", parasubordinate contract - "contratto di collaborazione coordinata e continuativa", internship contract - "contratto di stage", interim contract - "lavoro interinale"), (3) *apprenticeship contract* ("contratto di apprendistato"), (4) *permanent contract*, that is the open-ended contract ("contratto a tempo indeterminato").

Note that the starting time of the contract's activation is not the same for each individual in the database; therefore the length of follow-up is specific for each individual.

The new inter-temporal mobility measures have been computed choosing the sensitivity parameter $\alpha = 0$ (headcount ratios).

Table 1 shows that for the population of young workers (18-35 years old) who activated a contract in Italy in the year 2009, the headcount ratio of inter-temporal

overall mobility is equal to 7%, while the upward mobility is significantly higher than the downward mobility (4% versus 3.1%).

Table 1 – *Inter-temporal mobility headcount ratio, total and by subgroups (percentage values).*

	Overall mobility			Downward mobility			Upward mobility		
	Index	95% C.I.		Index	95% C.I.		Index	95% C.I.	
TOTAL	7.0	7.0	7.1	3.1	3.0	3.1	4.0	3.9	4.0
NATIONALITY									
Italian	7.3	7.2	7.4	3.2	3.2	3.3	4.1	4.0	4.1
EU	7.9	7.6	8.1	3.2	3.1	3.3	4.7	4.5	4.8
non-EU	5.6	5.4	5.7	2.4	2.3	2.4	3.2	3.1	3.3
GENDER									
Male	7.0	6.9	7.1	3.0	3.0	3.1	4.0	3.9	4.0
Female	7.0	6.9	7.2	3.1	3.0	3.1	4.0	3.9	4.0
EDUCATION									
None	6.4	6.2	6.5	2.6	2.6	2.7	3.7	3.6	3.8
Primary	7.3	6.6	7.9	3.0	2.7	3.4	4.3	3.9	4.6
Lower secondary	7.9	7.7	8.0	3.4	3.3	3.5	4.5	4.4	4.5
Higher secondary	6.9	6.8	7.1	3.1	3.0	3.1	3.9	3.8	3.9
Tertiary	6.2	6.0	6.4	3.0	2.9	3.1	3.3	3.2	3.4
AGE									
18- 24 years	7.5	7.4	7.6	3.2	3.1	3.3	4.3	4.2	4.4
25-35 years	6.7	6.7	6.8	3.0	2.9	3.0	3.8	3.7	3.8
MACRO-AREAS									
North-East	7.3	7.1	7.4	3.3	3.2	3.3	4.0	3.9	4.1
North-West	6.0	5.9	6.1	2.7	2.6	2.7	3.4	3.3	3.4
Center	6.5	6.4	6.7	2.8	2.7	2.9	3.7	3.6	3.8
South and Island	8.0	7.9	8.2	3.4	3.3	3.5	4.6	4.6	4.7

Source: author's elaboration of CC data

Splitting the analysis by subgroups according to the nationality, one may note that the workers with a European (but not Italian) citizenship have higher inter-temporal mobility than the Italian workers, while the least mobile are the non-EU individuals.

Table 1 shows also that the difference between males and females in terms of mobility are not statistically significant, while education and age have a significant effect. In particular, having none or tertiary education implies significantly less mobility than having primary or secondary education. Moreover, the younger workers are significantly more mobile than the older ones (7.5% versus 6.7%).

Splitting the workers according to the geographical area of their first contract, one may note that mobility is significantly higher in the South (Islands included), followed by North-East, North-West and, in the last position, the Center of Italy.

Table 2 looks at the Italian regions and shows that the regions with higher mobility are Valle d'Aosta and Trentino Alto Adige (with the autonomous provinces of Bolzano and Trento), where the levels of upward mobility are among the highest of the country.

Table 2 – *Inter-temporal mobility headcount ratio by regions (percentage values).*

	Overall mobility			Downward mobility			Upward mobility		
	Index	95% C.I.		Index	95% C.I.		Index	95% C.I.	
Piemonte	6.3	6.0	6.5	2.8	2.6	2.9	3.5	3.4	3.7
Valle d'Aosta	9.5	7.8	11.1	4.1	3.3	4.9	5.4	4.5	6.3
Lombardia	5.7	5.5	5.8	2.5	2.4	2.6	3.1	3.1	3.2
Trento	9.9	9.2	10.7	4.5	4.1	4.9	5.5	5.1	5.9
Bolzano	9.2	8.5	9.9	4.0	3.7	4.4	5.2	4.8	5.6
Veneto	6.8	6.5	7.0	3.0	2.9	3.2	3.7	3.6	3.9
Friuli V. Giulia	6.7	6.2	7.2	3.1	2.9	3.4	3.6	3.3	3.9
Liguria	7.4	7.0	7.9	3.3	3.0	3.5	4.2	3.9	4.4
Emilia Romagna	7.0	6.8	7.2	3.1	3.0	3.3	3.8	3.7	4.0
Toscana	7.0	6.7	7.3	3.1	3.0	3.2	3.9	3.8	4.1
Umbria	6.3	5.7	6.8	2.7	2.5	3.0	3.5	3.2	3.8
Marche	7.0	6.6	7.5	3.1	2.9	3.3	3.9	3.7	4.2
Lazio	6.1	5.9	6.3	2.5	2.4	2.6	3.6	3.5	3.7
Abruzzo	7.8	7.3	8.3	3.4	3.2	3.6	4.4	4.1	4.7
Molise	9.0	7.8	10.3	4.0	3.4	4.7	5.0	4.4	5.6
Campania	7.0	6.7	7.2	2.9	2.7	3.0	4.1	4.0	4.2
Puglia	8.6	8.3	8.9	3.7	3.6	3.9	4.9	4.7	5.1
Basilicata	8.8	7.9	9.7	3.8	3.4	4.3	5.0	4.5	5.4
Calabria	9.2	8.8	9.6	3.8	3.6	4.0	5.3	5.1	5.5
Sicilia	7.8	7.5	8.1	3.2	3.1	3.4	4.6	4.4	4.7
Sardegna	8.4	8.0	8.8	3.6	3.4	3.9	4.7	4.5	5.0

Source: author's elaboration of CC data

Let us now move to analyze the persistence in unemployment, by computing the index proposed in formula (8). From Table 3 one may note that EU-citizens show significantly higher persistence in unemployment than Italian workers, while no significant difference emerges between males and females. Splitting the population by education level, the lower unemployment persistence is registered for the higher educated individuals (14%). Moving to the age-based groups, one may note that the risk of persistence in unemployment decreases significantly with the age. Finally, looking at the geographical macro-areas, the highest unemployment persistence is registered in the South of Italy and in the Islands, followed by Center of Italy, North East and North-West, respectively.

Table 4 reveals, moreover, that the Italian region with the highest rate of persistence in unemployment is Sardegna, while the region with the smallest rate is Lombardia.

Table 3 – *Unemployment persistence (percentage values).*

	Index	95% Confidence Interval	
TOTAL	19.9	19.6	20.2
NATIONALITY			
Italian	19.7	19.4	20.1
EU	30.4	29.2	31.6
non-EU	15.4	14.7	16
GENDER			
Male	20.1	19.6	20.5
Female	19.7	19.2	20.1
EDUCATION			
None	19.8	19.1	20.4
Primary	22.7	19.7	25.7
Lower secondary	22.0	21.5	22.6
Higher secondary	19.6	19	20.1
Tertiary	14.0	13.2	14.9
AGE			
18-24 years	23.0	22.5	23.6
25-30 years	18.5	18	19.1
31-35 years	17.5	16.9	18.0
MACRO-AREAS			
North-East	18.5	17.9	19.2
North-West	16.9	16.3	17.5
Center	19.6	19.0	20.3
South e Islands	23.4	22.8	24.0

Source: author's elaboration of CC data

Table 4 – *Unemployment persistence by regions (percentage values).*

Regions	Index	95% Confidence Interval		Regions	Index	95% Confidence Interval	
Piemonte	18	16.7	19.2	Marche	21	19	23.1
Valle d'Aosta	18.9	13.2	24.6	Lazio	20.4	19.4	21.4
Lombardia	15.9	15.2	16.6	Abruzzo	22	20	24.1
Trento	22	19.4	24.7	Molise	19.7	15.4	24
Bolzano	24.6	21.7	27.4	Campania	23.6	22.4	24.9
Veneto	17.8	16.8	18.9	Puglia	22.9	21.6	24.2
Friuli Venezia G.	17.2	15.1	19.4	Basilicata	24.4	20.9	28
Liguria	21.1	19.1	23.1	Calabria	22.9	21.2	24.5
Emilia Romagna	17.7	16.7	18.7	Sicilia	23.6	22.4	24.8
Toscana	18.6	17.4	19.8	Sardegna	25.4	23.5	27.3
Umbria	16.6	14.3	18.8				

Source: author's elaboration of CC data

6. Concluding remarks

This paper has provided a new class of mobility indices that takes into account the inter-temporal status movements over more than two periods of time, differently from the traditional measures. The index has been obtained in two steps. First, an individual inter-temporal mobility index has been provided, which allows for sensitivity to mobility (through parameter α) and time discount, as well as a decomposition into upward and downward mobility. Since memory plays an important role when individual makes comparisons with his past, a discount factor has been introduced. In fact, an individual is usually less affected by his remote past than by his recent past. Secondly, individual mobility indicators are aggregated over all the population, in order to obtain an index which allows for comparisons among different societies.

The empirical exercise has analysed the inter-temporal mobility of occupational status in the Italian labour market and has exploited the potentiality of the Italian Compulsory Communications data, which stays in the availability of reconstructing even daily worker's history.

Future research may explore several directions. On the theoretical part, a possibile extension may consider an axiomatic characterization of the class of indices proposed. On the empirical part, the application may be enriched by including sensitivity analysis on the parameter α and on the time unit definition, as well as regression models for detecting the main determinants of the inter-temporal mobility.

Acknowledgement

This research was funded thanks to the agreement between the General Department for the Innovation Technology of the Italian Ministry of Labour and Social Policies (Director General: Grazia Strano) and the Department of Economics and Social Sciences of the Marche Polytechnic University.

The author is grateful to Stefano Staffolani and Matteo Picchio for the data preparation.

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SUMMARY

Aim of the paper is to provide a new class of mobility indices that takes into account the inter-temporal status movements over more than two periods of time. The index is obtained in two steps. First, an individual inter-temporal individual mobility index is provided, which allows also for analysis of upward and downward mobility. Since memory plays an important role when individual makes comparisons with his past, a discount factor has been introduced. Secondly, individual mobility indicators are aggregated over all the population, in order to obtain an index which allows for comparisons among different societies. The empirical application analyzes the mobility of the occupational status in the Italian labour market within an inter-temporal framework, using the Italian Compulsory Communications system data.

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PRO-COMPETITIVE REFORMS AND TIMING OF IMPLEMENTATION: AN IGEM-BASED SIMULATION ANALYSIS FOR ITALY

Barbara Annicchiarico, Fabio Di Dio, Francesco Felici

1. Introduction

In this paper we quantify the potential effects of some pro-competitive reforms for the Italian economy through simulations made using IGEM, the Italian General Equilibrium Model of the Department of Treasury of the Italian Ministry of the Economy and Finance (see Annicchiarico et al. 2013b).

Notably, after some years of deep recession and high unemployment, a wide-ranging economic reform process is taking place in Europe, primarily to restore macroeconomic stability and promote employment, economic growth and social cohesion. This wide reform process, launched by the European Commission in March 2010, foresees a comprehensive and ambitious reform strategy, known as the Europe 2020 strategy. This ten-year strategy, formally adopted in June 2010, offers a precise timetable to achieve improvements centered around some key policy areas of interventions, namely: knowledge and innovation, competition in the product markets, education, labour market participation and fight against poverty (for further details see European Commission 2010 and European Council 2010). In this work we focus on the study of the effects of pro-competitive policies intervening in the goods and in the labour markets.

This paper is related to the literature studying the potential macroeconomic effects of structural reforms in the context of Dynamic General Equilibrium (DGE) models which represent a useful tool of economic policy analysis. DGE models, in fact, embody several market imperfections and sources of inefficiencies and are able to capture the dynamic linkages between the main macroeconomic variables and the interactions between rigidities on labour and product markets. However, the use of DGE models for assessing the macroeconomic impact of structural reforms is quite recent. Relevant contributions are Bayoumi et al. (2004) and Everaert and Schule (2006) who use variants of the International Monetary Fund's Global Economy Model, Roeger et al. (2008) who employ QUEST III, Forni et al. (2010) who study the effects of increasing competition in the service sector in Italy, employing a two-region currency union DGE model, Lusinyan and Muir (2013)

who in a variant of the IMF's Global Integrated Monetary and Fiscal model (GIMF) study the macroeconomic impact of a comprehensive package of reforms in the labour and in the goods markets, Annicchiarico et al. (2013a) who study the effects of structural reforms in the labour and in the product markets using the European Commission Model QUEST III adapted to Italy.

The analysis of this paper covers two wide policy areas of intervention: goods market and labour market. For both policy areas the set of measures aim at promoting and enhancing competition in order to improve growth prospects and boost employment. As a matter of fact there is wide consensus, both in academic and policy circles, on the fact that competitive economies outperform rent-seeking ones, both in terms of growth and welfare.

Our results show that pro-competitive policies may produce beneficial and sizable effects on all relevant macrovariables. However, while in the long run these reforms go in the right direction, their initial impact would depend crucially on the chosen timing of implementation as well as on the inter-linkages between reforms when jointly introduced. A natural question, in fact, arises about the choice between the timing of implementation of these reforms and the appropriate sequencing of them. The timing choice is basically between a 'Big Bang" or a 'gradualist' approach. A Big Bang approach implements reform in a concentrated time frame, whereas a gradualist approach spreads various reforms over a more extended period of time. The gradualist approach is often preferred to minimize the adjustment costs, and, therefore, to ensure that reforms are introduced at a socially acceptable pace. Our results confirm that a gradualist approach is to be preferred so to smooth the related adjustment costs of the reform and reduce the possible initial negative impact.

The appropriate sequencing of the reforms problem arises, first, because markets adjust towards their long-run equilibrium with different speeds (labour markets tend to be more sluggish than goods markets) and second, because pro-competitive reforms are likely to produce important redistributive effects in favour of some groups and against others, potentially undermining the required social support for the reform plan. On the basis of our results, we argue that priority should be given to policies improving competition in the goods market in order to generate the necessary consensus for the reform intervening in the labour markets.

The structure of the paper is as follows. Section 2 presents a non-technical overview of IGEM; Section 3 describes the reform scenarios and presents the results of the analysis; finally Section 4 summarizes the main findings and concludes.

2. IGEM: A General Equilibrium Model for the Italian Economy

IGEM is a dynamic general equilibrium model for Italy recently created at the Department of Treasury of the Italian Ministry of the Economy and Finance to be used as a laboratory for economic policy analysis (see Annicchiarico et al. 2013b). The model, which is based on explicit microeconomic foundations, has been designed to quantify the potential macroeconomic impact of structural reforms, of fiscal policy interventions and of several shocks. Consistently with the conventional New Keynesian models (see e.g. Woodford 2003, Galí 2008, Christiano et al. 2005, Smets and Wouters 2003, 2007) and in line with the New Neo-Classical Synthesis (see Goodfriend and King 1997), IGEM embodies a large variety of nominal and real frictions shaping the short- and the medium-run behaviour of the economy, while neoclassical features tend to prevail in the long run, where the level of economic activity is determined by technology, preferences, the supply of factor inputs, the market structure and the fiscal policy put into place.

Specifically, the IGEM setup consists of a small open economy, which takes as given the world interest rate, world prices and world demand, and features six types of economic agents: (i) firms (monopolistically competitive intermediate goods producers, perfectly competitive final good producers, monopolistically competitive importing and exporting firms); (ii) households (Ricardian households who have access to financial markets and are able to smooth out their consumption profile, and non-Ricardian households who simply consume their after-tax disposable income); (iii) trade unions setting workers remuneration; (iv) a foreign sector; (v) a monetary authority; (v) a fiscal authority. Nominal frictions on wages and prices *à la* Rotemberg (1982), real rigidities on investment, labour and capital utilization, external consumption habit (i.e. "catching up with the Joneses" preferences as in Abel 1990), and imperfect competition in product and labour markets are necessary to create plausible short-run dynamics.

A peculiar feature of the model is that it has been designed to capture some specific features of the Italian labour markets, where several different contract types coexist and a dualism emerges between those workers, sheltered by union coverage and high firing costs, benefiting from stronger job security protection and higher pays, and those workers with little or no security protection, lower pays and low firing costs. The labour force is, in fact, divided in three different categories: (i) employees with a stable contract of employment and strong protection; (ii) atypical workers who have flexible working patterns and weak (or no) employment protection; (iii) self-employed workers and professionals who may supply work under contracts for services and operate under the tutelage of professional orders or registers, so enjoying a certain degree of market power. Adjustment costs on labour are such that it is more costly to change labour inputs of those who are qualified as

permanent workers. In the same spirit, the degree of nominal wage stickiness is much higher for permanent workers than for the other categories, as well as their market power. From this point of view, atypical and self-employed workers represent the more volatile component of the workforce.

An additional feature of the model is that this heterogeneity of the labour market is strictly related to that considered for the households. In particular, it is assumed that Ricardian households supply labour services as employees and as self-employed workers, while non-Ricardian consumers supply labour services as atypical workers and as unskilled employees. The reason goes as follows. Workers with stable contracts have full access to credit and financial markets in general, while atypical workers with flexible labour patterns are more likely to be liquidity constrained. Similarly, in some circumstances, low income workers may likely to be liquidity constrained. From this point of view IGEM is able to provide a rationale for the existence of non-Ricardian households.

The foreign sector is modeled as follows. Italy faces an exogenous world rate adjusted for a risk premium and takes as given world demand and world prices on tradable goods. The development of its external position depends on the current account surplus and so on the behavior of firms, households and government.

Finally, the government purchases final goods for consumption and investment, makes transfers to households, gives subsidies to intermediate goods producers, collects lump-sum taxes and tax payments on labour income, consumption and capital, receive social security contributions and issues nominal bonds. A debt-rule anchoring the level of lump-sum taxes to the stock of debt ensures long-run fiscal solvency. The behaviour of the monetary authority is, instead, described by a weighted Taylor to account for the fact that Italy is in a monetary union.[1]

2.1. Inefficiencies of the Economic Equilibrium and the Role of Structural Reforms

The economy described in IGEM is characterized by several distortions and sources of inefficiencies that inevitably conduce to a lower level of economic activity. Clearly, the lack of perfect competition in the labour markets and in the intermediate goods sector generates markups which reduce labour supply and distorts production decisions. More specifically, monopolistic competition in the labour markets distorts the equilibrium as follows. Trade unions for employees, and professional orders for self-employed set the nominal remuneration for each category of labour service in order to maximize households' expected utility, given

[1] For further details about the structure of the model, the interested reader may refer to Annicchiarico et al. (2013b).

firms' labour demand. Each specific kind of labour service is assumed to be an imperfect substitute for the services supplied by other workers under the assumption of a constant elasticity of substitution, which, in turn, determines the degree of market power: the lower the elasticity of substitution, the higher the markup and the lower the employment level. As a result of this behavior, besides the tax wedge (source of an additional distortion not discussed in this paper), there will be a wedge between the real wage rate and the marginal rate of substitution between leisure and consumption, namely the wage markup. Clearly, structural reforms intervening in the labour market, aimed at increasing the employment rate and at boosting the level of economic activity, tend to reduce this wedge.

As already discussed, the intermediate-good sector features monopolistic competition as well. Each firm operating in this sector produces a specific intermediate good, necessary to manufacture the final (homogenous) good, and enjoys some market power given the imperfect substitutability across different intermediate goods. As usual, this lack of competition reflects on prices which will be equal to a markup, over marginal costs. Pro-competitive reforms in the product market will be introduced into the model by decreasing this markup.

2.2. Parameterization and Model Solution

The parameterization of IGEM is mainly based on calibration, with the exception of the preference parameters characterizing the labour supply for which we have used the estimates obtained with the microsimulation model EconLav.[2] IGEM is calibrated on a quarterly basis and the chosen parametrization was done to match some relevant steady-state ratios and specific features of the Italian economy over the period 2002-2008.

There are two relevant parameters for the exercises carried out in this paper, namely, the elasticity of substitution between goods in the intermediate sector and the elasticity of substitution between differentiated labour inputs. The first elasticity is set at 5, so to have a steady-state level of net markup equal to 25%, while the second elasticity is set at 2.65 so to generate a steady-state level of net markup equal to 60.61%. In addition, it is worth reporting the composition of the labour market. On the basis of the RCFL - ISTAT 2008 data, employees are identified with those workers with a stable labour contract and eligible of employment protection, so belonging to the primary labour market. According to the above mentioned data, this category amounts to 53% of the whole workforce.

[2] EconLav is a labour market microsimulation tool available at the Department of Treasury of the Italian Ministry of the Economy and Finance. For further details the interested reader may refer to the webpage http://www.dt.tesoro.it/en/analisi_programmazione_economico_finanziaria/modellistica/

In turn, within this category the share of the employees with tertiary education corresponds to the skilled workers and represents 11% of the workers, while the remaining share is identified with the unskilled employees. The share of self-employed workers older than 35, is 21% and we set the model share accordingly. As a matter of fact, we exclude from this category of workers the young, since at early stages of their careers workers tend to be precarious and face the same difficulties of the workers with atypical labour contracts. For this reason, the last category of workers labeled as "atypical" includes young self-employed, apprentices, temporary workers and other workers with atypical contracts characterized by weak security protection and low firing costs. This residual fraction of workers amount to 26% and, as already pointed out, belong to the secondary market. Finally, in this version of the model, we assume that non-Ricardian households supply only atypical labour, hence they represent the 26% of the households. For further details on the calibration, see Annicchiarico et al. (2013b).

Turning to the solution strategy, IGEM is implemented in a TROLL platform which uses a Newton-type algorithm to solve the non-linear deterministic model. The decision rules of the model, which represent the model solution, are expressed in levels. The two-point boundary-problem which characterizes deterministic simulation, (i.e. we need initial conditions for predetermined variables and terminal conditions for forward looking variables), is solved as in Roeger and in't Veld (1999).

3. Pro-Competitive Reform Scenarios

In what follows we will quantify the potential macroeconomic impact of pro-competitive provisions covering two wide policy areas: goods markets and labour markets. The first policy area includes reform packages promoting market competition and favoring business and is mapped onto the model through a reduction of the price markup in the intermediate goods sector. The second policy area refers to labour market reforms, including measures directed to enlarge the labour force participation rate, to remove distortions in the labour markets and to align wages to labour productivity trends. This second set of policies are mapped onto the model though a reduction of the wage markup charged by the trade unions representing employees and by the professional orders acting in the interest of self-employed workers. Atypical workers are, therefore, not directly involved by this kind of reform.

It should noted that pro-competitive reforms are likely to reduce and redistribute rents across economic agents who, in turn, will be induced to adjust their choices

in accordance with the changed conditions. Intuitively, the lack of competition in the goods market is a source of rents in favor of producers, while the lack of competition in the labour markets, somehow, allows workers to participate in these rents. From this point of view, it is then clear that pro-competitive reforms in the goods market, by reducing the markup charged by firms, by diminishing these rents, tend to the reduce the remuneration demanded by trade unions and professional orders. It is then clear why to create the required social consensus for labour and social protection reforms, a labour market deregulation reform should be accompanied or anticipated by a corresponding product market deregulation.[3]
In order to better evaluate the potential effects of pro-competitive reforms in the two policy areas of interventions we consider different reform scenarios differing in the degree of progress made and in the timing of implementation. Of course, all scenarios are intended to be illustrative and the assumptions on the degree of progress made in each policy area and on the timing of implementation are to some extent arbitrary.

3.1. Long-Run Macroeconomic Impact

In this section we describe the long-run effects of greater competition in the goods and in the labour markets. We first consider increasing competition separately in each market (Scenarios 1-4), we then compare these outcomes with those stemming from a synchronized reform package intervening simultaneously in both markets (Scenario 5). All scenarios and the size of each intervention are described in Table 1.

Table 1 – *Pro-Competitive Reform Scenarios*

Scenarios	Price Markup	Wage Markup
Baseline	25	60.61
Scenario 1	15	60.61
Scenario 2	10	60.61
Scenario 3	25	50.61
Scenario 4	25	45.61
Scenario 5	15	50.61

In all simulations we only reduce the relevant markups, while all other parameters are set at their baseline values. All results are reported as percentage deviations from the initial steady state, with the exception of net foreign assets and

[3]On this point, see Blanchard and Giavazzi (2003).

of government debt which, being expressed as share of output, are reported in percentage points deviations.

Consider first the long-run (steady-state) impact of reducing the goods markup shown in Table2.

Table 2 – *Long- Run Effects of Pro-Competitive Reforms in the Goods Market.*

	Scenario 1	Scenario 2
Output	3.76	5.02
Consumption	2.59	3.42
Consumption (Ricardian)	2.58	3.39
Consumption (Non Ricardian)	2.66	3.59
Investment	9.03	12.14
Labour	1.43	1.9
Labour - unskilled employees	1.42	1.88
Labour - skilled employees	1.41	1.88
Labour - self-employed	1.38	1.84
Labour - atypical	1.54	2.03
Real wages - total	8.3	11.15
Real wages - unskilled employees	8.41	11.29
Real wages - skilled employees	8.41	11.29
Real wages - self-employed	8.28	11.11
Real wages - atypical	8.16	10.96
Terms of trade	-3.09	-4.07
Export	3.51	4.68
Import	0.31	0.41
Net Foreign Assets (%output)	-0.02	-0.03
Gov. Debt (%output)	-4.72	-6.22

Clearly, a lower markup implies an increase in output, consumption and investment. The increase in output, consumption and investment are respectively equal to 3.76%, 2.59%, 9.03%, respectively, in Scenario 1, where the markup is reduced by 10pp, and to 5.02%, 3.42%, 12.14%, respectively, in Scenario 2, where the markup is reduced by 15pp. Hours worked also increase for all the categories of workers as a result of the higher level of economic activity induced by the lower level of inefficiency. The higher capital stock increases the marginal product of labour, yielding to a higher remuneration for all workers. Domestic production becomes more competitive, so exports increase as well, while imports increase as a result of the higher level of absorption. The Italian terms of trade deteriorate in response to the reforms. This effect is simply the result of a decline in the export prices as a consequence of higher competition in the domestic economy. The negative terms of trade effect, in turn, mitigates the positive effects on consumption and investment stemming from the reforms.

The net foreign assets position is not significantly affected by the reform. The reason goes as follows. Pro-competitive reforms enhancing competition have a positive effect on the current account through higher exports, but at the same time,

the creation of a more friendly business environment expands investments with a negative effect on the current account.

Table 3 – *Long-Run Effects of Pro-Competitive Reforms in the Labour Market and of a Synchronized Reform*

	Scenario 3	Scenario 4	Scenario 5
Output	1.01	1.44	4.8
Consumption	1.12	1.58	3.71
Consumption (Ricardian)	1.34	1.9	3.92
Consumption (Non Ricardian)	0.01	0.01	2.69
Investment	0.78	1.1	9.87
Labour	0.94	1.33	2.37
Labour - unskilled employees	1.12	1.59	2.54
Labour - skilled employees	1.12	1.59	2.54
Labour - self-employed	1.12	1.59	2.51
Labour - atypical	0.11	0.15	1.64
Real wages - total	-0.04	-0.06	8.26
Real wages - unskilled employees	-0.19	-0.27	8.21
Real wages - skilled employees	-0.19	-0.27	8.21
Real wages - self-employed	-0.19	-0.27	8.08
Real wages - atypical	0.53	0.76	8.73
Terms of trade	-0.85	-1.21	-3.9
Export	0.95	1.34	4.48
Import	0.08	0.12	0.39
Net Foreign Assets (%output)	0	0	-0.03
Gov. Debt (%output)	-1.26	-1.78	-5.92

We now consider the effects of pro-competitive reforms in the labour markets regarding employees and self-employed workers. The results are shown in Table 3, where the first two columns refer to the cases in which the reforms only impact the labour market (Scenarios 2-3), while the third column reports the results of a synchronized reform package involving the goods and the labour markets simultaneously. Clearly, institutional reforms able to reduce the market power of wage setters have beneficial effects on output, consumption, investments and labour. The effects are quite substantial, although much lower than those obtained from a similar reduction in the goods markup.[4] In the long run the overall effect on output amounts to 1.01% when wage markups are reduce by 10pp, and to 1.44% when they are reduce by 15pp. The higher level of economic activity along with the lower labour costs, due to the wage moderation, induces lower prices of domestic production, so promoting exports. Imports will also be higher as a result of the higher level of domestic absorption, although the effect is mitigated by the terms of trade deterioration. Overall, we observe that lowering the markups reduces

[4] These moderate effects are probably due the fact that the elasticities of labour supply are quite low, since they are based on microdata estimates.

wages and increases hours for all the four categories of workers. However, we observe some important differences motivated by the fact that atypical workers are not directly involved with the reform. As a matter of fact, the positive effect on hours is higher for the employees and the self-employed workers who will ultimately experience lower real remunerations. On the contrary, atypical workers will work harder, but at the same time they will receive a higher wage as a result of their higher marginal productivity due to the increased stock of capital and to the higher employment level of the other categories of workers.
As in the previous case, we observe that the effects on the net external assets position are negligible. Intuitively, labour market reforms increase labour supply leading to a fall in the country's relative wage and prices and so boosting exports and improving the next external asset position. On the other hand, real wage reduction implies lower marginal costs for firms, so boosting investments and capital inflows able to negatively impact the current account. Finally, the improvement in debt ratio is to be attributed to the higher level of economic activity and to the higher tax revenues.

The last column of Table 3 shows the long-run effects of a joint reform involving the goods and the labour markets simultaneously. In particular we assume that all markups are reduced by 10pp. The main insight from this exercise is that the long-run effects of the combined reform package are essentially equal to the sum of the effects of each single reform implemented separately. Output increases by 4.8%, consumption by 3.71%, investment by 9.87% and labour by 2.37%. It is also important to stress that real wages increase for all categories of workers, since the positive impact induced by the pro-competitive reform in the goods market more than compensate the negative effects induced by the labour market reform. This result supports the above mentioned argument according to which structural reforms of the labour market should be anticipated or accompanied by effective reforms in the goods market. In doing so, in fact, it is possible to generate the required support for the structural interventions aimed at moderating wages.

3.2. Transition and Timing of Implementation

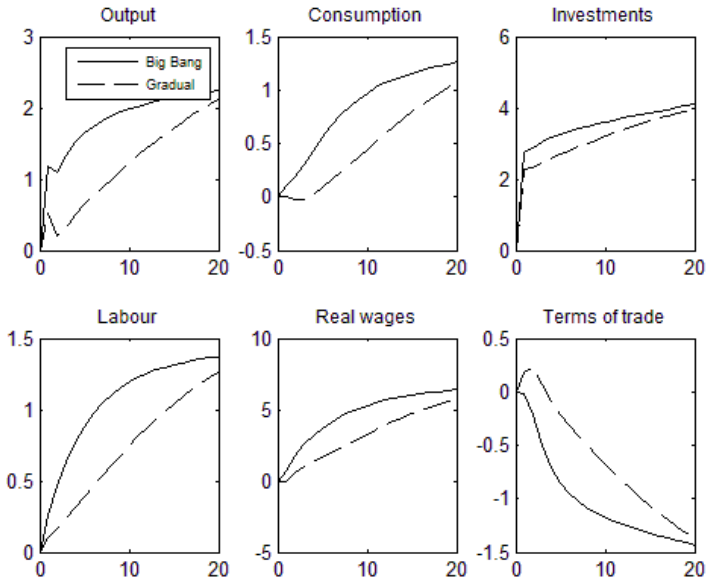
Figures 1-3 plot the transition path of the main macrovariables in response to a pro-competitive reform intervening in the goods market (Figure 1), in the labour markets (Figure 2) and simultaneously in both markets (Figure 3). In all exercises we reduce the markups by 10pp (Scenarios 1,3,5). All variables are expressed as percentage deviations from the initial steady state and results are plotted over a 20-quarter time horizon. The variable labeled "real wages" refers to the average

workers remuneration prevailing in the economy. As before all policy changes are assumed to be permanent. However, since we are interested in the transition of the economy to the new steady state, we now consider two different timings of implementation: (i) immediate implementation ("Big Bang" hypothesis – continuous lines) in which each reform is assumed to be introduced at once; (ii) gradual implementation (dashed lines) in which each reform are introduced gradually in a time span of 5 years, which represents a realistic time span for a reasonably smooth implementation timetable.

Notice that in all experiments we assume that agents have perfect foresight to rule out the effects induced by uncertainty about the time path of the reforms. In addition, we assume that the announced reform plans are fully credible.

In the first place we observe that nominal and real adjustment costs prevent the immediate adjustment of the economy to the new equilibrium also in the Big Bang hypothesis. Rigidities and adjustment costs also explain the strong divergence between the two timings of implementation also at the end of the time interval.

Figure 1 – *Macroeconomic Impact of a Pro-Competitive Reform in the Goods Market*



Now consider Figure 1, where, clearly, the macroeconomic response to the pro-competitive reform in the goods market tends to be more smoothed in the case of gradualism. However, we notice that consumption slightly decreases during the first quarters of the simulation in the case of gradual implementation of the reform.

The reason for this result is the folowing. In the first period of the simulation the full reform plan is announced and only partially introduced. Since agents are aware of the fact that prices will be lower in the future they will find it optimal to postpone their consumption decisions.[5] This lower demand for consumption also explains the slight improvement in the terms of trade. It goes without saying that this result stems from the assumption of full credibility of the announced reform plan. The observed slightly decline of real wages during the very first quarter might be also connected to the delayed increase of aggregate demand.

Figure 2 – *Macroeconomic Impact of a Pro-Competitive Reform in the Labour Market*

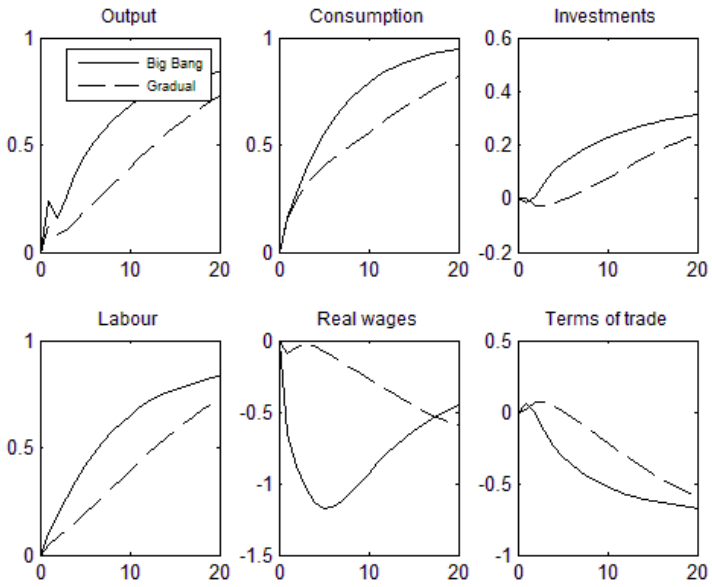
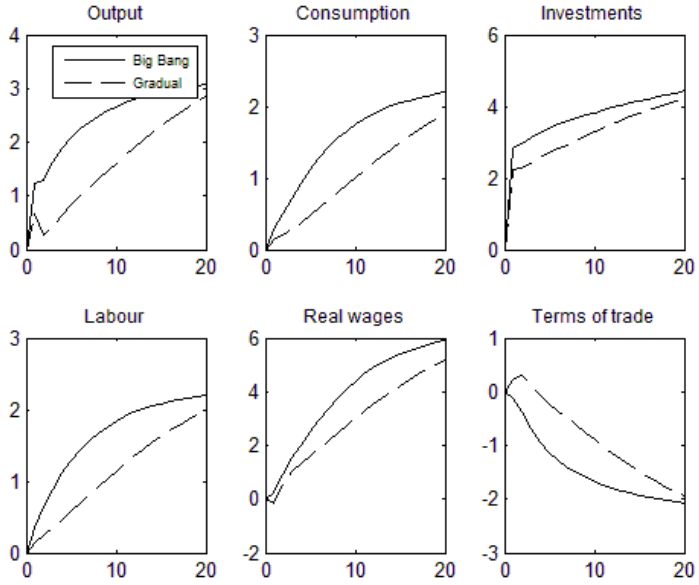


Figure 2 shows the results of a reform promoting competition in the labour market. Again gradualism ensures a more smoothed response of the main macrovariables, which is particularly evident for the average real wage which slowly declines. In the case of immediate implementation, instead, the average real wage falls sharply and only after about 5 quarters starts increasing. Intuitively, the markup reduction induces an immediate drop of workers remuneration, while the benefits of the reform have not yet materialized. After 5 quarters nominal prices have adjusted and the beneficial effects of the reduced inefficiency manifest themselves.

[5] Of course, only Ricardian households are in the position of accounting for the reform plan when making consumption decisions.

Finally, Figure 3 shows the response of the economy to a joint reform plan. As already pointed out when discussing the long-run effects of the structural interventions, we have that the effects of the synchronized reform package are essentially equal to the sum of the effects of each single reform implemented separately. With a Big Bang hypothesis, half of the observed output increase would materialize during the first three years. Most importantly, the overall effect on real wages is positive all along the transition path, with the exception of the first quarter under the hypothesis of gradual implementation, where the pro-competitive reform in the goods market leads to a slightly retarded response of real wages, as already discussed.

Figure 3 – *Macroeconomic Impact of a Synchronized Reform*



4. Conclusions

This paper quantifies the potential effects on the Italian economy of different pro-competitive reform scenarios in two specific policy areas, namely: goods markets and labour markets. The simulation exercises have been conducted with IGEM, the general equilibrium model for the Italian economy of the Department of Treasury of the Italian Ministry of Economics and Finance.

We show that structural interventions aimed at enhancing competition in goods market and at aligning wages to productivity trends are likely to bring about beneficial effects on output, consumption, investment and employment.

Our results also stress the importance of the timing of the implementation of the reform plan in shaping the response of the economy during the first years of the simulation exercise. In particular, in the face of a credible and gradual pro-competitive reform plan intervening in the goods market, forward looking households will find it optimal to initially consume less, planning to consume more when the beneficial effects of the reform will materialize and prices will be lower. On the other hand, pro-competitive interventions in the labour markets induce a fall of real wages during the early stages of the reform. Despite the real wage decline is shown to be temporary and strongly reduced in the case of gradual implementation, this negative repercussion of the reform could easily undermine social consensus and jeopardize the full implementation of the reform itself. That is why pro-competitive reforms in the goods market may help to create the support for labour market reform.

Finally, a word of caution is needed. We are aware that quantifying the economic impact of economic reforms represents an extremely difficult task and that all results should be interpreted with extreme caution and accounting for the tight theoretical assumptions of the model used. In addition, there might be delays in the implementation of a reform, problems of credibility and important country-spillovers to be considered in the analysis. We leave these further complications for future research.

Acknowledgements

This paper was prepared for the 50th Annual Meeting of the Italian society of economics demography and statistics (SIEDS). We are very grateful to the organizers and to the participants for their very helpful comments and the stimulating debate. The usual disclaimer applies. The views expressed herein are those of the authors and not necessarily reflect those of the Italian Ministry of Economy and Finance.

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SUMMARY

This paper quantifies the potential macroeconomic effects on the Italian economy of various pro-competitive reform packages using the Italian General Equilibrium Model (IGEM) of the Department of Treasury of the Italian Ministry of the Economy and Finance. Our results indicate that reducing the goods and the wage markups is likely to be conducive of sizable long-run gains in output and employment. Most importantly, our findings support the view that the structural interventions aimed at aligning wages to productivity trends should be anticipated or accompanied by pro-competitive reforms in the goods market in order to generate the required social consensus for labour reforms.

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THE MACROECONOMETRIC MODELS FOR ITALY (MEMO-IT): POLICY EVALUATION AND FUTURE CHALLANGES

Fabio Bacchini, Maria Elena Bontempi, Cristina Brandimarte, Roberto Golinelli, Cecilia Jona-Lasinio, Carmine Pappalardo

1. Introduction

In May 2012, Istat released its first macroeconomic forecasts for 2012-2013 based on MeMo-It, the new Macroeconometric Model of the Italian economy (Istat, 2012). The development of MeMo-it was the result of the transfer of the forecasting duties from Isae to Istat. The driving principles of the new model are the transparency and the best fit to the available information set and to a lesser extent the adeherece to a theoretical economic paradigm.

The research activity to develop MeMo-It follows two main lines: the first is devoted to extend the capabilities of the model for policy evaluations and aims at increase its ability to perform real time analysis of policy measures; the other is focused on the improvements of the methodological features of the model.

MeMo-it is currently used to accomplish Istat institutional commitments (the so called Audizioni) and at the same time, it is subject to continuous developments to incorporate to the energy sector and to improve its long-run properties.

After a short presentation of the main features of MeMo-It in section 2, section 3 discusses some evidence on its capabilities for policy evaluation. Section 4 illustrates the state of the art of the ongoing research activity to develop the model and section 5 concludes.

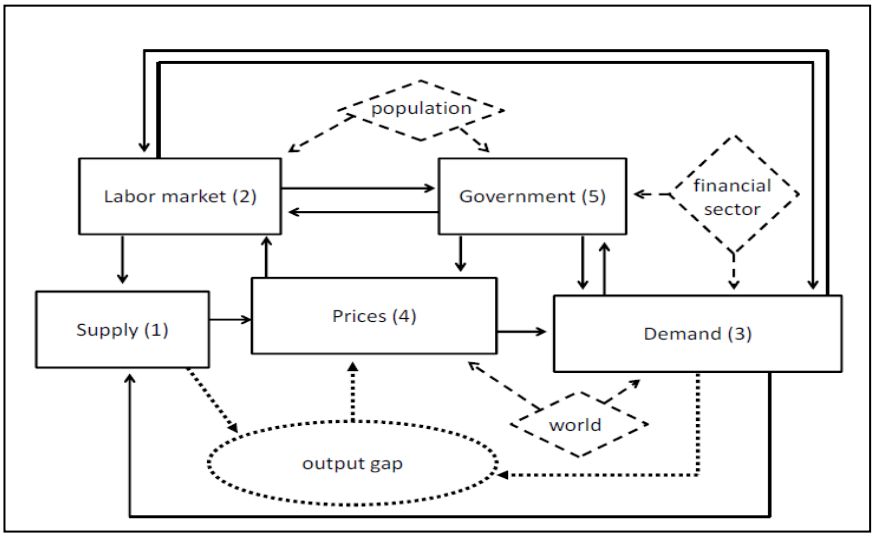
2. MeMo-It characteristics[1]

MeMo-It is an annual model for the Italian economy that requires two sets of external (exogenous) information over the forecasting period. First, consistent assumptions about the developments of the international scenario (such as trade growth, exchange rates, ECB interest rates, and the oil price). Second, an annual estimate of key GDP components obtained from short-term models based on monthly and quarterly data available at the time of forecast (SMeMo-It). Thus the

[1] For a detailed description of the model's characteristics see Bacchini et al. 2013

final annual projections are based on the full information set available at the time forecasts are released according to SMeMo-It for the first simulation year. For example, the forecast exercise in November is based on SMeMo-It that uses the quarterly information on National Accounts (NA) about the first two quarters of the year and thus provides a preliminary picture of the current annual values of the main NA aggregates . This information is introduced in MeMo-It by means of add factors and intercept corrections, interpreted as a fine-tuning of statistical information rather than a form of combined or judgmental forecasts (Stekler, 2007).

Figure 1 – *Outline of MeMo-It block relationships*



The theoretical modeling background of MeMo-It is a mixture of both the approach of the London School of Economics and the techniques of the Fair-updated Cowles Commission: in order to merge theory and data, MeMo-It uses cointegration methods on dynamic sub-systems to estimate theory-interpretable and identified steady state relationships, imposed in the form of equilibrium-correction models. However, in absence of weak exogeneity property (see Pesaran et al., 2001), single equations are preliminarily inspected by estimating parameters with two-stage least squares (2SLS). When the whole model is assembled, all MeMo-It parameters are simultaneously estimated with three-stage least squares (3SLS). Note that the use of conventional formulae for computing the asymptotic covariance of the 2SLS/3SLS estimators and the Wald-type test statistics are good approximations despite the fact that the variables of the model might be integrated

(Hsiao, 1997a and 1997b). The diagram in Figure 1 outlines the main relationships that characterize MeMo-It.

In particular, the five rectangles represent the model's basic blocks that are progressively numbered from 1 to 5. In addition, three rhombuses denote the main sources of external information for the age- and gender-structure of the population, the ECB policy interest rate (in the financial sector) and global variables, such as world demand, exchange rates, oil price and other import prices. Arrows identify the causal structure of the MeMo-It relationships across blocks.

MeMo-It is substantially based on the New-Keynesian approach where the supply side of the economy plays a central role. Accordingly, the underlying key assumption is that, in the short-run the economic activity is mainly driven by the demand side, while in the long run the economic system converges to potential output given by the supply side. Prices react to the output gap and, in this way, they accounts for the disequilibrium of supply and demand.

The dotted arrows in the lower portion of Figure 1 represent the interactions arising from such disequilibrium (between the supply and demand rectangles) and the output gap (in the oval circle) that, in turn, affects the prices rectangle. At the moment of the first press release in May 2012, MeMo-It was composed by 53 stochastic equations and 78 identities.

3. The evaluation of the fiscal policy using MeMo-It

Istat currently provides economic analysis and policy evaluations of government fiscal policy measures. Recent examples are the evaluations of 'Legge di stabilità' or 'Documento di programmazione economica e finanziaria'. The macroeconomic impact of policy reforms is simulated by means of multiplier analysis. The analysis can be defined as an impulse-response summary of the model's parameters in a reduced form summarizing the performance of the model as a whole. This analysis is also very informative about the main transmission mechanisms embodied in the model (see for example Coenen et al. 2012). If, as an example, we would like to evaluate the macroeconomic impact of an increase in Government spending (equal ex ante to 1 percent of baseline GDP in the initial year (i.e. 2013)[2], we see, from Figure 1, that there is a positive effect on GDP that influences the prices through the output gap. Then, there are also slight positive effects on unemployment and negative effects on the trade balance due to the larger domestic demand and to the negative competitiveness effect. Precisely GDP will expect to grow in the period 2013-2015 (0.7, 0.5 and 0.4 respectively) and unemployment to decrease (-0.2, -0.2 and -0.3 respectively).

[2] See Bacchini et al. 2013 for further analysis on multiplier

Table 1 below shows the results of a simulation exercise performed[3] in June 2013, to evaluate the impact of a reduction of the tax wedge paid by enterprises (table 1)[4].

Table 1 – *Effect of a reduction on the tax wedge paid by enterprises*

	2013	2014	2015
GDP	0.0	0.2	0.2
Consumption	0.1	0.4	0.5
Investment	0.3	0.6	0.9
Employees	0.7	1.2	1.6
Real disposable income	0.6	0.7	0.9

4. Future challenges for MeMo-It

New questions to solve, better fit to the data are the main advancements for a macroeconometric model. The extension of MeMo-it to the energy and environment domain is at the top of the research agenda for this year. This is followed by the reinforcement of the long-run properties of the model. In this section we briefly account for the developments in these areas[5].

The extension to energy

MeMo-It is currently being extended to model energy and environmental features in order to become a relevant tool to evaluate the impact of related policy measures on the Italian economy. The development strategy is organized in two main steps: first, MeMo-It will be extended to account for demand and supply of energy (2E-MeMo-It-S1); then it will include an environmental module starting from the carbon emissions (see for example Reynes et al. 2011) (2E-MeMo-It-S2).

In a first stage the model will include in the supply side a KLEM production function to account for the use of energy inputs in the production process. The energy and intermediate inputs used in the production process are demanded by the business sector of the economy. Therefore it is necessary to explicitly model both demand functions of E (energy) and M (intermediates inputs) and add them to the supply side KLEM block represented in figure 2. The demand for energy and

[3] See Istat 2013, Audizione Commissione Lavoro Pubblico e Privato

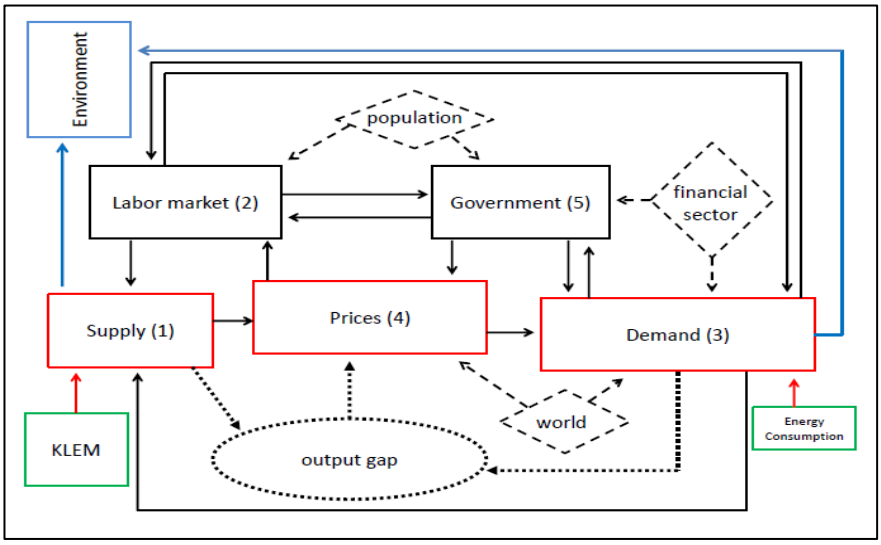
[4] Reduction is equal to 1 p.p. of GDP (ex-ante). Results are illustrated in terms of deviation from the standard scenario without the tax wedge reduction.

[5] The research agenda includes an intensive activity for the methodological improvements in the short-run models. A new proposal for the forecast of the Eurozone GDP has been presented at international conference on July 2013 and a new methodological proposal for the foresight of the Italian industrial index of production will be presented at the end of the year together with the evolution of SMeMo-It.

intermediates will be modelled through behavioral equations able to explain both short and long run dynamics. Energy prices will be modeled accordingly. The above structure allows to evaluate the effects of energy policies on the business sector through their impact on the demand of production inputs. At the same time, we include the household energy consumption in the demand block.

First, energy consumption will be modelled without distinguishing among the energy assets but referring to an energy aggregate including gas, oil, electricity and renewable sources. Then the analysis will be focused on the extension of 2E-MeMo-It to the environment. Figure 2 shows the block structure of the economy-energy-environment model and illustrates the main transmission channels between the supply and demand side of the economy and the environment (blue lines). The explicit inclusion of the environment will lead to the inclusion of a module for the evaluation of the emissions.

Figure 2 – *Developing 2E-MeMo-It*



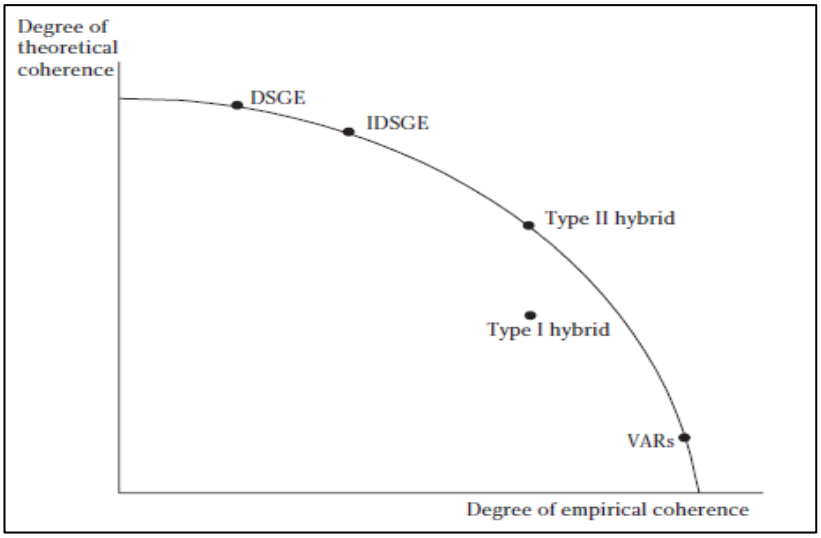
A preliminary version of the 2E-MeMo-It will be presented at the end of 2013.

The long-run features[6].

The classical Pagan (2003)'s representation, reported in Figure 3 below, introduces the frontier concept, also recalled in Bacchini et al (2013): models along this frontier all belong to the category of "best practice" models, even though they reflect different tastes and preferences that, in turn, are due to the motivations of the institution to which modellers belong. MeMo-It could be upgraded from type I to the "best practice" models or the type II hybrid models (with explicit long-run equilibrium) by paying more attention to its long-run properties and by including the modelling of stocks. In fact type II hybrid models meet other three requirements:

- their equilibrium path must descend from an a priori theoretical view that, in turn, requires some parameters restrictions (e.g. RBC type small model for the UK of Garratt et al, 2003);
- some decisions may be influenced by expectations about the future;
- they must provide a consistent treatment of stocks and flows.

Figure 3 – *Where MeMo-It is and where it could be*



MeMo-It attainment of an explicit long-run equilibrium path (steady-state growth) would not only allow a better understanding of its theoretical structure, but it would also provide terminal conditions for dynamic solutions of models

[6] A more comprehensive discussion on the limits of MeMo-It is illustrated in Bontempi 2013

consistent expectations. In order to achieve this aim, it has to improve the degree of theoretical coherence while maintaining the same degree of empirical evidence. Rather than imposing restrictions to the data ex-ante, the actual data (in this case, the estimated parameters) are used to interpret and to constrain the long-run relationships. The proposed steps can be easily implemented since the block-structure of the model can be formally represented by a number of long-run/steady-state relationships. The suggested steps are the following:

s1) Start from the latest version of the estimated model, produce a plausible long-run (40 or 50 years) scenario for the exogenous variables of the model by also investigating their persistence properties, then use this scenario in order to simulate the long-run steady-state solution.

s2) If the model converges, analyse the main features of the long range simulation; if not, investigate what trends - hidden in some intercept, in some missing long-run homogeneity restriction, or in some exogenous variables assumption - prevent the model from stabilizing.
These two preliminary steps accomplish the "clean-the-model" phase, where many iterations may be needed.

s3) When a long-range solution is reached, compare its main features with the main stylized facts of mainstream DSGE or RBC models

s4) Test for cross-equation parameters' restrictions needed to reach long-run micro-founded relationships.

s5) Finally, perform a number of key multipliers' exercises in order to assess - in the light of alternative theoretical explanations - where the model converges and through which pattern.

All the steps that have been described are currently under investigation.

5. Conclusion

This paper provides a snapshot of the main features of MeMo-It, the macroeconometric model developed by Istat in 2012 together with the current research activities for its implementation.
Further developments will be focused on modeling Investment behavior across assets types and on the integration of micro models on households and firms in MeMo-It.

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SUMMARY

In May 2012 Istat released for the first time its macroeconomic forecasts for 2012-2013 based on MeMo-It, the new Macroeconometric Model of the Italian economy. Following its presentation, the model has been used also for policy evaluation in the institutional documents presented by Istat.

This paper illustrates both the model results for policy evaluation and the research activities that are ongoing to extend the domain of analysis of the model to the energy sector. At the same time the features concerning the long-run properties and the relation between MeMo-It and the short-run models and the microeconometric models are also illustrated.

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A QUARTERLY MEASURE OF POTENTIAL OUTPUT IN THE NEW EUROPEAN FISCAL FRAMEWORK

Cecilia Frale, Serena Teobaldo, Marco Cacciotti, Alessandra Caretta

1. Introduction

The commonly agreed Production Function method developed by the European Commission and by the European Council Output Gap Working Group (OGWG) (D'Auria et al., 2010) to measure potential growth and output gap has gained large relevance, both at national and at the EU level.[1] As regards the European dimension, this methodology has become the reference in Stability and Growth Pact (SGP, as reformed by the so-called Six Pack regulation) to estimate structural deficits and the convergence to Medium Term Objective (MTO). [2] The MTOs are defined in structural terms, meaning that they represent cyclically-adjusted general government budget position, net of one-off and other temporary measures, mostly close to balance. According to the preventive arm of the SGP, countries must attain the MTO or be on an appropriate adjustment path towards it so to ensure sustainable public finances and compliance with the 3% of GDP deficit criterion in all but the most unusual adverse circumstances.

At the national level, the general principle of a balanced State budget over the cycle has been inserted in the Constitutional amendment of article 81 voted by the Italian Parliament in March 2012 and has been expressed in terms of the country specific MTO by the reinforced implementing law (L. no. 243/2012). Likewise, artt. 3 and 7 of Law 243/2012, beyond mentioning that public finances are in equilibrium when at MTO, have defined how to monitor fiscal performance, have

[1] Other approaches to estimate output gap and potential output are the ones developed by the OECD (2010) and IMF (De Masi, 1997) which somehow differ from the Commission methodology. The OECD methodology is based on a production function and quarterly figures, but underlying variables are estimated through simple univariate models. By contrast, IMF uses a set of flexible methodologies (from capacity utilization to real GDP analysis) to estimate potential output and output gaps.

[2] The reform process of the EU fiscal surveillance has been completed with two new regulations (the so-called Two Pack) entered into force in May 2013 and regarding new common provisions for monitoring and assessing draft budgetary plans. Overall, the output gap estimation is also needed when evaluating compliance with other fiscal rules, such as the debt rule and the expenditure rule.

introduced a correction mechanism in case of deviation from fiscal target and allowed to deviate from the MTO in exceptional events.

Despite the prominent role reached by the CAB as a tool of fiscal policy, the output gap methodology may be subject to some shortcomings from both theoretical and technical side (Larch and Turrini, 2009). There is also a need to implement timely procedures to assess potential output projections.

First of all, the use of annual data may result in an inappropriate use of available statistical information at higher frequency (quarterly or monthly) that may have some relevance in the derivation of potential growth and output gap in real time.

Secondly, as the out-of-sample extension of potential output components such as Capital, Labour and Total factor productivity, currently carried out to minimize the so-called 'end point bias' of the underlying statistical filter, is performed through simple univariate autoregressive methodologies for a number of variables (such as hours worked, investments and participation rates), it is not possible to take into account over the medium term the cross correlations and linkages among such underlying variables.

Finally, potential output estimates are, typically, carried out assuming the macroeconomic outlook of Commission Spring of Autumn forecasts (or, alternatively, national authorities projections) as exogenous. This choice may result in large revisions of underlying figures due to unavoidable judgmental forecast errors as well as to the huge variability of the out-of-sample projections. Such real time variability may be extremely harmful for policymakers when assessing the achievement of their own MTOs in compliance with European and, in some cases, national constitutional rules.

The relevance of all of these issues is well known and widely recognized especially in technical *fora*. Recently, we have observed an increasing interest on the methodologies based on mixed frequency models.[3] They are particularly useful to extract the information content from high frequency indicators that are used as proxy for target variables observed at lower frequency and eventually with a time lag. In addition, these models are particularly suited as a time series disaggregation tool, given their multivariate nature and given that the target variable is estimated at a higher frequency.

Relying on these considerations, we propose a new methodology based on the Production Function approach which uses a flexible State Space mixed frequency model (annual plus quarterly) to estimate each factor of production (Labour, Capital and TFP) for determining the level of potential output in real time. In

[3] This approach has been followed by Mariano and Murasawa (2003), Mittnik and Zadrozny (2004), Aruoba et al. (2009), Camacho and Perez Quiros (2009) and Frale et al. (2009). These models can also be used as a multivariate tool for time series disaggregation, as done in Frale et al. (2008), Harvey and Chung (2000), Moauro and Savio (2005).

addition, we also propose a multivariate model using a mixed frequency Kalman filter to extend out of sample in a multivariate framework the pattern of hours worked and participation rates. The advantage of using a mixed frequency model rests on the fact that available and timely information may efficiently be used to provide more reliable real time estimates of potential output with respect to those obtained through low frequency annual data. In addition, our proposed model is flexible enough as it could be estimated by imposing external constraints, such as the convergence on annual values such as Commission or national authorities forecasts. Finally, the Kalman filter specification allows to derive a common factor model that may be crucial for extrapolating labour supply variables over longer out-of-sample horizons.

The note is organised as follows. Section 2 presents the mixed frequency model. Section 3 describes the application to Italy showing estimation results and sensitivity analysis. The reliability of our results in real time is also assessed by comparing the variability of potential growth with respect to that obtained by the European Commission through different forecast vintages. Section 4 presents some concluding remarks.

2. The Mixed Frequency Model

Although the methodology currently agreed at the European level for the estimation of the potential output is comprehensive and well established, two possible directions for improvement deserve to be explored: first, the use of quarterly data,[4] and, second, the adoption of a multivariate factor model for estimating potential labour.

The use of disaggregated information allows to exploit timeliest and more updated information as yearly data are released with substantial delay and only once a given year is ended. For instance, yearly data on GDP, let's say for the year 2012, are published only in March 2013, whereas the first information about GDP for the first quarter of 2012 is already available in May 2012. This means that the information contained in partial quarterly figures could be efficiently used for updating the yearly projections, at least, 10 months in advance. This is particularly relevant in periods of high variability of business cycle such as recessions or quick

[4] In the past, the European Commission tried to propose output gap measures based on higher frequency data (i.e. quarterly figures) which, notably, are considered as more suited for estimating business cycles. The adoption of yearly averages of quarterly (or monthly) business survey figures to estimate Total Factor Productivity is an example which goes in this direction. Moreover, the shift to the Bayesian Kalman filter approach to estimate Total Factor Productivity can be considered as a successful attempt to minimize the end point over the medium run.

expansions, when the macroeconomic situation could quickly deteriorate or improve.

Moreover, it is well known in the literature that business cycle features are better captured by high frequency series, quarterly or monthly, which are more sensitive to changes in the business economic activity. By contrast, annual data fail to take into account such underlying variability. This is the reason why, to date the cycle either monthly series (such as the industrial production index) or quarterly data (e.g. GDP) are generally used instead of yearly figures.

As far as the second innovation is concerned, we reckon fundamental to use a multivariate model in order to properly forecast potential labour.

It is unambiguously established that participation rate, employment, active population and hours worked are correlated both on the basis of macroeconomic theory and on the basis of the statistical definition of such variables. In our view, using multivariate models guarantees internal consistency among different drivers of the labour market. By contrast, the use of single equations to estimate out of sample labour market dynamics does not guarantee the coherence of single forecasts and thus it can bring to misleading conclusions.

In this respect, the use of mixed frequency models allows to solve, simultaneously, both of the issues identified above that is: using the most recent and updated information to estimate potential output in real time (quarterly) and estimate labour supply relations using a multivariate framework. In addition, the mixed frequency approach and, in particular, the Kalman filter are enough flexible to allow the introduction of some constraints so as to be consistent with pre-determined yearly aggregates (such as for example EuroPOP 2010 demographic projection, or EC forecasts).

There are many possibilities for linking a set of indicators available at high frequency to the target variable observed at lower time interval. Among them the mixed frequency factor model proposed in Frale et al. (2008) features an institutional relevance, given that it has been developed by Eurostat for EuroMIND, the Monthly INDicator of the economic activity in the Euro Area. The methodology relies on the idea that a set of time series, available at different frequencies (e.g. quarterly and yearly), can be decomposed into one (or more) common non-stationary component and some idiosyncratic specific to each series. Both the common factor and the idiosyncratic follow autoregressive standard processes as shown by the following representation.

The treatment of the time disaggregation is made following Harvey (1989) and assuming that the disturbances have a Gaussian distribution, the unknown parameters are estimated by maximum likelihood, using the prediction error decomposition, performed by the Kalman filter.

Given the multivariate nature of the model and the mixed frequency constraint, the maximum likelihood estimation can be numerically complex. Therefore, the univariate filter and smoother for multivariate models proposed by Koopman and Durbin (2000) is used as it provides a very flexible and convenient device for handling high dimension and missing values (see Cacciotti, Frale and Teobaldo (2013) for the full model specification).

3. Application for Italy

The methodology presented in the paper has been applied to the Italian case in order to estimate the Output gap, the Potential GDP growth and the relative contributions of labour, capital and total factor productivity. Given the annual data provided by the EC, we use quarterly series by ISTAT or Eurostat so as to disaggregate (to the quarterly frequency) yearly values in sample and to produce quarterly forecast out of sample. This is particularly useful in order to analyse the robustness of the results respect to different projection scenarios.

In section 3.1 we present the results of the disaggregation and forecast of potential GDP and we compare them to the EC's results (aggregating our quarterly results to yearly values).

Each key input of potential GDP, namely potential labour (LP) , capital (K) and (TFP) is estimated in sample at the quarterly frequency and forecasts are produced on different time horizons. The potential GDP is then computed through the classical formula:

$$\bar{Y} = LP^{0.65} \times K^{0.35} \times SRK. \quad (1)$$

It has to be stressed that an important feature of the model is the fact that it allows not only to match quarterly estimates to be consistent with annual historical data but also to impose out of sample constraints. In fact, the model allows either to exactly replicate the EC forecast, or, alternatively, to constraint only historical data or to impose different constraints on different variables. For example, since the commonly agreed methodology by EC uses the AWG (Aging Working Group) projection to extrapolate the population of working age after the short term forecast horizon, that constraint can be easily included in the model.

In order to show that, we present in Section 3.2 some sensitivity analysis on the stability of the estimates with respect to their revision by applying different input forecasts and between successive EC forecast vintages.

The results allows to appreciate the strengths of the proposed methodology in terms of flexibility and robustness.

3.1. Estimation results

This section deals with the detailed presentation of the results of our estimates with respect to the EC forecast exercise of Spring 2012. The main methodological changes are for the Labour and Capital components whereas the TFP is computed with the standard EC model just using a quarterly version of the EC model.

We show how to use timely quarterly data and how to build the multivariate mixed frequency models for Labour and Capital so as to exploit efficiently the cross correlation among data underlying series. We estimate factor loadings along with their standard errors so as to obtain disaggregated quarterly series as resulting from the model. Finally we collect all results and compute the potential output and output gap with the standard official procedure by the EC.

The current methodology applied by the EC for the estimation of potential labour involves several steps. In each of them, a singular component of the total labour supply is estimated through univariate approaches which foresee a mechanical or a simplistic extrapolation of projections out of sample, unless for the NAIRU. The univariate estimates are then plugged into the following equation for the computation of potential Labour :

$$LP = POPW \times PARTS \times (1 - NAIRU) \times HOURST \qquad (2)$$

where POPW is the active population, PARTS is the smoothed participation rate, and HOURST is the trend of the average of hours worked.

We see a strong limitation in the use of single equations for each component that eventually can produce inconsistent results. Not least, the use of single univariate estimates just plugged into equation (2) open the issue of how to incorporate the statistical errors induced by the single univariate estimates in the final equation, which is completely ignored by the official EC procedure.

To improve the efficiency of the estimates we propose a multivariate dynamic factor model for all labour series, where the different components of the labour supply are jointly estimated and forecast maintaining the coherence among them.

As discussed before we bind yearly series to match EC series and we complement the information with more recent quarterly data

In particular in the application we used annual series of Employment, Unemployment rate, Active Population and Hours worked and quarterly series of Hours worked and Participation rate so as to disaggregate in sample yearly data and to include more recent information.[5]

[5] We tried to include other quarterly series but they come out to be not statistically significant.

The quarterly series of Participation rate and hours worked are those published by ISTAT and the participation rate is consistent with the definition used by the EC and calculated as follow:

$$PARTS = \frac{Empl+Unempl}{POPW} \quad (3)$$

where Empl is the total employment, Unempl is the total unemployment and POPW is the total population between 15 and 64 years.

The rationale beyond the use of a multivariate dynamic factor model is to extract a common factor representing the underlying pattern of the labour supply to which the different series are correlated accordingly to a specific factor loading. The results are shown in table 1 where the estimated factor loadings are presented together with their standard errors[6]. The common factor (Dμt) has been assumed to follow an AR(1) process which is quite standard in the literature.

Table 1 – *Labour market model: Estimated factor loadings with standard errors*

	Loading	SE	Student-T
Employment	0.09	0.02	3.70
Unemployment rate	2.31	0.44	5.21
DPopulation	0.13	0.02	7.06
Hours worked	-0.02	0.01	3.58
Common factor:	(1-0.72)$D\mu_t=\eta_t$	η_t ~N(0,1)	

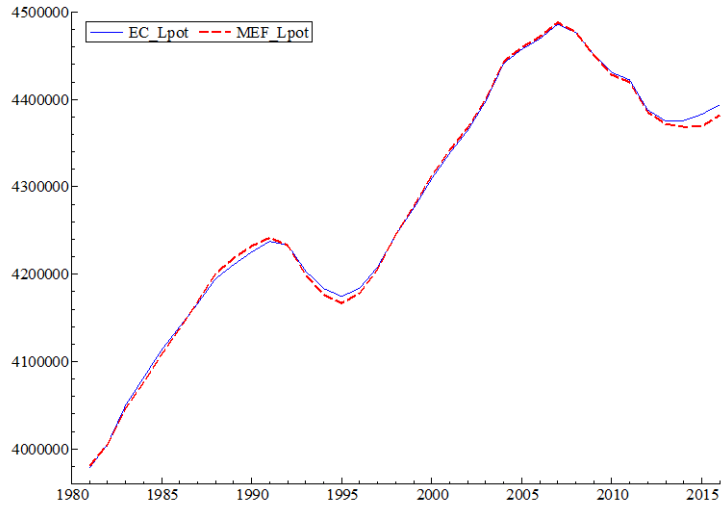
The model produces directly quarterly values of hours worked, while quarterly participation rate is calculated through equation (3). These results are in turn used for extrapolating the series out of sample over the next 6 years. Hence potential levels of both series (hours worked and participation rate) are extracted by applying HP filter. This is only a preliminary attempt and other filters such as Kalman or Band-pass can be applied to improve the quality of results. The NAIRU quarterly series is obtained by appropriately changing the parameters of the GAP program by the EC.[7] For this preliminary exercise NAIRU quarterly series has been obtained by converting the annual frequencies (data from Commission) by a quadratic-match average method, but it could be envisaged a quarterly version of the standard bivariate model for the NAIRU. To compare our results to those obtained by the EC, we aggregate the potential labour series by averaging the quarterly information

[6] The population has been included in the model in first difference so as to match the cyclical characteristic of the other series which generally are more dynamic.

[7] However, we are currently working on a different specification of the multivariate model for labour supply allowing to forecast also the series of wage growth. On the basis of this specifications, the quarterly NAIRU can be projected out of sample also for the period (t+3) - (t+5).

over a yearly frequency. Figure 1 shows Italian potential labour over the period 1981-2016 as obtained by the EC compared with our estimates.

Figure 1 – *Potential Labour*



As expected the quarterly method produces slightly more volatile results given the higher frequency of the data. Moreover, the inclusion of updated quarterly values for the year 2012 (up to first quarter of 2012) allows to better capture the slowdown due to the recent economic recession.

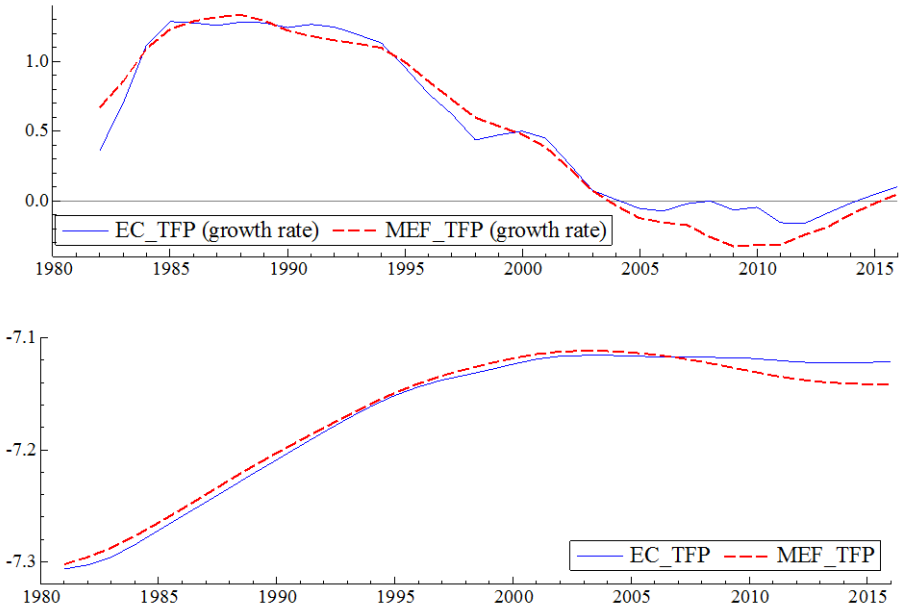
As far as the estimation of Capital is concerned, we rely on the EC model at the yearly level and we disaggregate the series at the quarterly frequency by using a multivariate model similar to that used for the Labour supply. In particular, we use quarterly data on Investments published by ISTAT to disaggregate the yearly series of Capital taking into account also yearly potential output as estimated in a first run of the procedure as to mimic the practice in the EC's approach. We would like to emphasize that Investments and Potential Output are not the focus of the model but only instruments to disaggregate yearly Capital at the quarterly frequency. For sake of brevity we omit the full results which are available under request.

Once labour supply and capital stock are estimated, Solow residual and the corresponding estimate of the Total factor Productivity at quarterly frequencies can be computed. In order to do that, we use a quarterly version of the program GAP

by the EC, where prior distributions at the quarterly frequency have been derived accordingly.

The Solow residual is calculated until the end of the short term forecast horizon by using quarterly forecast of GDP obtained by applying a multivariate model similar to that of Labour consistently with yearly EC's projections for the years 2012 and 2013. The quarterly capacity index used as a proxy for the unobserved level of capacity utilization is the usual CUBS of the EC's procedure calculated at quarterly frequency by transforming indicators coming from the Business and Tendency Surveys published by the EC from a monthly to a quarterly frequency[8]. Figure 2 shows our results compared with those of the EC.

Figure 2 – *Quarterly trend total factor productivity*



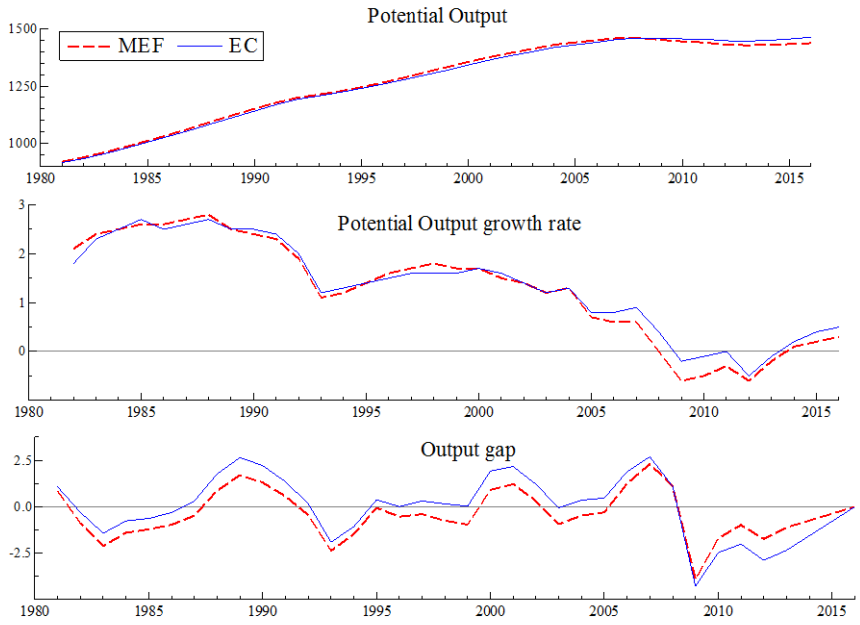
As before the quarterly frequency allows to better capture the cyclical swings and thus to produce a more dynamic TFP.

[8] See for more details the web site http://ec.europa.eu/economy_finance/db_indicators/surveys/index_en.htm.

Combining the results obtained in previous steps we compute the quarterly potential output by using the Cobb-Douglas production function (1). Results are shown in figure 3 in levels and growth rates along with the estimated value of the potential GDP by EC in Spring 2012.

Our results shows a lower potential output growth after the crisis and consequently a smaller output gap.

Figure 3 – *Potential output and output gap: MEF vs EC Spring 2012 estimates*



3.2. Analysis of revisions and sensitivity to forecasts

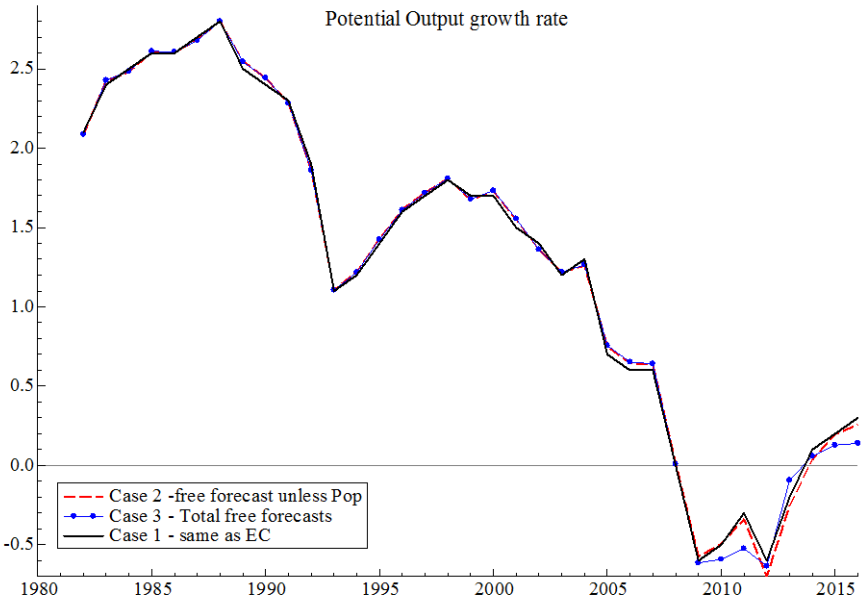
In this section, we present an insight on the stability of our estimates with respect to the revision of the variables and consistently with the updating of available data. Moreover, the impact of changes in short term forecasts of input series on long term growth prospects is also assessed. Figure 4 presents the estimates of potential output resulting by applying different input forecasts.

In particular, whereas the constraint to historical data is always maintained, we assume different ways to link the model to yearly EC forecast data for the period 2012-2016.

More in details:

- Case 1: The model is constrained to the 2012 Spring forecasts over the period 2012-2013 unless for Active Population that is linked to EUROPOP 2010 projection up to 2018. In such scenario, the only difference with respect to the commonly agreed Production Function methodology is due to the use of quarterly data in the multivariate model for Labour Supply and in both Capital and TFP components.
- Case 2: The model keeps the link to historical figures but it is set to freely produce forecasts for all the underlying series with the only exception of Active Population which is still constrained to EUROPOP projections up to 2018.
- Case 3: also the constraint on the active population is relaxed and the model produces the forecast for all variables from 2012 up to 2016.

Figure 4 – *Sensitivity Analysis: Impact of forecasts*



Note: Case 1: Historical data up to 2011 + Spring forecast 2012-2013+ Active Population a up to 2018, the difference is due only to the new methodology). Case 2: Historical data up to 2011 + forecasts by the model, unless Active Population constraint up to 2018. Case 3: Historical data up to 2011 + forecasts by the model for all variables including Active Population

The inspection of figure 4 shows the relevance of Active population in defining the long term growth.

In fact estimates by Case 1 and Case 2 are quite similar and the only relevant change occurs once the constraint to the Active population is relaxed.

Moreover, the differences in sample with EC estimates are due to the use of quarterly values which allows to capture cyclical swings and thus it produces a more dynamic output growth.

A second experiment of sensitivity analysis is made in terms of revision of estimates between successive vintages of EC Forecasts.

Figure 5 – *Sensitivity Analysis: Revisions of estimates*

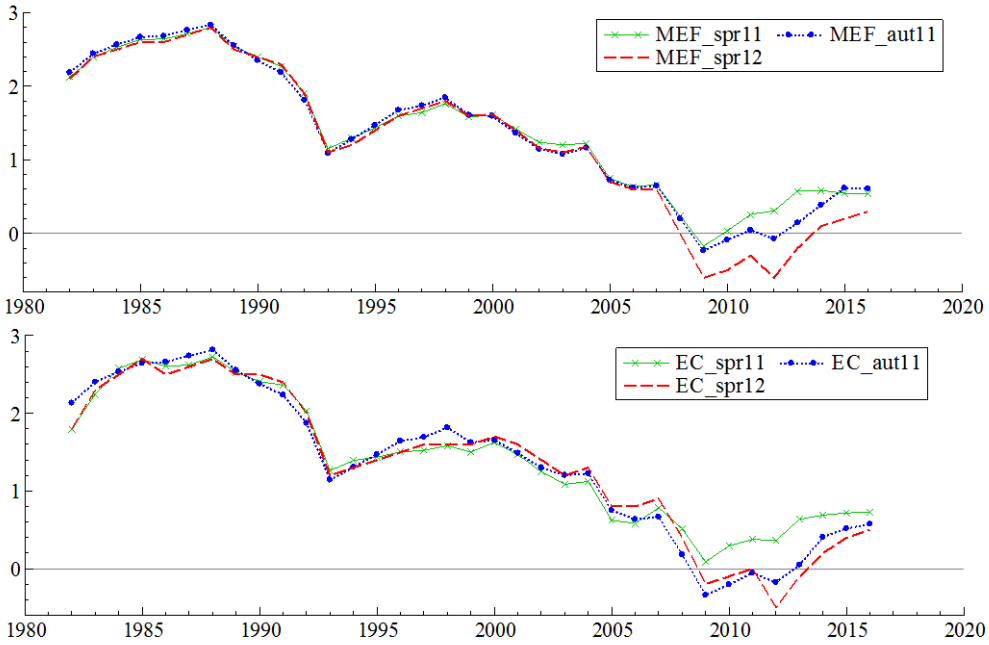
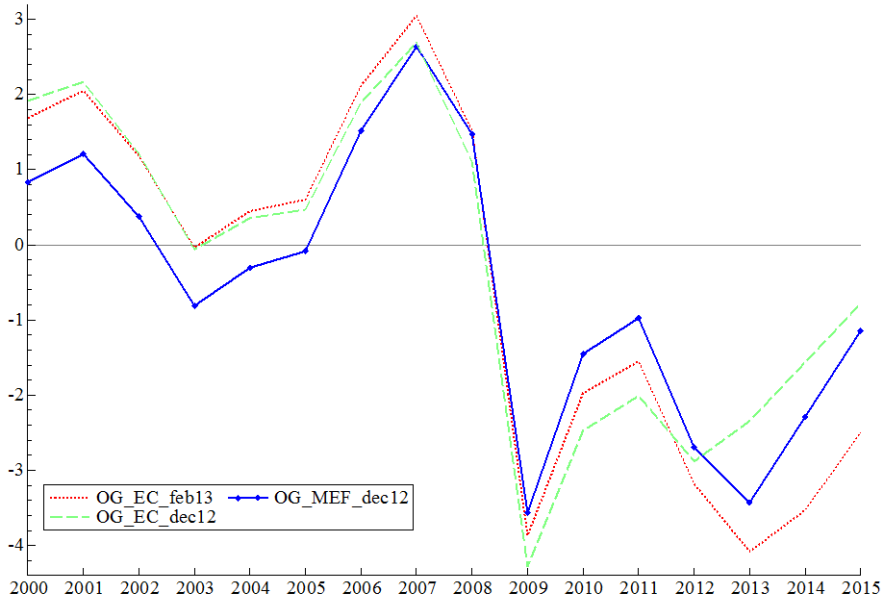


Figure 5 presents the estimates of Potential Output (in growth rates) in the last three consecutive vintages of forecast: Spring 2011, Autumn 2011 and Spring 2012. The same vintages specification is presented for our method. It is clearly visible that the proposed new methodology appears to be less influenced by revision of data especially on an historical basis. Whereas the EC methodology produces substantial revisions which extends backward until 2000, our model shows stable results for statistical historical figures. In addition, as our model is bounded to the results of EC forecasts, the revisions in the outer part of the sample mainly represent the forecast error underlying the projection exercise in each vintage. Moreover it has to be highlighted that another source of revision with

respect to 2012 EC Spring forecast is represented by the introduction in our estimates of the latest figures on the first quarter of 2012. This produces a drop in potential growth for 2012 which is not reflected in the latest EC forecast.

Finally, we propose an ex-post evaluation to provide an overview of the benefit of using quarterly information which is available in advance respect to yearly figures. In fact, although the EC updates the macroeconomic forecast twice per year this is not enough to incorporate new information released during the year. Figure 6 compares the estimate of the Output gap made in December 2012 with both the official EC procedure and the MEF quarterly method with the same realized in February 2013 that exploits all the information about 2012 published in the National Accounts.

Figure 6 – *Comparison of EC and MEF results with ex-post estimated values of Output Gap*



It is quite visible how the quarterly procedure outperforms the standard approach in producing values closer to those made with full information and this is due probably to the ability of the quarterly method to exploit partial information on the year 2012. We are aware that this is only a single example but given the complexity of the exercise we leave for a future analysis a proper assessment of the real time performance of our results.

4. Conclusion

This methodology, still in progress, presents a new way of estimating on a quarterly basis the single components of potential output (Labour, Capital and TFP).

For Capital and Labour a multivariate State Space model in mixed frequency has been adopted. Though computationally more demanding, this specification, through the use of quarterly and annual observations, is able to reproduce and timely update - more often than under the current OGWG framework - both the historical, the real time and the projected series of the European Commission forecasts.

As it is mostly based on higher frequency observations, our methodology allows also to capture business cycle features and the variability of economic fluctuations in a more efficient fashion than what would result by using annual data.

Besides all this, one of the most important innovations of our methodology is represented by the use of a multivariate Kalman Filter for projecting out of sample all the components of labour supply (including wage growth) and Capital Stock. The choice of a multivariate framework for projecting jointly out of sample (over the years (t+3)-(t+5)) hours worked, participation rates, unemployment rates (and eventually wage growth) allows to exploit the underlying macroeconomic relations existing, respectively, among the components of Labour supply and Capital stock and to provide a sound alternative to the simple univariate procedures in use so far.

According to our estimates, results for Italy appear as more robust and stable than those obtained with the current methodology at least as far as past historical revisions of underlying figures of different forecast vintages are concerned. As shown by Cacciotti and Pradelli (2009), revisions of past values of unobserved variables are potentially large and may surely affect the results in real time. In such a context, the relative stability in potential output growth estimates for past observations is a desirable feature especially for its use in the current fiscal framework for determining the medium term average growth of the expenditure benchmarks and assess the attainment of the Medium Term Objective (MTO) as prescribed by the new constitutional amendment introduced in the Italian legislation.

In our opinion, this model offers some appealing features. In particular, it allows to assess on a quarterly basis the reliability of real time of output gaps and potential growth based on underlying annual macroeconomic projections. Such a property appears as being essential in a fiscal framework, such as the one introduced in Italy in 2012, where the compliance to the MTO is crucial to assess whether particular correction mechanisms should be triggered or not on the basis of real time variables and a specific macroeconomic medium term outlook. In

addition, a quarterly framework based on mixed frequency variables allows to assess the revision in output gaps and structural deficits due to the updating of macroeconomic variables, providing the policy makers with an efficient tool to measure possible slippages from the MTO well in advance and giving to them the possibility to reshape fiscal policies in case of need.

Acknowledgement

This paper represents the authors personal opinions and does not reflect the view of the Italian Department of Treasury. We are grateful to an anonymous referee for his comments. We also thank people working at the Treasury-Dir I-Unit II for their support in the elaboration of the results. Routines on the mixed frequency factor model are coded in Ox 3.3 by Doornik (2001) and are based on the programs realized by Tommaso Proietti for the Eurostat project on EuroMIND: the Monthly Indicator of Economic Activity in the Euro Area.

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SUMMARY

This paper presents a new mixed frequency methodology to estimate output gaps and potential output on a quarterly basis. The methodology strongly relies on the production function method commonly agreed at the European level (D'Auria et. al., 2010) but it significantly improves it allowing to assess the impact of real time forecast for GDP and other underlying variables. This feature of the model is particularly welcome in the current Italian budgetary framework which has foreseen the introduction of the principle of a budget balance in structural terms in the Constitution. By allowing to measure output gap with a quarterly span on the basis of recent developments indicators, the methodology provides interesting hints on the cyclical position of the economy in real time to be used for deriving cyclically-adjusted fiscal aggregates.

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SOCIETÀ E RIVISTA ADERENTI AL SISTEMA ISDS
ISSN ASSEGNATO: 0035-6832

Direttore Responsabile: Dott. CLAUDIO CECCARELLI

Iscrizione della Rivista al Tribunale di Roma del 5 dicembre 1950 N. 1864

Associazione all'Unione Stampa Periodica Italiana

TRIMESTRALE

La copertina è stata ideata e realizzata da Pardini, Apostoli, Maggi p.a.m.@tin.it – *Roma*

Stampato da CLEUP sc
"Coop. Libraria Editrice Università di Padova"
Via G. Belzoni, 118/3 – Padova (Tel. 049/650261)
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