ASSESSING THE IMPLICATIONS OF LONG TERM CARE POLICIES IN ITALY: A MICROSIMULATION APPROACH

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ABSTRACT:

This paper projects the characteristics of the long-term disabled in Italy and the evolution of total public expenditure for long-term care over the next four decades. The future dynamics of ltc expenditure in Italy is of particular relevance for two reasons: the limited and insufficient level of public expenditure currently targeted to the disabled, and the perspective, in the next few decades, of one of the most rapid ageing processes in the world.

The analysis is carried out using a dynamic microsimulation model that estimates the evolution of the social and economic structure of the Italian population. A disability module is built under two different hypotheses about the process generating the probability of being disabled: a pure ageing scenario where the probability of becoming disabled is fixed for each age, and an alternative scenario where the risk of disability is endogenous to changes in life expectancy and in other characteristics of the population. After the projection of the future structure of the pool of the disabled population, the paper studies the dynamics of public ltc expenditure.

1. INTRODUCTION

The Italian population is currently experiencing one of the most rapid ageing processes in the world. The percentage of people aged over 60 over the whole population, at 19.5% in 2005, is projected to rise to 28.0% in 2030 and to 34.4% in 2050 (Istat 2003). This process is very likely to have profound implications on the future sustainability and composition of public expenditures. One of the most relevant consequences of population ageing will be the increase in the number of the disabled elderly, and therefore in long term care expenditures.

The Italian social protection system devotes an insufficient amount of resources to the financing of ltc services (Gori 2006). There is no national ltc fund of the type introduced by many countries in the last few years, for example in Germany and in Japan (Antz et al. 2007, Fukui and Iwamoto 2006). The frail elderly, who represent the bulk of the disabled population, are assisted mainly by informal care provided by family members or private providers, most of them migrant workers coming from Eastern Europe, often operating in the black market. The institutionalisation rate is low when compared to international standards, and falling in recent years. At home care services, provided directly by local authorities or by non-profit organisations, have a significant diffusion only in the Northern part of Italy.

The ageing of the baby boom generation is not the only factor that may produce an ltc crisis in the future of Italy and other advanced countries. Important demographic changes will probably translate into a reduction in the availability of informal care for the future disabled. The strong decline in fertility rates that started in the 1980s means that in the following decades the elderly will be able to rely on a falling number of children. Rising divorce rates are producing an increase in the number of elderly living alone. The increasing labour force participation rates of women have positive impacts on the sustainability of public finances, but will reduce the availability of female adults willing to provide care for their parents, both elderly and children.

The seriousness of the problem of ltc provision for public finances will strongly depend also on the future evolution of disability rates among the elderly. In the last few years a falling trend for disability rates among the elderly has been observed in Italy (Istat 2007a), as well as in other developed countries (Manton et. al., 2006). If this trend persists, it will reduce future ltc costs, ceteris paribus. On the other hand, not only it is very risky to extrapolate this trend to the future, but the costs of formal care for each assisted person will probably rise, due to the increase in life expectancy and the risk of spending a long final period confined in bed.

In the context of this background, the paper has two aims.

The first is to offer a projection for the next four decades of the number of disabled persons in Italy and a description of their changing demographic characteristics. There are by now

numerous studies that make projections of ltc expenditures in the distant future, up to 2050 or even 2100, for many advanced economies (Oecd 2006, Comas-Herrera et al. 2007, Fukui and Iwamoto 2006). Most of these studies, however, are mainly conducted on a macro level, computing cell means of the number of disabled people and ltc expenditures. Usually, they project to the future the current disability rates for various age and gender groups. Many of them then provide some sensitivity analysis of the base results, changing the level and evolution of one or more of the factors that can contribute to the growth of ltc expenditure (disability rates for age classes, unit costs of ltc services, income elasticity of demand for ltc services, etc.).

We present a set of projections computed on the basis of a dynamic population model that simulates the future evolution of the life-cycle events of a sample of microdata of individuals representative of the Italian population. The main advantage of this model is the possibility to observe the future changes in the socio-demographic characteristics of the pool of disabled people, a topic so far not considered by the projection studies applied to the Italian case (Rgs 2006, Comas-Herrera et al. 2007). It is therefore possible to check for changes in the composition of their families, or in their living standards. One strong element of worry, for example, is the possibility of a marked decline in the average size of the households where the disabled live, with the consequence of a reduced availability of informal family support. With a complete microdata model, we are able to track the life course of each disabled person, and to check whether, for example, there will be an increase in the number of disabled elderly living alone, thereby necessitating more formal care and ltc expenditure by the state. Another advantage of the microsimulation model is the possibility to endogenize the probability of being disabled and make it dependent on a set of personal characteristics, including the length of expected residual life.

The second objective of the paper is to estimate, building on the projections of the number of the disabled belonging to various gravity levels, the future cost of public expenditure on ltc in Italy. We perform two simulations. The base simulation simply projects to the future the expenditure level provided by the current institutional setting, introducing an ltc fund that would ideally replace all forms of cash or in kind public transfers currently targeted towards the disabled, without changing the total current public ltc expenditure in the starting year of the simulation. The alternative simulation assumes a significant increase in the amount devoted to ltc expenditure, reflecting the growing awareness in public opinion that current ltc provision is strongly inadequate to meet the needs of the disabled and their relatives.

Section 2 describes the main characteristics of the dynamic microsimulation model used to perform the analysis; section 3 provides a picture of some of the most relevant changes that

will affect the group of the disabled in the future; in section 4 we study the dynamics of total public ltc expenditure and how population ageing will increase its burden on future workers and pensioners.

2. THE DYNAMIC MICROSIMULATION MODEL

All simulations presented in this paper are carried out using CAPP_DYN, a dynamic microsimulation model of the Italian population developed at the Centro di Analisi delle Politiche Pubbliche (Capp), a joint research centre for the analysis of public policies of the Universities of Modena and Bologna (Morciano, 2007). The model simulates the main characteristics of the Italian population from 2005 to 2050. Its structure is presented in Fig. 1: there is an initial base population, a second block which estimates past earnings of the currently active population, a simulation cycle which determines the future evolution of the population, and a final output where all annual cross–sectional data are aggregated into a single panel. There are so far very few dynamic population models applied to the Italian society; the two other models of this kind have been built by Vagliasindi et al. (2004) and Ando and Nicoletti Altimari (2004), but none of them has been applied to the study of disability and long term care.
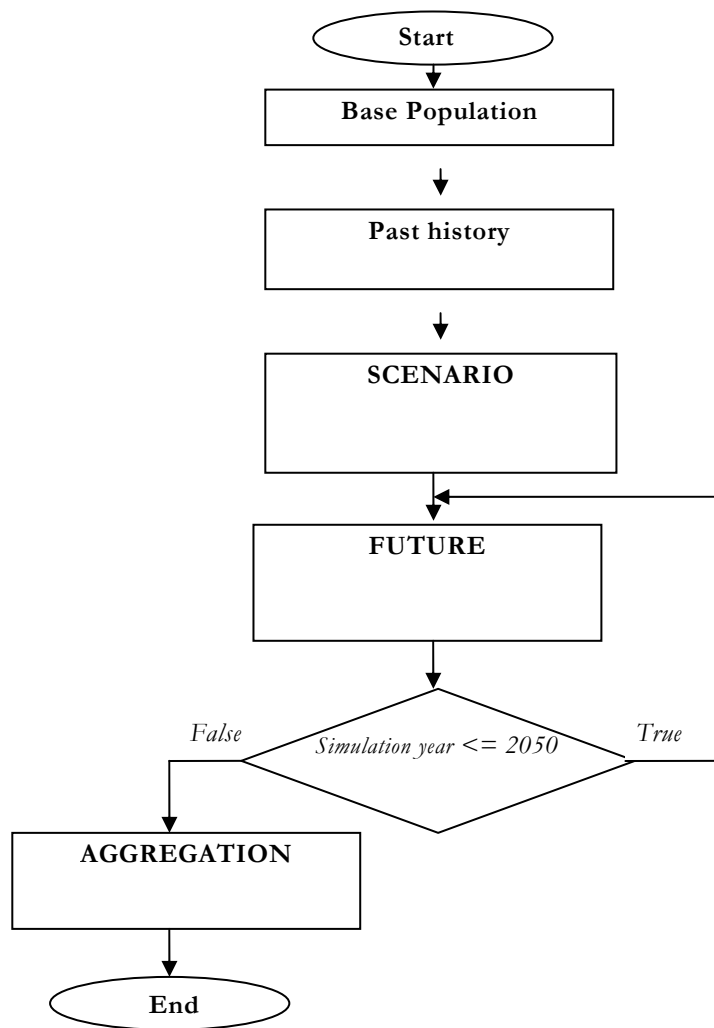
Figure 1 The structure of CAPP_DYN

The initial population is taken from the 2002 wave of the Bank of Italy Survey of Households Income and Wealth (SHIW_02), a dataset with 8001 households and 21,400 individuals, which has been resampled and inflated. Any simulation extracts randomly a sample of 107,000 households and 270,000 individuals.

The unit of simulation is the individual, but we keep information on family structure and on its changes through time. All individuals in the sample are subject to a large number of demographic and economic events such as birth, education, marriage, work, retirement, death etc.. Economic and demographic transitions are implemented with the aid of Monte Carlo processes. A set of matrices and econometric models are used to produce transition probabilities, so as to produce for each individual a lifetime pattern of education, work career, personal and family income, etc.

CAPP_DYN has a recursive structure consisting in a set of modules executed in a predetermined order. The structure of the modules is depicted in Fig. 2. The simulation starts with a set of demographic modules (mortality, fertility, net migration, household formation, divorce). Then a module for educational choices follows. The next module deals with the labour market participation decisions and the estimation of earnings. It is possible, during the individual's lifetime, to change occupational status (full time, part-time, out of the labour market, unemployed). Finally each individual, on the basis of the current pension law, of his/her accrued seniority and of the legal retirement age, moves to retirement according to the current law.

Individual income derives from working or from the social security system. For employed people, an earnings equation is used to estimate lifetime labour income. For retired individuals we compute occupational, survival and social-flat rate benefits taking into account, as much as possible, the rather complex details of the Italian pension system.

A series of exogenous variables is used to link the evolution of the aggregate labour income to the macroeconomic path of gdp defined in the scenario. The final result of the model is a panel which aggregates all annual cross sections from 2005 to 2050. Individuals and households of the simulated population are heterogeneous over a relatively large set of demographic and economic characteristics, enabling the model to treat a series of important issues (distributive in particular) that cannot be dealt with cell based or representative agent models.
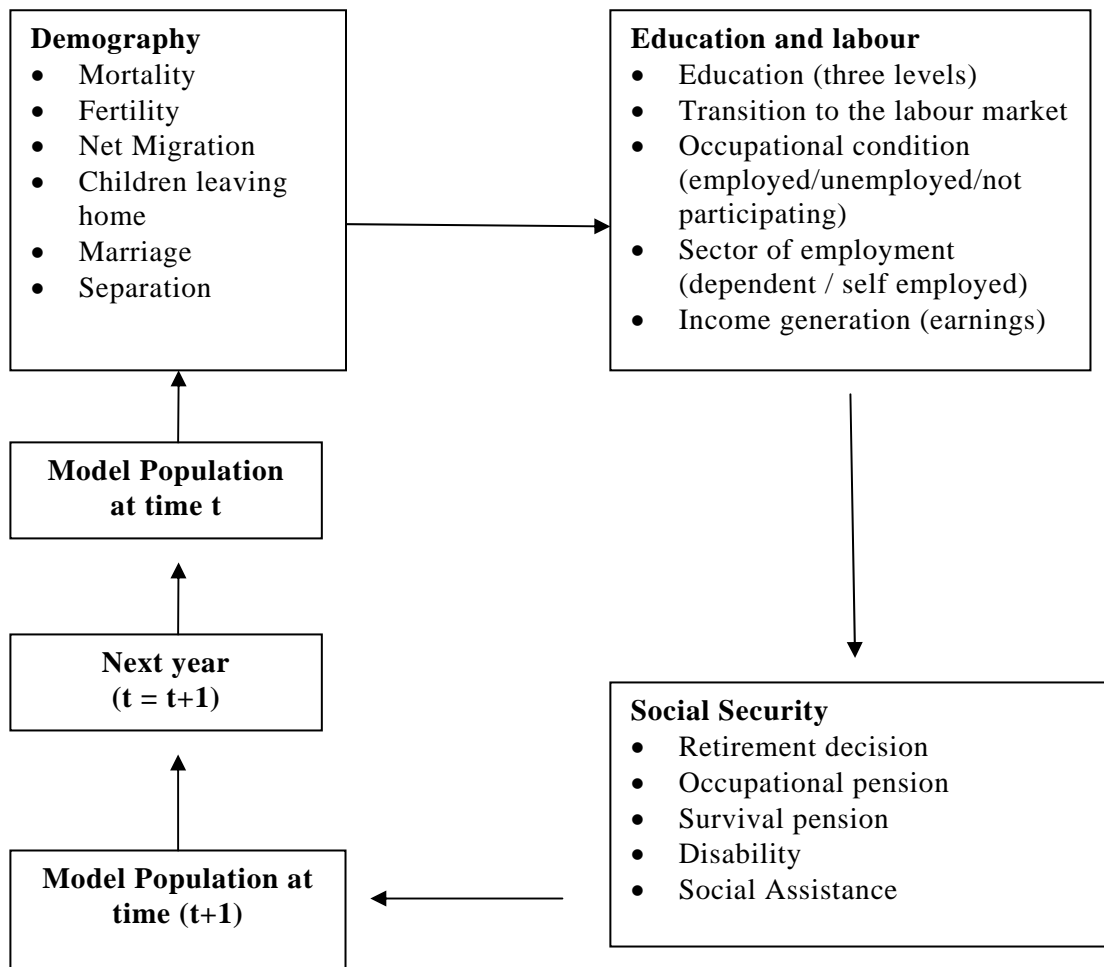
Figure 2 The modules of CAPP_DYN

The primary database for CAPP_DYN is SHIW_02. The use of a survey as the database of the model has advantages and drawbacks. With respect to dynamic models that are based on a random extraction from administrative data, our dataset has a richer set of information on family composition, educational level, economic status of each observation. On the other hand, the SHIW_02 is based on a stratified sample design. This means that each household has an attached weight given by the inverse of its probability of inclusion in the sample. So we need to find a procedure which enables us to treat each observation as though it were a single household. We have used a resampling procedure to generate a very large proportional sample of households. In the process, we have made a series of statistical adjustments using Census data, in order to insure that the distribution of demographic and

economic characteristics closely matches the corresponding distribution of the Italian population.

Many other sources of information have been used in the construction of the model. Educational choices and earnings equations are simulated on the 2006 wave of PLUS, a survey data of the Ministry of Welfare devoted to the analysis of the Italian labour market (Mandrone and Radicchia, 2006). Transitions in the labour market are derived from a multinomial logit estimation on a pooled sample of the 1993-2003 waves from the Quarterly Labour Force Survey carried out by the Italian statistical office (Istat). Survival probabilities, fertility rates and net migration hypotheses, which are used to define the demographic evolution of the population, are taken from the Istat official forecasts of the Italian population for the period 2005-2050 (Istat 2001).

The most important exogenous variables used in the simulations are real per capita income growth and real per capita earnings growth. Data are taken from the 2005 model of the Ragioneria Generale dello Stato model (Rgs 2005), which is currently used by the Italian Government to routinely estimate the evolution of pension, health and long term care expenditure with respect to Gdp in the medium-long term. Labour income age-related profiles are endogenous and therefore not necessarily aligned to Rgs assumption. A special module has been implemented to calibrate the endogenous results of the model in order to make them consistent with the base economic hypotheses. All monetary variables are in constant 2002 Euro prices.

2.1 The disability module

The simulation of the disability condition is based on external information extracted from the Istat Survey on health conditions and use of health services, carried out every five years on a sample of more than 100,000 individuals of all ages. The most recent survey, used for this paper, has taken place in 2005. The survey collects, for each interviewed person, information about the ability to perform, without the need of being helped by others, some basic activities of daily living like bathing, eating, dressing. There are 19 questions of this type that can be grouped into four areas of disability: being unable to go out of home, having serious difficulties in movements, in everyday activities, in communicating abilities. A person is defined, for example, as disable in performing everyday activities if he has reported a serious difficulty in at least one of the questions that fall under this area. For each of the four areas, we therefore end up with a dummy variable, taking the value of one if the individual is disabled in performing that set of activities. On the basis of this classification, we have distinguished three levels of disability, depending on how many of these dummy variables take the value of one:

low disability level if the person is disable in only one of the four groups of variables, middle level if two dummies are one, severe disability in case of three or four areas of disability. Table 1 provides some basic descriptive statistics about the survey. Average age is increasing with the seriousness of the disability condition, as well as the share of women.

Table 1 Descriptive statistics of the Survey on health conditions and use of health services

	Whole sample	Disabled, level 1	Disabled, level 2	Disabled, level 3
Age	41.8	68.1	75.5	78.8
Woman	51.4%	63.0%	68.4%	70.0%
Compulsory ed.	59.7%	88.6%	89.5%	93.5%
High school	26.4%	8.8%	7.7%	4.4%
Degree	8.2%	2.6%	2.7%	2.1%
North	45.2%	41.5%	38.8%	39.2%
Centre	19.2%	18.8%	20.1%	21.8%
South	35.6%	39.6%	41.1%	38.9%
Widow	7.9%	36.9%	45.6%	53.7%
Years of expected life	40.9	19.2	13.5	11.3
Number of obs	128040	2797	1869	1324

In order to attribute to each individual of the simulation database a disability status, we have tried two alternatives:

a) *Pure ageing*: in the simplest case, on the Istat Health survey we have computed the shares of disabled people within classes defined by gender and age (Costello and Przywara, 2007). These are the probabilities of being disabled, depending only on gender and age class, that are used to select, with Monte Carlo techniques, which agents of the database are attributed a disability status. Three levels of disability are distinguished. This hypothesis assumes that all future gains in life expectancy will be spent in bad health, and therefore may be defined as a very pessimistic one.

b) *Endogenous disability*: in general, the probability of being disabled is not constant within groups of population that share the same age and gender, but depends on a vector of possible socio-demographic determinants. When these variables change, the probability of suffering from a severe disability should change accordingly. To take account of this endogeneity, we have performed on the 2005 Health survey an ordered probit estimation where the dependent variable can assume four different levels: no disability (95.5% of total sample), low disability (2.13%), middle disability (1.4%), severe disability (0.96%). The explanatory variables must be restricted to the socio-demographic characteristics that are common to the Health survey and to the database of the microsimulation model: age, gender, education level, geographic area, widowood. We have added to the set of explanatory variables also the number of expected

years of residual life for each person, taking these data (depending on age and gender) from the latest Istat estimates. The introduction of the expected years of residual life is important because if life expectancy rises, the probability of becoming disabled should not remain constant for each given age. Indeed, it is by now widely recognised that it increases rapidly in the last period of life. In the presence of a process of population ageing, the omission of expected residual life in the regression would translate, in the simulation stage, into an overestimation of the probability of becoming disabled and therefore also of the future costs for ltc (Norton and Stearns, 2004). This second hypotesis may be considered as a variant of the various theories maintaining that the number of years spent in bad health should decrease when life expectancy increases (Fries 1980, Manton et al. 2006). It is however more elegant and consistent with the data used to build the model than the application of a simple ad hoc rule to reduce the probability of being disabled in line with the increase in life expectancy. In order to check the results of its application, we also apply as a comparison scenario, a very simple rule where the probability of becoming disabled in changed each year in the same proportion as the increase in life expectancy. This rule is called "constant health scenario" by Costello and Przywara (2007).

Tab. 2 presents the results of the ordered probit estimate performed on the 2005 Health survey. The dependent variable may assume four different values: 1 no disability, 2 low level of disability, 3 intermediate level, 4 serious level. The independent variables relating to age are introduced with a spline function, and their coefficients show a marked increase in the probability of becoming disabled for those aged more than 70. The disability status is strongly dependent on the education level (the omitted variable is the graduate level), and also on being resident in the southern part of Italy (the omitted geographic area). The length of expected residual life has a significant effect: if in the future expected life will increase, this will translate into a reduction in the probability of becoming disabled for each given year of age.

Table 2 Ordered probit estimates of the probability of being disabled

	Coef.	z
<=30	-.0550573	-6.23
31-50	-.0400283	-4.62
51-60	-.0254506	-2.83
61-70	-.0012168	-0.15
71-80	.0463014	6.78
>=81	.0604139	12.23
Female	.3137215	8.14

Compulsory education	.4726271	12.76
High school	.1472367	3.48
Northern Italy	-.2386426	-14.43
Central Italy	-.1517866	-7.41
Widow	.0996938	4.70
Years of expected residual life	-.0540823	-6.14

Number of obs = 128040; LR chi^2(13) = 15988.04; Prob > chi^2 = 0.0000;

Log likelihood = -21515.021; Pseudo R^2 = 0.2709.

On the basis of the results of this regression, we select in each year, with the aid of a Monte Carlo process, which individuals are disabled. If a person is attributed the disability status in year t, he cannot go back to the no-disability status, but, if the level of disability is lower than the most serious one, he can be attributed a worse status in any subsequent year, until death. Among those who belong to the group of the most severely disabled, and who have also been disabled for more than three years, we randomly select (in each of the two alternative imputation strategies described above) a subsample to be hosted in nursing homes, whose number is consistent with official estimation of the number of people recovered in Italy (Istat, 2007b).

3. PROJECTING THE NUMBER AND CHARACTERISTICS OF THE DISABLED

The next stage is the imputation, in the microdata base of the dynamic simulation model, of the probabilities of being disabled computed according to the two different strategies shown above. According to the first alternative (pure ageing), we simply use the Monte Carlo method to select those who are attributed the status of being disabled, with the percentage of people belonging to each disability level exogenously fixed so as to reproduce in the simulated data a distribution of the disability rates, by classes defined in terms of age and gender, which is similar to those observed in the Istat survey on health conditions. In this first scheme, therefore, disability rates for various age groups are fixed, and the total disability rate increases simply because the population is growing older.

The second alternative strategy (endogenous disability) makes the total shares of the disabled in the simulated population fully endogenous, because they depend not only on the ageing of the baby boom generation, but also on the reduction in mortality rates and on other changes in the socio-demographic characteristics of the population that are correlated with the probability of being disabled, like for example the increase in education levels. If expected life increases,

the probability of becoming disabled falls for any given age, a consequence that is not accounted for in the pure ageing scenario. In both cases, we simulate the disability condition for all age classes, not only for the elderly.

Table 3 shows, separately for the two alternative simulation schemes, the projected future composition of the total Italian population in four classes: those who are not disabled, and those who belong to the three different levels of disability described above.

Table 3 Number and percentage of persons with disabilities

1) pure ageing scenario

year	% not disabled	% disabled low level	% disabled intermediate level	% disabled worst level	Of which:% disabled worst level in nursing homes	% disabled out of total population	% disabled out of population aged 25-64	Average age of the disabled
2005	95.4%	2.1%	1.3%	1.2%	0.3%	4.6%	8.2%	73.7
2010	94.9%	2.3%	1.5%	1.3%	0.3%	5.1%	9.1%	75.9
2020	94.0%	2.6%	1.8%	1.6%	0.3%	6.0%	11.2%	77.2
2030	92.7%	3.1%	2.1%	2.0%	0.4%	7.3%	14.3%	78.7
2040	91.5%	3.5%	2.5%	2.5%	0.5%	8.5%	18.1%	80.1
2050	90.5%	3.8%	2.9%	2.9%	0.5%	9.5%	20.7%	81.6

2) endogenous disability scenario

year	% not disabled	% disabled low level	% disabled intermediate level	% disabled worst level	Of which: % disabled worst level in nursing homes	% disabled out of total population	% disabled out of population aged 25-64	Average age of the disabled
2005	95.5%	2.1%	1.3%	1.1%	0.3%	4.5%	8.2%	73.9
2010	95.2%	2.1%	1.5%	1.3%	0.3%	4.8%	8.6%	76.5
2020	94.7%	2.2%	1.5%	1.6%	0.3%	5.3%	9.7%	79.8
2030	94.3%	2.3%	1.7%	1.8%	0.3%	5.7%	11.3%	82.2
2040	93.3%	2.6%	2.0%	2.2%	0.4%	6.7%	14.2%	83.5
2050	92.2%	2.9%	2.3%	2.6%	0.4%	7.8%	17.0%	84.9

During the 45 years of the simulation, according to the pure ageing scenario the total percentage of the population affected by disability will more than double, from 4.6% in 2005 to 9.5% in 2050. The increase will be particularly strong for those suffering from the two most severe disability levels. Due to the ageing of the baby boom generation, also the ratio between the number of disabled and the number of people in working age will significantly increase: today there are 12 persons aged from 25 to 64 for each disabled, in 2050 this number will fall to 5. The average age of the disabled will significantly rise, by about 8 years over the whole period. Much of the increase in the average age of the frail population is taking place in the first half of the projection period.

The alternative simulation, with endogenous disability rates, shows a significantly lower increase in the total number of the disabled. The rise in education levels and, more importantly, in the length of expected life, reduce disability rates for each given age. It follows that the disabled are, in this second scenario, significantly older than in the first one. This second hypothesis, although less dramatic than the first one, confirms that the number of the disabled is likely to increase in the future, from 4.5% to 7.8%. Fig. 3 shows the different evolution of the share of the disabled population according to the two alternatives. Considering that in 2005 the number of disabled (of all ages) in Italy is estimated around 2,6 million, the naïve pure ageing scenario projects this number to increase to 4,3 million by 2030, and to 5,6 million at the end of the simulation period, in 2050: an increase of 115%. The more realistic scenario with endogenous disability projects smaller numbers: 3,4 million in 2030 and 4,6 in 2050: between 2005 and 2050, the percentage increase would be 77%. Comas-Herrera et al. (2006) estimate a percentage increase (only for the over-65) of 107%. In our model, the overestimation bias produced by the pure ageing scenario on the change in the number of the disabled is 33% in 2030, reaching 51% in 2050. Fig. 3 shows also the evolution of the share of disabled according to the simple "constant health scenario" illustrated above, which reduces each year the probability of being disabled in line with the rise in life expectancy. The results are very similar to those produced by our endogenous disability scenario. Our method, however, does not impose any ad hoc rule. Due to this similarity, in the following of the paper we will refer only to the two basic scenarios already described.
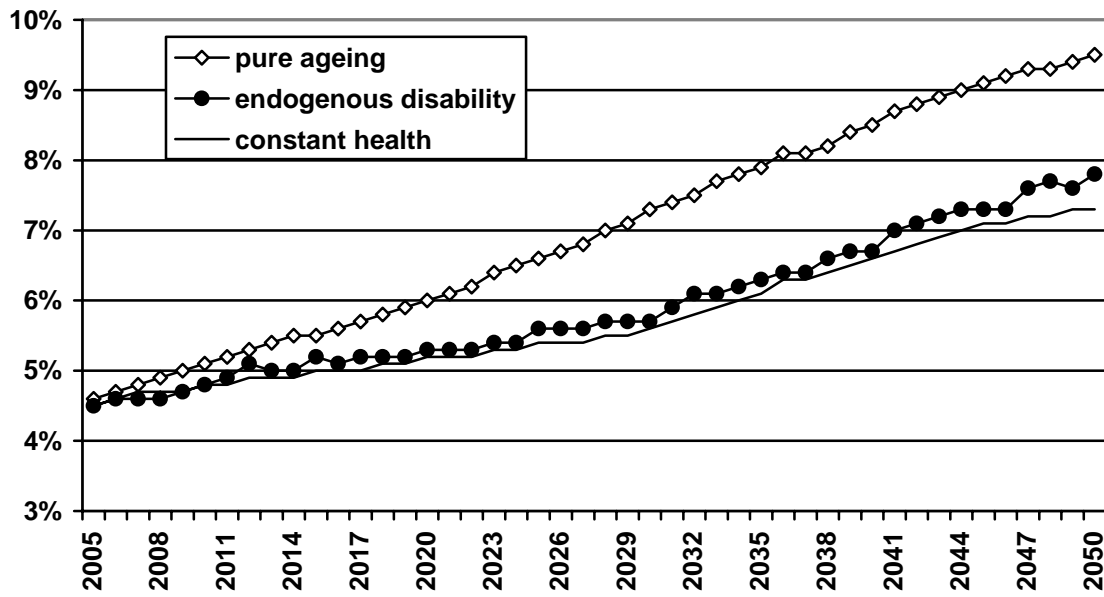
Figure 3 Percentage of the disabled out of total population

Fig. 4 presents the evolution over time of the percentage distribution of the disabled by age classes. The share of the over-80s is projected to rise significantly over the period, particularly according to the endogenous disability hypothesis. Since the severity of the disability condition tends to worsen with age, this factor will surely produce an increase in total ltc spending.

1) pure ageing scenario
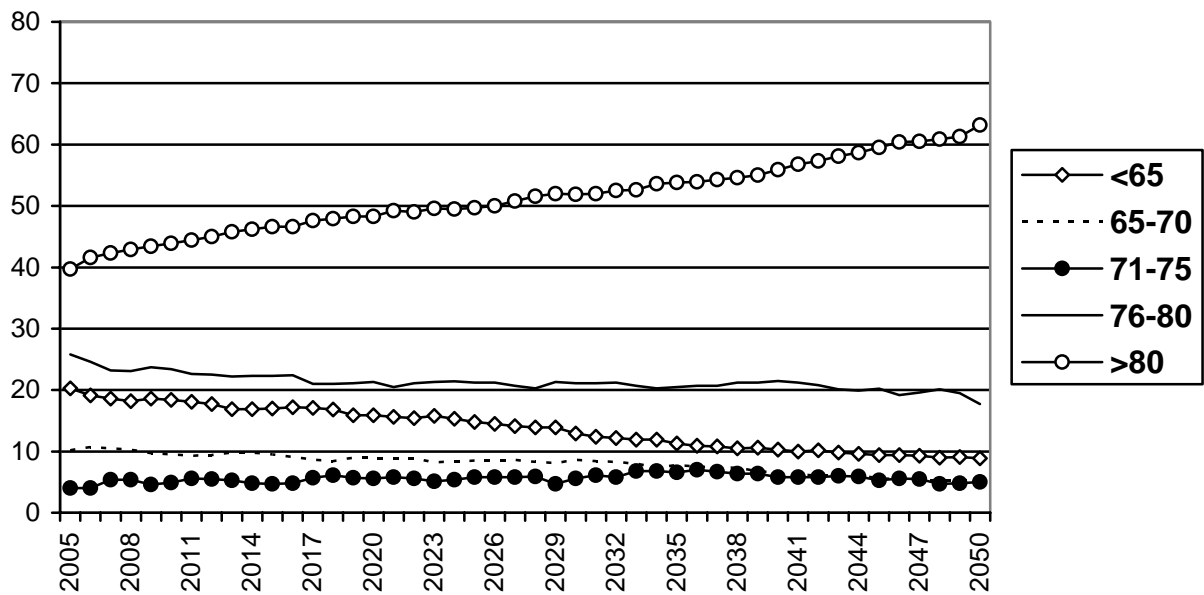
2) endogenous disability scenario
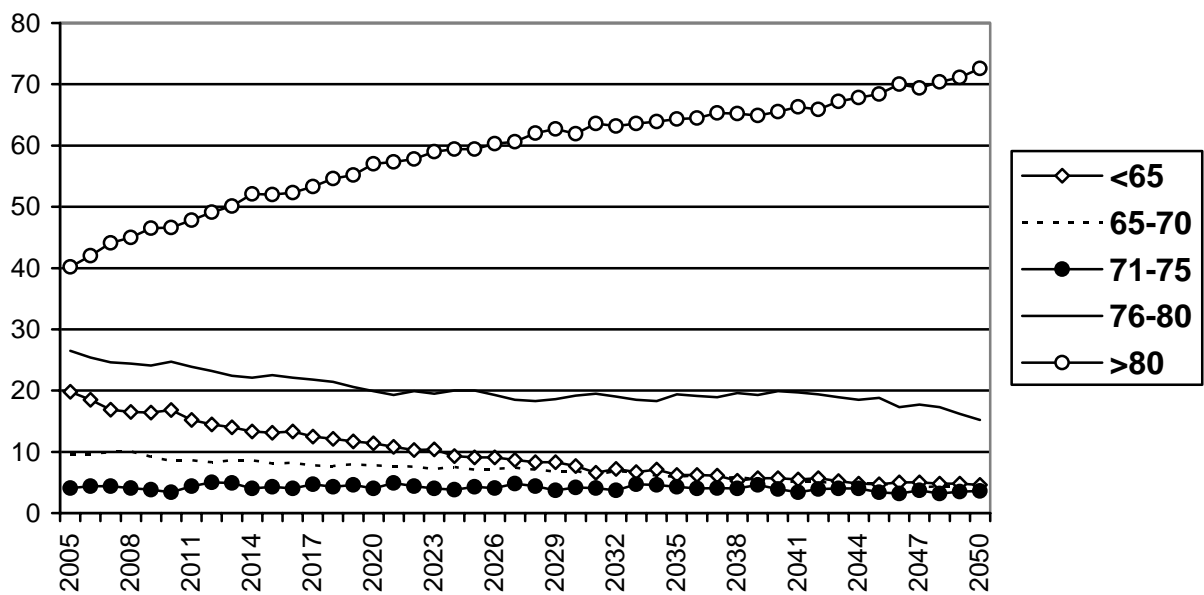
Figure 4 Distribution of the disabled by age class (in %)

The number of years of life spent in a condition of disability will increase significantly during the period if we assume no changes in the disability rates for age classes and gender (Fig. 5). The graph starts in 2020 because in the dynamic model we do not simulate how many years in disability has an individual before the beginning of the simulation period, so in the first period of simulation the average numbers of years spent in disability by the disabled would be strongly increasing, starting from 1 in 2006. The scenario with endogenous disability shows a

much lower increase in the number of years, because of the shifting of the disability rates according to the increase in life expectancy.
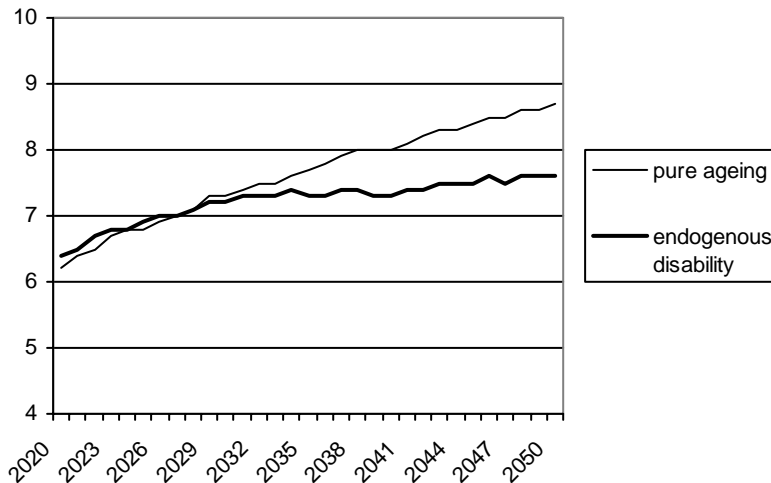

Figure 5 Average number of years spent in disability by the disabled

We concentrate now on some changes in the characteristics of the disabled that could influence the probability of receiving care. All the figures that follow in this section are obtained from the scenario with endogenous disability. Fig. 6 shows that the disabled of the future will be much less able than those of today to rely on informal care provided by their children, for the basic reason that they will have much less children than the those who currently need care. Today 56% of the disabled can receive help from at least two children, but this share will fall to slightly more than 30% at the end of the period. The generation born in the 1950s is the first that has significantly reduced its fertility behaviour with respect to the previous ones. When its members will become disabled, around 2030, many of them will therefore have only one child that could potentially provide assistance.
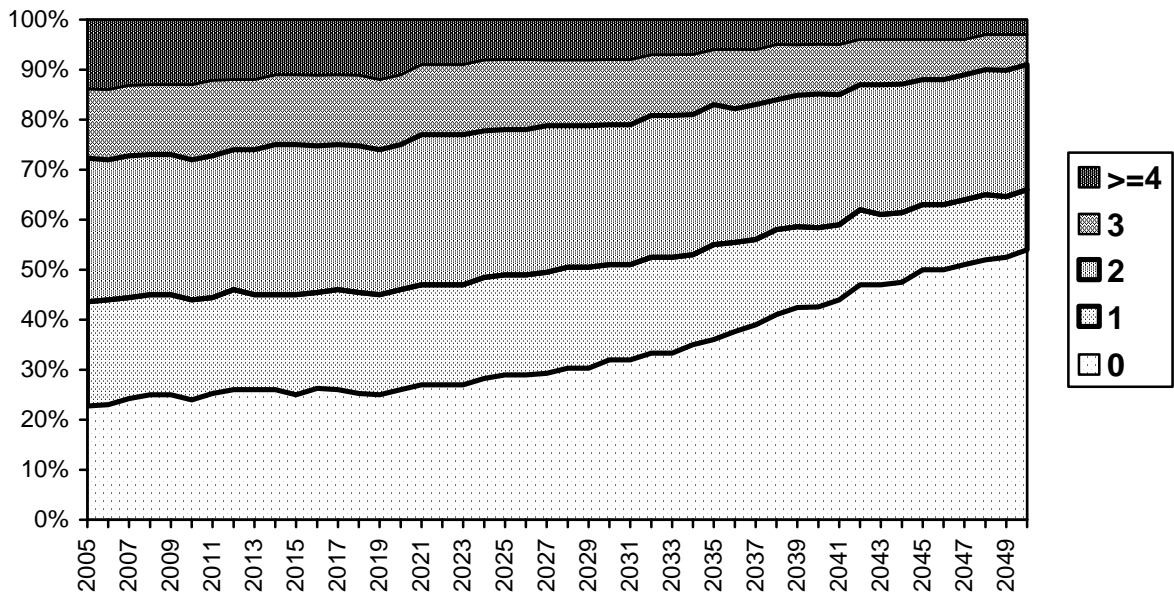
Figure 6 Distribution of the disabled by the number of their children (in %)
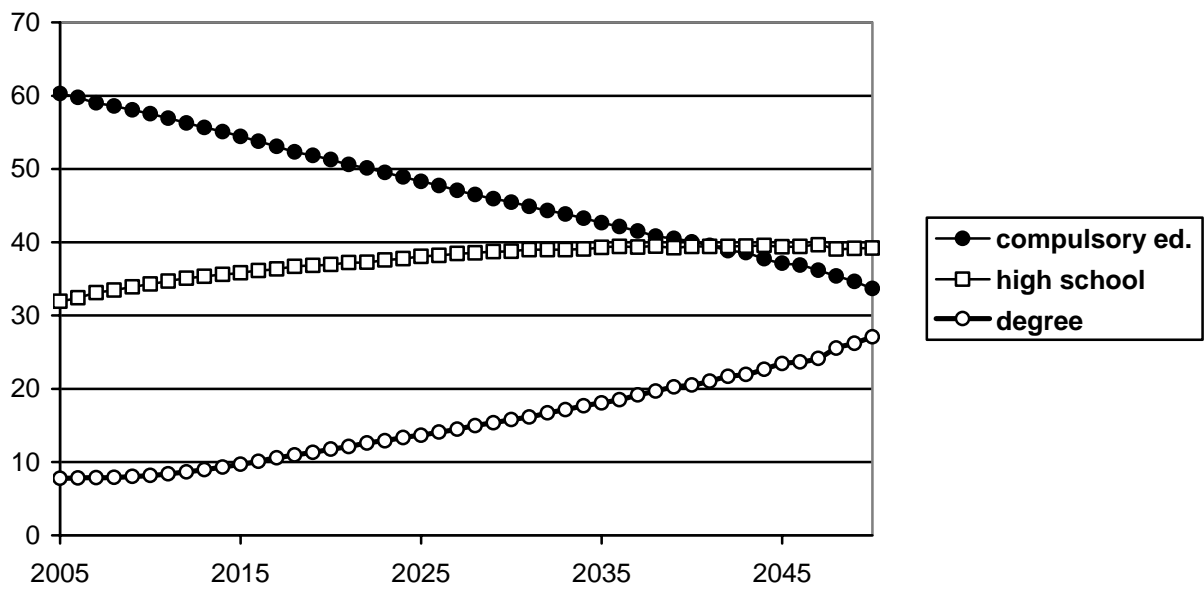
Figure 7 Distribution of the children of the disabled by education level (in %)

These children, however, will not only be less numerous than today, but will be also much less willing to provide informal care, because they will be more and more educated, therefore more productive and with an increasing opportunity cost from providing care (Fig. 7), and also more involved in formal work outside home (Fig. 8). The growth in the employment rate among adult women and people aged 55-64, necessary to assure in the future the sustainability and the adequacy of the social security system, might cause a reduction in the aggregate amount of the informal care, that currently, together with private assistance provided mainly by immigrants, substitutes a well structured (public) insurance system against the risk of disability.

Figure 8 Employment rate of women aged 55-64
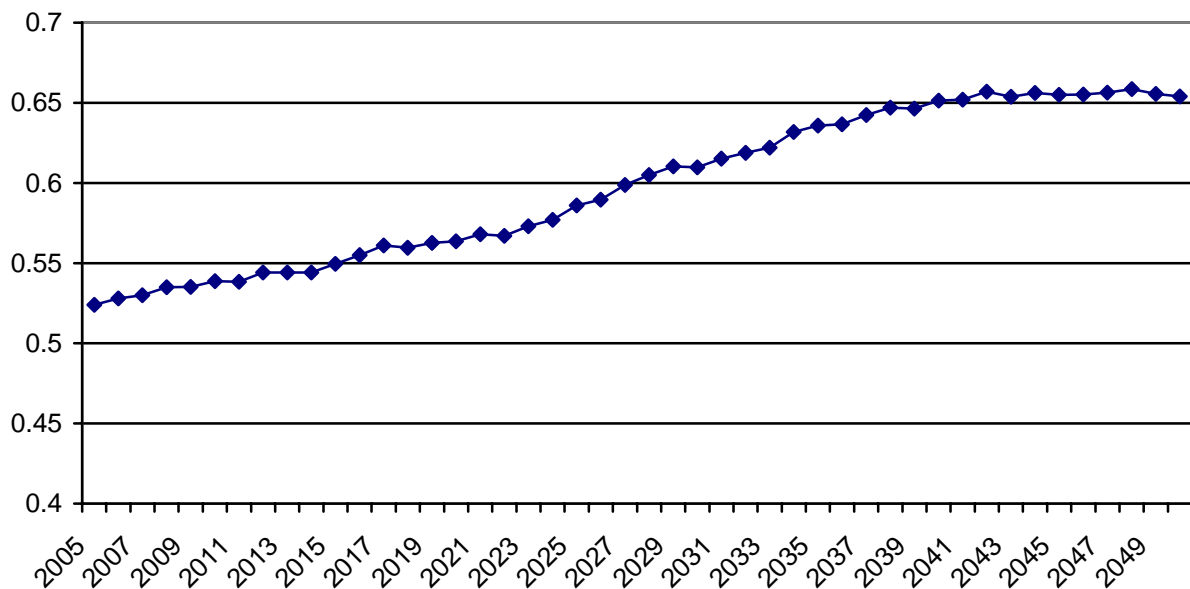
4. PROJECTING THE COSTS OF LONG-TERM CARE

In this section we perform two simulations of the future cost of public expenditure for ltc. We do not consider the presence of possible interrelationships between the changing characteristics of the disabled in the future and public expenditure, for the main reason that it is very difficult to imagine how public provision will react to changes in the composition of the group of the

disabled. In principle, it is even conceivable that no change in the structure and per capita amount of social expenditure will take place. We consider this case as our base simulation. More generally, the reaction of public policies to the demographic crisis may take many forms, which cannot be anticipated now. We therefore consider a second scenario, where the government reacts to the increase in disability rates shown in section 3 with an increase in the value of the resources transferred to the frail people.

Both scenarios can in principle be rationalised as the introduction of an ltc fund, which in one case simply incorporates current schemes without changing their structure and expenditure level, while in the other case it increases the amount of the resources involved. We can imagine that this fund is financed through a tax collected on a base that is some variant of national income[1].

The set up of an ltc scheme poses two main sets of problems. From a long run perspective, the most interesting questions concern the financial sustainability of the fund and its distributive features over the life-cycle. Due to the ageing process and the worsening dependency ratios, the number of beneficiaries of the fund will increase, while the tax base from which the contributions to the fund are collected will shrink, unless an exceptional increase in productivity will take place. It is therefore crucial to verify whether the fund is sustainable through time. This problem can be studied properly only with an dynamic simulation model able to project in the long run (at least a few decades) the whole structure of the population and therefore both the amount of tax receipts and the evolution of the number of likely beneficiaries, given the trends in demography and in the lengthening of expected life.

During the last decade, many advanced countries have created specific social security programs, based on targeted contributions, in order to finance the establishment of ltc funds. In Italy, current programs towards the elderly are financed out of general taxation, and the debate about the opportunity of establishing a specific ltc fund with an autonomous financing scheme is gaining momentum, but so far without translation into practice.

The first of our two simulations assumes the invariance of current policies towards ltc, and provides an estimate of the rising burden of ltc expenditure on gdp and the public budget. Although relevant, however, the expenditure level provided by the current institutional setting is still insufficient to guarantee a reasonable coverage for the needs of the disabled (Gori, 2006). We therefore study also the implications of a possible new ltc scheme, with a more generous funding than that allowed by the very fragmented institutes of today. This new

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[1] In fact the distribution f the burden of such a tax is a very important issue. At this stage of the work we decided not to consider alternative options, which will be the subject of future research.

scheme would incorporate the current amounts of expenditure in ltc, and would provide different transfer levels according to the kind of care received (at home or residential). Its set up is based on a calibration with current expenditure levels, so as to give it a realistic path over time. We analyse the evolution of the fund over time, with respect to gdp, and the tax shares that should be imposed in order to reach an equilibrium level in the short run and over a longer period.

If current ltc expenditures are financed on a pay-as-you-go basis, and if the government wants to maintain a balanced budget for the fund in each year, then the increase in the number of the disabled implied by the ageing process would force the government, during approximately the next four decades, to raise each year the tax rate to be applied.

The base simulation is conducted under the assumption that the present institutional setting for ltc will remain unchanged in the future. The starting point is therefore the reconstruction of current expenditure levels. According to official estimates recently provided by Rgs (2006), public expenditure in Italy towards the disabled in 2005 was about 22 billion euro (1.6% of gdp). It can be divided in three parts: a) "health care costs", amounting to about 12 billion euro, a component that includes both residential expenditures and the provision of drugs, psychiatric assistance, visits by doctors, etc.; b) 8 billions for a cash transfer called "Indennità di accompagnamento" (attendance allowance), targeted to dependent people and not means tested, amounting to nearly 500 euro per month in 2006, irrespectively of the level of disability; c) 2 billions in transfers in kind, mainly formal housing assistance provided by municipalities, generally subject to a test of means.

In our simulations, the expenditure on ltc that we project is composed of its whole amount for points b) and c), and of only the part of point a) that is not strictly related to health expenditure, because health care costs are a component of social expenditure on health and will be in any case provided by the public sector irrespectively of the future organization of the ltc system.

Public expenditure on ltc that forms the basis for our simulations therefore corresponds to 0.9 percentage points of gdp in 2005, a figure very similar to that computed for the starting period of the simulation by other projection studies (Oecd 2006, Comas-Herrera et al., 2007).

After the identification of the pool of disabled among the microunits of the model, we assign different amounts of cash-equivalent transfer to each of the three disability levels. Those belonging to the least serious level are assumed to receive only in-kind housing assistance at the local level. They can of course receive also other care by private providers or relatives, but these forms of care do not generally imply a public contribution. We therefore attribute to each person belonging to the first disability level a sum of money corresponding to the ratio

of total expenditure for housing assistance and the numerical consistence of the low-gravity disabled.

Each of the disabled belonging to the second and third level receives the attendance allowance. This assumption generates a number of beneficiaries in the simulated data which is very close to the real number of beneficiaries of this cash transfer in 2005 (1.4 million). Finally, those belonging to the worst level who are resident in nursing homes receive a much larger amount of money, i.e. 2000 euro per month, corresponding to the public contribution to residential costs.

The second, alternative simulation tries to rationalize an increase in the generosity of public expenditure. To reduce the arbitrariness that is inevitable in defining the level of expenditure for this more "generous" case, we choose as a reference the German ltc fund, established in 1994. We therefore double the transfer received by those belonging to the second and third level who are not institutionalised, from 500 euro per month to 1,000 euro per month. This amount corresponds to a weighted average of the value of the cash and in-kind transfers provided by the German ltc fund in 2005 (Arntz et al., 2007), and more generally would signal a significant increase in the attention of public policies towards the disabled. In both simulations, the per capita expenditure levels are projected to increase yearly at the same rate of real gdp. We do not model any kind of tax or contribution, but simply estimate the cost of different ltc programmes in terms of gdp.

Fig. 9 shows the dependency ratio, computed as the ratio between the number of disabled and the sum of the numbers of workers and pensioners, who represent the pool of taxpayers that must contribute to finance the ltc fund. According to the pure ageing scenario, this ratio increases by 75% (from 8% to 14%) over the simulation period, even if on the denominator we compute the number of pensioners. In fact, as the micro analysis of section 3 has shown, this is due to the rapid growth of the number of individuals aged more than 80 years, who are very likely to become disabled. If we assume that the disability risk falls as expected life increases, this compresses the increase in the share of the disabled from 75% to 50% (i.e. from 8% to 12%).
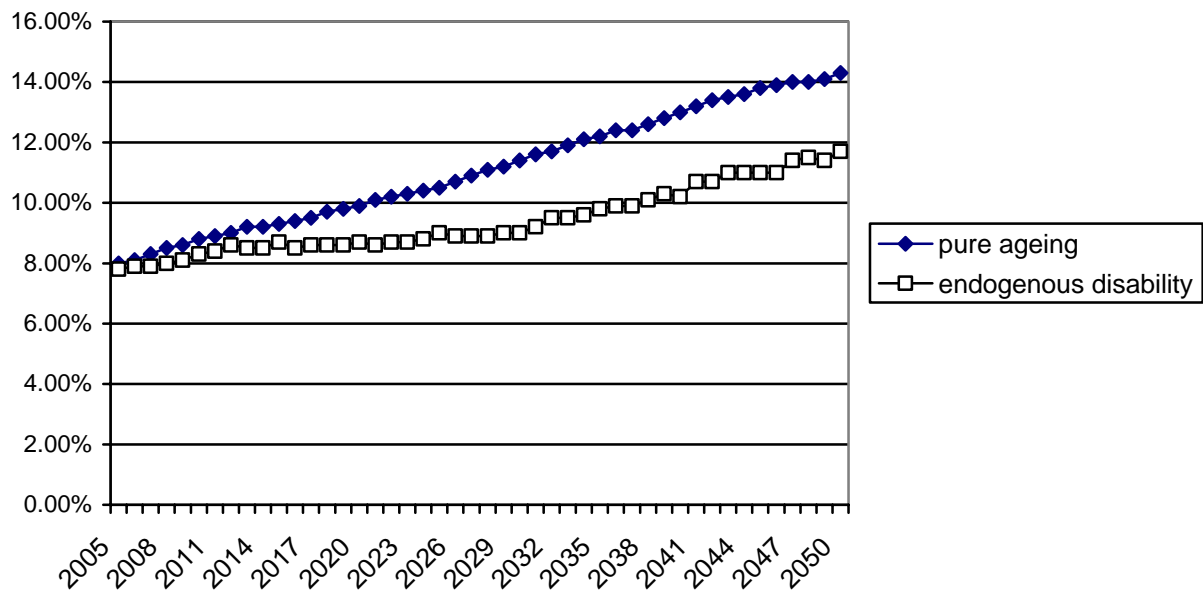
Figure 9 Number of ltc disabled / number of employed + pensioners

Fig. 10 reports the dynamics of ltc expenditure in the first of the two scenarios that we have chosen for this section, i.e. the base case where the generosity of public ltc assistance for each disabled person will not change in the future. All values are expressed as percentages of gdp.
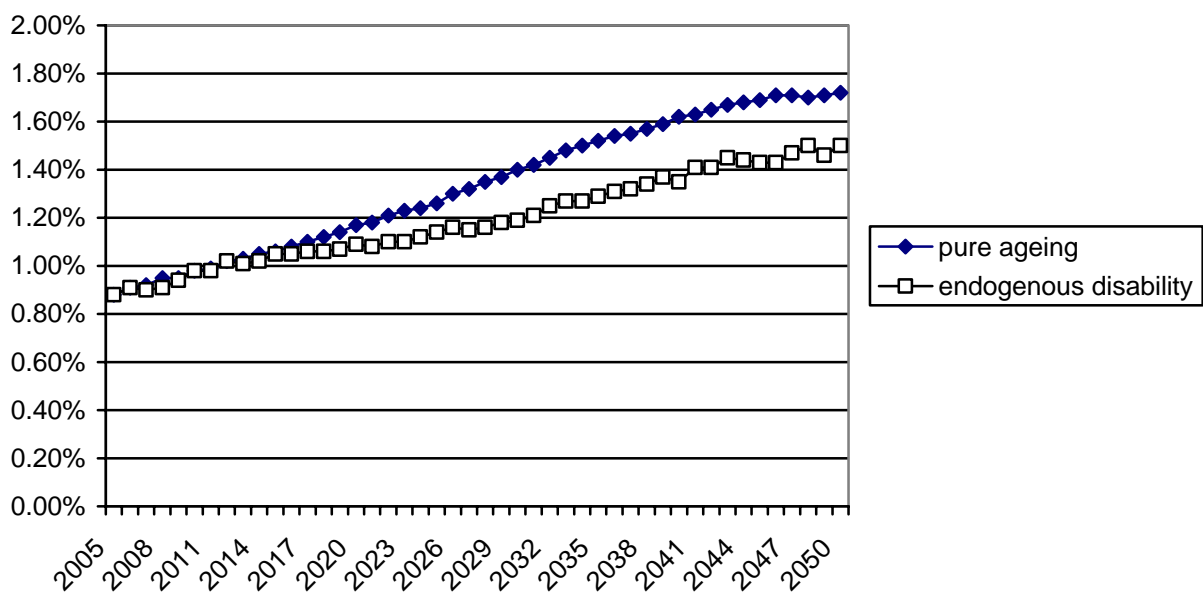

Figure 10 Ratio between ltc expenditure and gdp, case of constant generosity of public programs.

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Total expenditure for ltc, expressed as the share of gdp that the government should collect so as to finance the fund on a pure pay-as-you-go basis, increases constantly from 0.9% of gdp in 2005 to 1.7% in 2050 in the pure ageing scenario, and from 0.9% to 1.5% in the other case. This is therefore also the implicit tax rate of ltc public expenditure on gdp that must be applied to maintain year by year the fund in perfect equilibrium between receipts and transfers. The increase in the ratio between ltc expenditure and gdp that we obtain is lower that that computed by the official Italian government estimates (Rgs 2006), which are based on more prudent assumptions, since they assume that only half of the gains in expected life will be spent in good health.

A reasonable alternative measure of the burden of ltc expenditure on current incomes is provided by the ratio between total public ltc expenditure and the total amount of labour incomes and pensions, i.e. the tax base on which the resources form financing ltc costs are collected. In both cases, pure ageing or endogenous disability, this implicit tax rate will rise, but by different amounts: starting from 1.7% of this tax base, the implicit rate will reach 3% in 2050 under the pure ageing alternative, and 2.6% under the alternative endogenous disability hypothesis.

The second, "German-style" scenario (Fig. 11), fixing the initial expenditure for each disabled at a higher level that the current one, requires a more relevant financial amount of resources. The dynamic evolutions of the tax rate, of total expenditure and of the reserve fund are graphically similar to those presented above. The levels of all ratios are however always higher, reaching nearly 3.5% of gdp in the case pure ageing scenario, and 2.7% in the endogenous disability case. The corresponding equilibrium tax rates on workers and pensioners (not shown) would increase from 2.6% to 5.5% in the pure ageing case, and to 4.5% in the other.
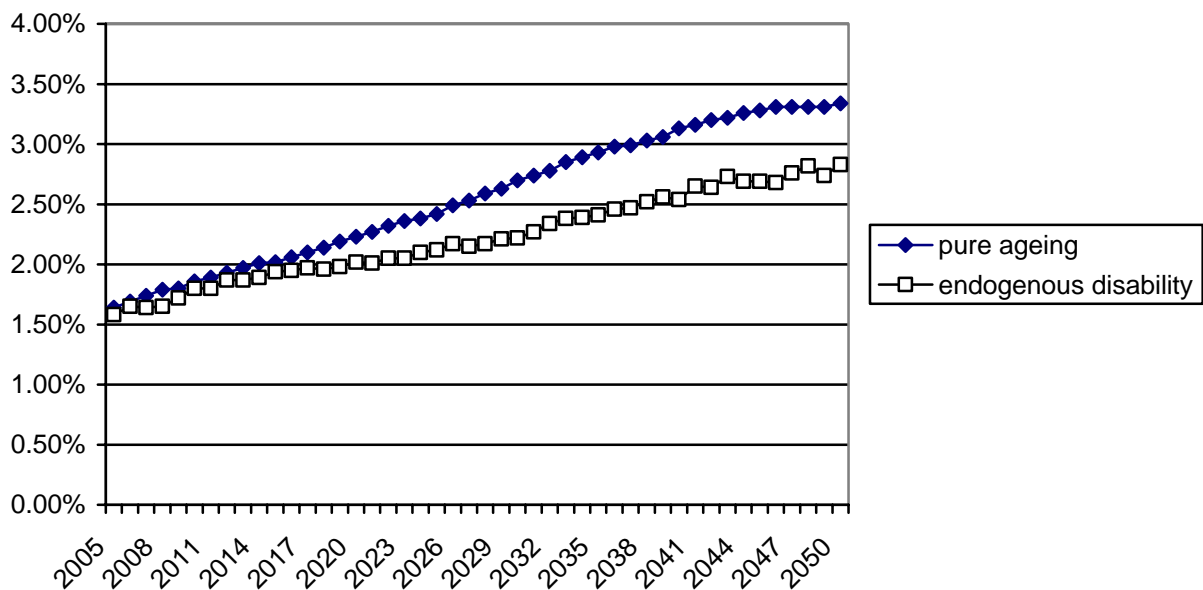
Figure 11 Second ("German") scenario: total ltc expenditure on gdp

5. CONCLUSIONS

Using a dynamic microsimulation model, the paper tries to shed some light on the future characteristics of the Italian disabled and on the trend of ltc expenditure.

We compare two projections. One is made under the assumption that current disability rates will apply also in the future for each age; this is a pessimistic hypothesis, because it corresponds to the assumption that all gains in expected life will be spent in bad health conditions. The other criterion, more realistic, assumes that the disability rate is fully endogenous, and reflects the projected trends in demographic characteristics and in life expectancy. The 2005 Istat Survey on Health has provided the basic data for the estimation of disability risks.

The demographic transition will produce a strong increase in the number of elderly disabled, and a marked reduction in the number of relatives on which they will be able to rely for assistance. Changes in the education level of the population and in the labour market, with an increase in participation rates of women, will reinforce these tendencies.

Under the pure ageing scenario, in 2050 there will be 2,5 million more disabled people. According to the alternative hypothesis, their number will increase by 1,5 million, i.e. 40% less. It is however incorrect to conclude that the increase in future ltc expenditure will be 40% less than that projected by the pure ageing scenario, because the average age of the disabled

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according to the endogenous disability hypothesis will be higher (see table 3 and figure 10). In other words, in the future the number of disabled people will increase less than many fear, but the disabled of tomorrow will be older and more likely to live alone and without assistance from close relatives than the disabled of today.

In the second part of the paper we tested the likely evolution of ltc expenditure in the face of the expected ageing process. The results show that, even if the current low and insufficient level of average ltc expenditure would be maintained in the future, the tax rate of a pay-as-you-go ltc public fund paid by workers and pensioners should increase from 1.7% to 3% at the end of the simulation period (2050) in the most pessimistic case, and to 2.6% if increased life expectancy translates into a fall of disability rates for each age class. In the case of a desirable increase in the average expenditure for ltc from 500 to 1,000 monthly Euros at 2005 prices, the same tax rate should obviously increase in both scenarios.

The dynamic microsimulation model used for this paper could be fruitfully applied to study also the likely evolution of the types of formal and informal care for the disabled of tomorrow, given the changes in the demographic conditions of the disabled and in the labour market position of their relatives.

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