# The consolidation of the public budget in Italy (1985-2000): an analysis of the redistributive effects on Italian Households

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## *1. Introduction*

The main objective of this paper is the examination of the redistributive effects on households' incomes of the changes in taxes and benefits implemented in the period of the consolidation of the Italian public budget, from 1985 to 2000. We will analyse the distribution of incomes at the beginning and at the end of this process, both in a single period and in an intertemporal model. The effects on income distribution of specific fiscal measures adopted during the last 10-15 years in Italy have been analysed either by using tax-benefit models (for example in Rossi, 1994), or stressing their long term effects on the intergenerational redistribution of resources (Franco et al., 1994; Isae, 2000,). However, there is still little empirical research which tries to assess the total effects of the changes in the fiscal stance occurred in the last 15 years in Italy from a redistributive point of view. An answer to this question might indeed give a clearer picture of the contribution given by specific groups of the population to the fiscal effort which allowed Italy first to regain a sustainable path of the public debt/gdp ratio, and afterwards to join the EMU in 1997.

The chapter is divided into two main sections. In the first section we develop a model to compute gross of tax and disposable household incomes for a sample of Italian population taken from the 1987 Bank of Italy's Survey of Income and Wealth; then we apply these data to evaluate the distributional impact on annual incomes of some of the main fiscal changes occurred in the last 15 years. In the second section of the chapter, data from the same source will be used to construct a steady state intertemporal model able to analyse the intragenerational effects on lifetime incomes of the reforms occurred in the same period in the rules governing the pension system and the personal income tax. Both models can give useful insights about the effects of fiscal policies on income and resource distribution. The single period model provides information about which groups of the population contributed more to the consolidation process, being more affected by the increase in the overall level of taxation net of transfers from the State. The intertemporal model is better able to evaluate the effects of policy changes that need some time before displaying their full consequences, and involve different stages of individual lives. The typical example is the pensions system, but modifications in the personal income tax as well, given its importance on household budgets, can be fruitfully studied in the lifetime context. We will consider only steady state effects of this policies: each individual in the model faces a constant fiscal rule for his/her entire lifetime, both for the pension system and for the personal income tax.

We believe that this second approach can enrich our distributive analysis. Pension systems are intrinsically intertemporal in their effects. Therefore the right setting in

which to analyse them should be one where the pension system is considered over the complete story of each individual participating in it. At the same time, when we measure the distribution in an annual perspective we run the risk of mixing up in the same part of the distribution individuals with different lifetime potential incomes, just because of differences in age at a certain time.

## *2. Static analysis*

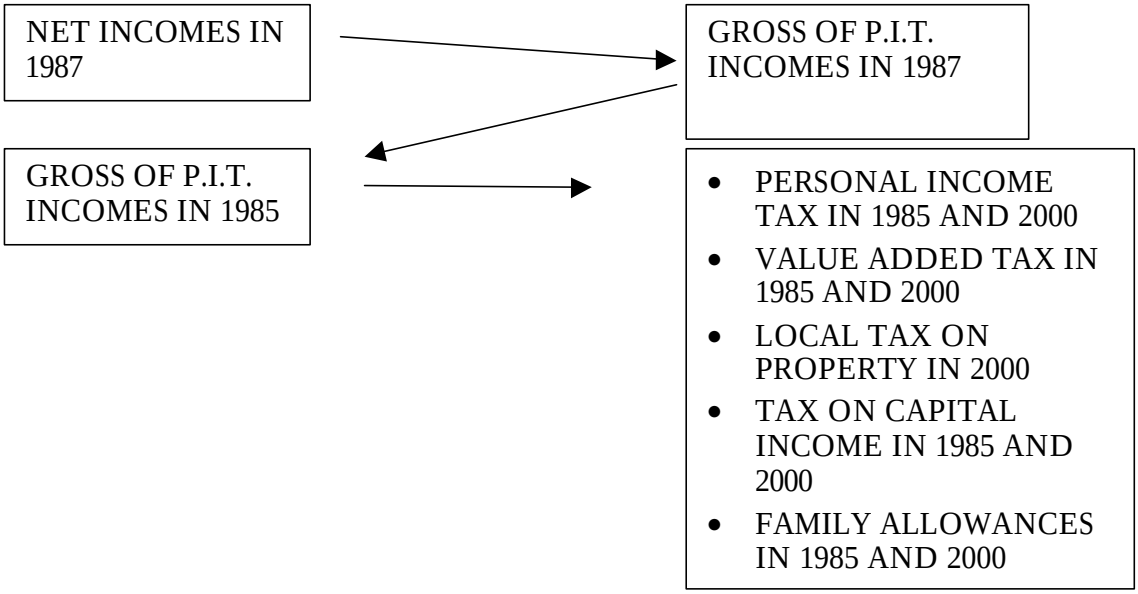
To measure the distributive effects of consolidation policies on annual household incomes, we have chosen as reference data set the Bank of Italy Survey on Household Incomes carried out in 1987. In 1985, indeed, no survey was carried out by the Bank of Italy, and the 1986 survey has some relevant quality problems. On this data set, we have computed taxes paid and benefits received by each household according to the 1985 policy rules, and what the same household would have paid in taxes and received in benefits applying the fiscal rules prevailing in 2000. A possible alternative could consist in the comparison between the 1987 survey data, and the data of a survey carried out around the end of the consolidation process, for example the 2000 dataset. In this case, however, the distributional results would be influenced also by the changes in the underlying characteristics of the data, for example the ageing of the population, or by the fact that the same households could have reacted to the consolidation process by changing their behaviour, in particular with respect to consumption and labour supply decisions. By choosing to work with a single cross-section, we are instead able to insulate the distributive effects of the changes in policy rules, ceteris paribus. We therefore simply compute what each household living in 1985 paid in that year, and what the same household, with unchanged characteristics[1], would have paid under the policy regime of 2000. The steps followed to estimate disposable incomes in 1985 and 2000 are described in figure 1.

Since in the Bank of Italy survey individual incomes are reported net of the personal income tax, the first step consists in the passage from net to gross incomes. Afterwards we deflate individual gross incomes to 1985 values and use this new database to estimate individual and household total disposable incomes gained and net taxes paid according to the 1985 and 2000 legislations. At the end of the exercise we

[1] After having of course updated nominal values to inflation and to real income growth: it would meaningfullness to apply, for example, the 2000 structure of the personal income tax to income expressed in 1985 real terms.

compare distribution of households equivalent incomes after and before net taxation[2]. We use both global measures of distribution and the comparison of the incidence of the Italian tax- benefit system in 1985 and 2000 by deciles, age groups and professional categories of the head of the household.

*Fig. 1: The steps of the cross-sectional simulation*




Our final objective is to have an estimation of total disposable incomes and of the main taxes and transfers (except taxable pension benefits) in 1985 and 2000. In particular we estimate: i) the personal income tax (Irpef) both at the individual and at family level; iii) the value added tax; iv) taxes on incomes from financial assets; v) the local tax on property; vi) family allowances. We also consider assistance transfers as invalidity and war pension benefits, which are exempt from the personal income tax and are reported in the original survey. At this stage we do not examine explicitly old age and survival pensions. In this single-period analysis we consider pension benefits as a component of taxable income: because of the intrinsically intertemporal nature of this expenditure program, we will consider the distributive effects of pension benefits, net of contributions paid by each individual, in the second part of this chapter, where we develop a model which considers the entire life course of individuals living in 1985. A description of the social characteristics of the sample used in the estimation is reported in table 1.

[2] We define net taxation as the sum of all taxes estimated minus family allowances and assistance transfers.

Most incomes in the Bank of Italy's survey are defined net of the personal income tax. Therefore we first select net incomes for each individual in the survey which enter in the base of the personal income tax (Irpef). We consider net wages and salaries, incomes from self employment and household firms and taxable pension benefits. We separately consider property income, which in the survey is defined before of the personal income tax. Incomes from financial assets were not considered, both in 1985 and in 2000, as a part of the base of the personal income tax: according to the Italian legislation the taxation on these incomes is proportional.

*Table 1: Social and demographic characteristics of the sample*

| | |
|---|---|
| Individuals | 25,092 |
| Households | 8,027 |
| Average number of persons living in a household | 3.125 |
| Average age | 36.82 |
| Men in the sample | 49.61% |
| Dependent workers in the sample | 28.49% |
| Self employed in the sample | 10.51% |
| Retirees | 15.59% |
| Living in the north | 40.73% |
| Living in the centre | 19.60% |
| Living in the south | 39.67% |
| Primary school | 64.58% |
| Secondary school | 25.03% |
| Degree | 10.39% |

Table 2 reports the number of observations and mean values for net incomes used in the estimation of the personal income tax:

*Table 2: Before tax incomes reported in the 1987 survey. Euro 1987 prices.*

| **Type of net income** | **Number of observations** | **Mean value** |
|---|---|---|
| Wages and salaries | 7,219 | 8,198 |
| Incomes from self employed | 2,103 | 16,712 |
| Pensions | 3,901 | 4,524 |

Reported values for net incomes may be distorted by evasion, which in Italy is unevenly distributed among categories (Bordignon-Zanardi, 1997). In order to have a more unbiased value for before tax incomes net of tax evasion, we multiply each income by a parameter taken from Marenzi (1989), which gives an estimation of the

percentage of income evaded according to category and income level.[3]. The sum of all this "adjusted net incomes" for each individual of the sample is then used to construct backwards the personal income tax.

We then consider whether there are dependants in the family in order to impute family deductions, and calculate gross of tax incomes. At the end, we sum property incomes to the other estimated components of after tax incomes in order to have an estimation of the gross of taxes incomes. Mean values of individual after tax incomes in 1987 are reported in table 3.

*Table 3: Individual after tax incomes estimated from the 1987 survey. Euro 1987 prices.*

| Types of gross incomes | Number of observations | Mean value |
|---|---|---|
| Wages and salaries | 7.219 | 10.128 |
| Incomes from self employed | 2.103 | 19.019 |
| Pensions | 3.901 | 5.444 |

After tax incomes in 1987 are then used to the estimate total disposable incomes in 1985 and 2000 according to the procedure displayed in figure 1.

*2.1.1 The personal income tax in 1985 and 2000*

Individual after tax incomes in 1987 are deflated by the general price index to compute after tax incomes in 1985. The personal income taxes in 1985 and in 2000 are then calculated for each individual in the sample by applying the rules of the 1985 and of the 2000 personal income tax law. Gross of tax incomes in 2000 are obtained by updating 1985 incomes by the rate of growth of prices and by the real rate of growth occurred for each categories of incomes [4].

We calculate the gross personal income tax for each observation with positive income, then we allocate to each individual the appropriate deductions and tax credits according to his/her personal conditions. In particular, we consider deductions and tax credits given to employed and/or self employed workers, to dependent relatives, to mortgages and to education expenditures.

[3] Estimated parameters for evasion vary from zero for dependent workers and pensioners to 76% for small businessmen with less than 4.000 Euro of net income. Fot the average net income of self employed the paramter is equal to 25%.

[4] The values for the rate of growth of each category of income are taken from the Italian National Institute of Statistics (Istat).

*2.1.2 Other taxes and transfers in 1985 and 2000*

After the personal income tax, the second tax in order of importance in Italy is the Value added tax on consumption goods. Since various governments during the 15 years under scrutiny have progressively increased its rates, this tax has provided a significant share of the increase in total taxation occurred in the period. Vat is applied on the various goods and services with different tax rates, but the Bank of Italy survey contains only the amount of total expenditure for each household. In order to simulate the distributive impact of the changes in Vat, therefore, we had to impute to each household of the survey a vector of budget shares, using the Household Budget Survey that the Italian National Institute of Statistics carries out every year as our source. The merge has been done through a series of regressions, run on the household budget survey, of this kind:

$$w_i = \alpha_i + \beta_i \ln C + \gamma_i (\ln C)^2 + \delta_i X$$

where $w_i$ is the budget share of the i-th good or service, C is total consumption, and X is a set of demographic characteristics common to the two surveys. We have considered 17 budget shares, detailed in the Appendix, which shows also some results of the regressions [5] and a list of the average tax rates applied to the 17 categories both in 1985 and in 2000. Estimates have been separately run on households with and without cars, because the owning of a car has a considerable influence on the whole consumption patterns and budget shares. The estimated coefficients have been applied to the observations of the Bank of Italy survey, and then the amount of Vat paid in both 1985 and 2000 has been computed [6].

In 1992, the government decided to introduce a local tax on real estates, devoted to finance the local authorities. Its tax rate is differentiated according to the nature of the buildings, being lower for residential houses and higher for commercial buildings. The simulation of this tax on our database is particularly problematic, since the tax base is the rateable value, while our data report only the market value of houses. We have made an imputation of rateable value using an estimate[7] of the ratio between the latter and the market value.

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[5] The OLS method used implies that the 17 constants must sum to 1, and the 17 beta and gamma to 0.

[6] Before computing the Vat paid under the 2000 tax rates, total household consumption has been multiplied by the same rate of change on average applied to incomes, in order to maintain constant the saving rate.

[7] Provided by a publication of the Confederation of Italian local authorities.

Incomes form financial assets at the beginning and at the end of the consolidation process are computed as the product between the stock of financial wealth reported in the 1987 survey and the respective nominal rate of interest as measured by the Bank of Italy in 1985 and 2000. Stocks of financial assets in 2000 are inflated by the rate of growth of prices and the real rate of growth of the stocks themselves.

Since our final aim is the estimation of changes in disposable income, we also consider family allowances and other minor assistance expenditures as invalidity and war pensions.

Family allowances are computed applying the rules of the 1985 and 2000 to the sample. As family allowances are targeted to specific demographic groups and subject to an income test, we use information about family composition and estimated values of gross incomes and income from financial assets in order to assign them to individuals in the sample.

Finally, assistance expenditures are explicitly reported in the survey. We report values of the 1987 survey in 1985 and 2000 using the same procedure already explained for the other components of disposable income.

*2.2. The redistributive effects of adjustment policies on annual incomes*

In this subsection we present the results of our simulations of the redistributive effects of some of the main components of the tax-benefit system in Italy at the beginning and at the end of the consolidation process. The sustained growth of the average tax rate on gdp in Italy starting from the second part of the eighties and the slowing down of the real rate of growth of public transfers, particularly pensions, to both household and firms during the nineties are well documented at macro level.

The use of a simulation model based on microeconomic data offers the possibility to study how this change in the net tax burden is distributed across the population. In particular, a comparison of the effects of the tax-benefit system in 1985 and 2000 on the same sample can give us some useful insights about the distribution of the costs of the consolidation process among different groups of the Italian society. Before the distributive analysis, incomes of households with different compositions have been made equivalent using a coefficient given by the number of households members raised to the power 0.65, a parameter which has become in recent years the “official” equivalence scale in Italy, being used to test the economic conditions of households requesting social assistance.

The effects of taxes and transfers are measured by comparing the distributions of two definitions of income:

1. **GROSS EQUIVALENT HOUSEHOLD INCOME** = (GROSS INCOME + EVASION + INCOME FROM FINANCIAL ASSETS) / EQUIVALENCE SCALE

and

2. **DISPOSABLE EQUIVALENT HOUSEHOLD INCOME** = GROSS EQUIVALENT HOUSEHOLD INCOME + (FAMILY ALLOWANCES + ASSISTANCE TRANSFERS – PERSONAL INCOME TAX - TAX ON FINANCIAL INCOME - VALUE ADDED TAX - LOCAL PROPERTY TAX ) / EQUIVALENCE SCALE

We use global indexes of redistribution (Gini, Reynold-Smolensky, Kakwani) on equivalent incomes before and after taxation both in 1985 and in 2000, and the incidence of taxes and transfers by deciles of gross equivalent household income, by age and by professional categories of the household head. First, the change in the distribution of the burden by deciles is shown for each tax.

*Fig. 2: Average rate of the personal income tax by deciles of equivalent gross household income, 1985 - 2000*

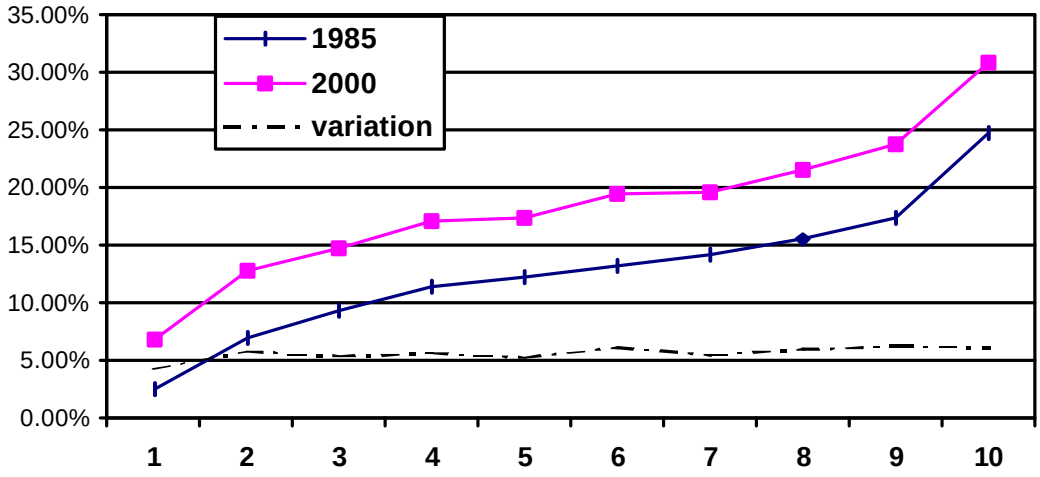



Fig. 2 shows the average tax rates, on gross incomes, of the personal income tax, on households ordered by deciles of gross equivalent income. The burden of this tax has increased substantially for all income groups, but with not significant differences across deciles in the measure of the change of the tax rate. The personal income tax confirms its important redistributive impact: the difference in the average tax rate between the first and the last decile remains bigger than 20% during the whole period analysed.

We move then to the Value added tax. This tax is strongly regressive when evaluated against income (Fig. 3). Its burden has increased for all deciles, but particularly so for the poorest one. This result could be biased (for both years) by the

presence, in the first decile of the income distribution, of cases of under-reporting of income, with a consequent underestimation of the saving rate.

*Fig.3: Average rate of the value added tax by deciles of equivalent gross household income, 1985 - 2000*

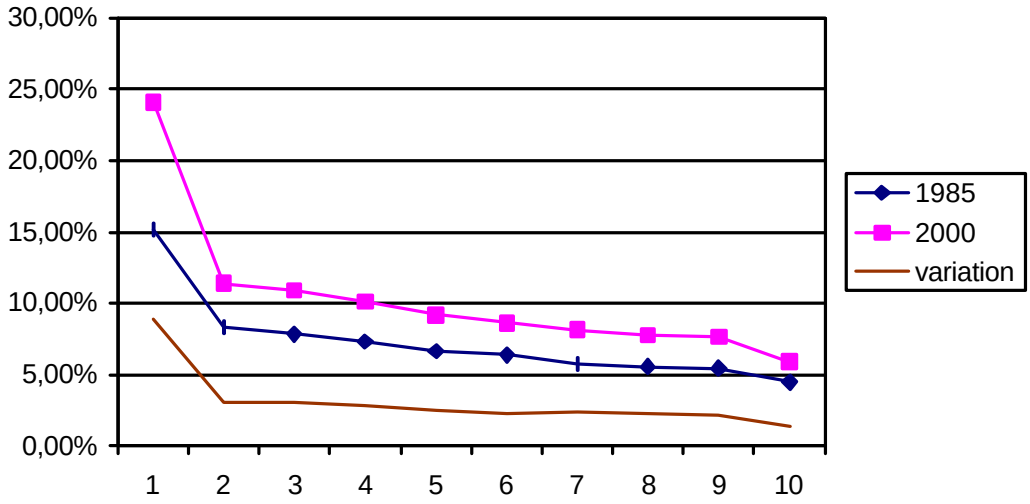
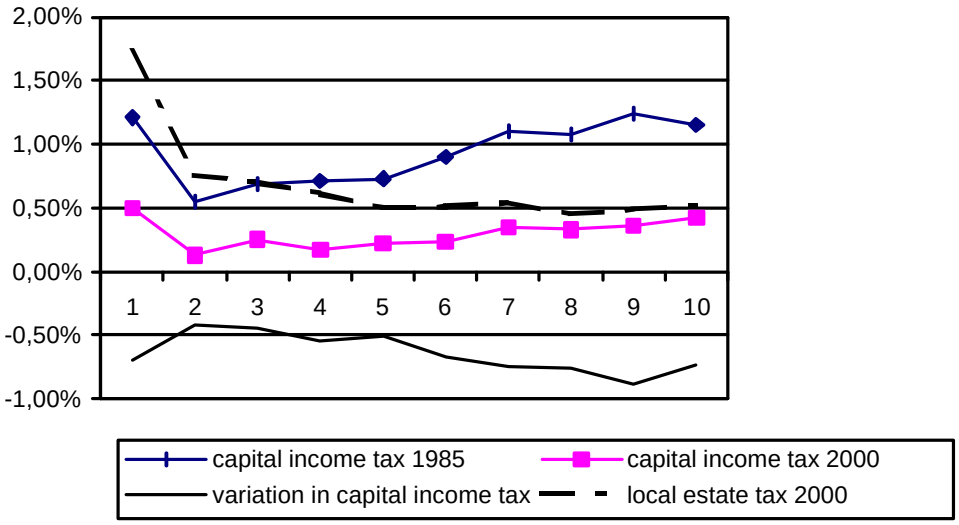



*Fig. 4: Average rates of the capital income tax and of the local estate tax by deciles of equivalent gross household income, 1985 - 2000*

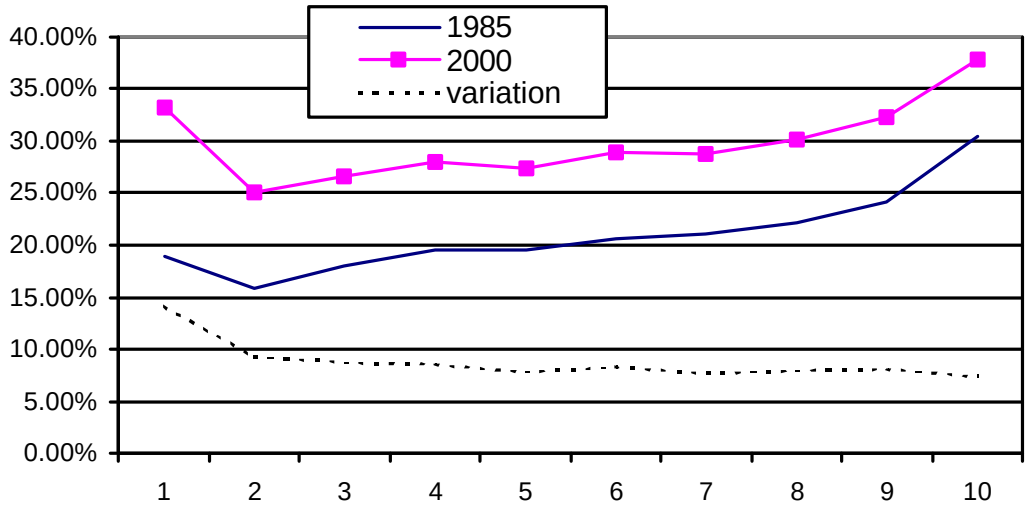



In the following graph we put together the tax on capital income and the local estate tax, this last one being applied only from 1993 onwards. Due to the strong reduction in nominal interest rates, the nominal burden of the capital income tax has strongly declined for all income groups. The local estate tax turns out to be regressive, albeit only slightly so if we rule out the first decile. In this case, a strong incidence of

this tax on the poorest part of the population may be rationalised with the consideration that some poor households, living in their own house, may pay the tax, even with very low incomes, since the tax base is not income-related.

Finally, next graph puts together all forms of taxation here examined, in 1985 and 2000.

*Fig.5*: *Average rates of total taxes paid by deciles of equivalent household income, 1985-2000*

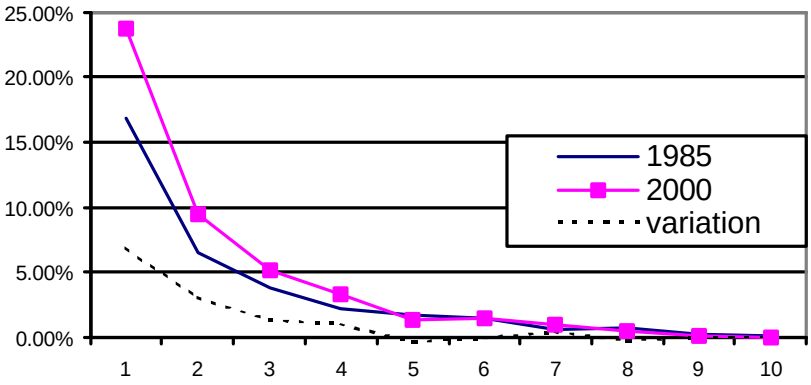



On the whole, if we exclude the first decile the set of the taxes here considered is still progressive, with a variation in the average tax rate almost constant for all. The exception is represented by the poorest 10% of the population, whose result is driven by the effects of the change in value added tax and, to a lower extent, by the introduction of the local estate tax.

We moved then to the analysis of the expenditure side of the budget. The change in the distribution of assistance benefits in the period has been markedly pro-poor (Fig. 6).

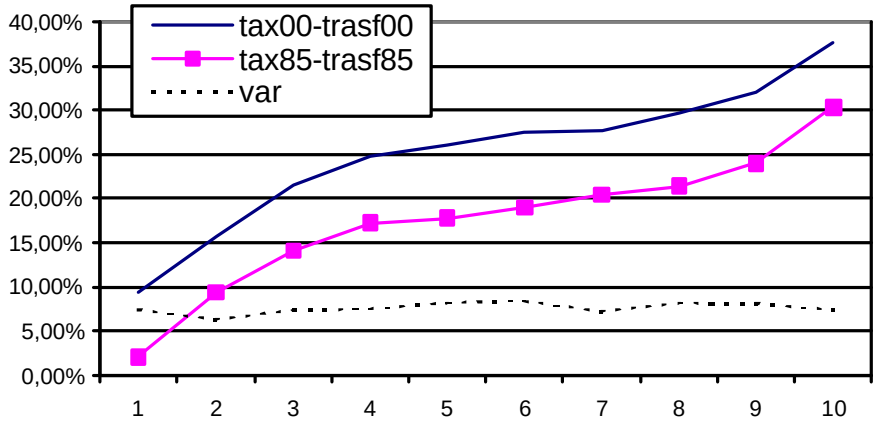
In this section we limit the analysis only to family allowances and to social assistance expenditure, without considering unemployment benefits (which did not change significantly over the period and are not precisely measured in the survey) and pension benefits, examined in section 2. Between 1985 and 1995 total expenditure on family allowances more than doubled, with benefits concentrated on the lower part of the distribution.

*Fig. 6: Ratio of assistance benefits to gross household income, by deciles of gross equivalent houshold income*




This greater expenditure has compensated the increasing incidence of taxes on the first decile as shown by Fig.7 .

*Fig. 7: Net fiscal incidence on deciles of equivalent gross household income, 1985-2000*




If we consider together taxes and benefits, the net fiscal incidence on households has not changed significantly over the period: the net burden has increased by the same proportion for all deciles.

A synthetic way to express these same findings consists in decomposing the change in the Gini index of the distribution of incomes before and after state intervention (R) into two main components: a progressivity effects, measured by the Kakwani index of progressivity (Kak), and a measure of the incidence of the tax (t/(1-t)), plus a minor term (D) signalling the presence of reorderings in the classification by gross or net incomes caused by the tax. The redistributive effect depends positively on both the progressivity level and on the average tax rate. Table 4 shows this decomposition for the taxes considered above. The redistributive effect of the personal income tax has remained substantially unchanged, but with opposing movements of the

progressivity index, decreasing, and of the average tax rate, strongly increasing. The negative sign of R for the Vat signals its departure from proportionality in favour of the rich, while capital income taxes, and the local estate tax as well, have a very weak distributional impact. Putting together all taxes here examined (last two rows), with or without the explicit consideration of benefits, we can reinforce the conclusion that the redistributive impact of total taxes did not very much changed over the period. This substantial distributional neutrality has been made possible by the divergent behaviours of progressivity and average incidence: decreasing the first, strongly increasing the latter.

*Table 4: Decomposition of the redistributive effect of various taxes*

| | R= | Kak | * t/(1-t) | - D |
|---|---|---|---|---|
| Personal income tax 1985 | 0.041 | 0.207 | 0.206 | 0.001 |
| Personal income tax 2000 | 0.043 | 0.158 | 0.286 | 0.002 |
| vat 1985 | -0.005 | -0.068 | 0.071 | 0.000 |
| vat 2000 | -0.008 | -0.070 | 0.105 | 0.001 |
| Capital income tax 1985 | 0.0019 | 0.1591 | 0.0121 | 0.0001 |
| Capital income tax 2000 | 0.0008 | 0.1942 | 0.0042 | 0.0000 |
| local estate tax 2000 | -0.0004 | -0.0516 | 0.0072 | 0.0001 |
| total taxes 1985 | 0.035 | 0.129 | 0.285 | 0.002 |
| total taxes 2000 | 0.034 | 0.091 | 0.405 | 0.002 |
| *Taxes - benefits 1985* | *0.041* | *0.170* | *0.261* | *0.004* |
| *Taxes - benefits 2000* | *0.045* | *0.133* | *0.380* | *0.005* |

Considering now the distributional impact of the consolidation by some socio-demographic groups, Table 5 displays the incidence of total taxes net of transfers by activity of family head. Again, there is a very similar rise in the average tax rate, slightly more pronounced for white collars and executives. Even more evenly distributed appears the change in the net tax burden by age of the head of the household.

*Table 5: Ratio of total tax net of transfer to gross equivalent household income in 1985 and 2000 by condition and age of the household head.*

| | 1985 | 2000 | Change |
|---|---|---|---|
| Dependent worker | 19,6% | 26,8% | 7,3% |
| White collar | 23,1% | 31,1% | 8,0% |
| Executive | 28,2% | 36,2% | 8,0% |
| Self employed | 27,2% | 33,7% | 6,6% |
| Pensioner | 15,1% | 22,0% | 6,8% |
| | | | |
| <=30 | 23.8% | 31.7% | 7.9% |
| 31-40 | 24.4% | 32.2% | 7.8% |
| 41-50 | 24.3% | 32.3% | 8.0% |

| | | | |
|---|---|---|---|
| 51-60 | 23.2% | 30.8% | 7.6% |
| 61-70 | 19.1% | 27.0% | 7.9% |
| 71-80 | 14.6% | 22.2% | 7.5% |
| >80 | 10.8% | 17.7% | 6.9% |

## *3. Life-cycle analysis*

The second method that we use to study the distributive effects of the changes in tax-benefit policies in the last 15 years is based on a life-cycle approach. Some measures, in particular those involving changes in the social security system, can indeed be better examined using a dynamic setting, which allows to consider the whole life-cycles of people involved in the program, while a mere static analysis, based on annual incomes, could overlook most of the consequences of these changes. Moreover in the static approach the relative position of an individual in the distribution of current disposable income could depend on his/her age, whereas in the life cycle one, being the lifetime income of each individual equal to the present value of the sum of earnings gained through his/her life[8], income turns out to be an "age free" measure of resources distribution.

We therefore construct a dynamic framework, starting from the same database used for the previous analysis, and analyse the distributive effects of some of the most relevant policy changes of the period not on annual incomes, but on life-cycle incomes. Section 3.1 describes the steps and the hypotheses followed for the set up of the data set, and section 3.2 illustrates the main results of this distributive analysis.

### *2.1 Constructing life-cycle variables*

Since our aim here is to study the change in the distribution of lifetime incomes caused by government policies during the period of the budget consolidation, the first step consists in the construction of measures of lifetime incomes. In fact, we do not have direct access to a real panel of individuals[9], so we must use a simulation. Starting from the same 1985 data set that we have used for the static analysis, we select from it only the persons who are working, of both sexes, from age 23 to 62, i.e. 7237 individuals. These observations are put in a new dataset, to which other age and year

[8] Capital income net of bequests is used to make the path of consumption independent from the path of current income and therefore should non be considered.
[9] The SHIW contains a panel section, which is however too small to estimate reliably cohort, time and age effects on the evolution of earnings.

data are added, so as to reproduce, in a simulated panel, their whole life courses from the age of 23 to the age of 90. Since the base year is 1985, and in that year persons have ages comprised between 23 and 62, the dataset extends in the past up to the year 1946, when those persons aged 62 in 1985 started working, and in the future up to the year 2052, the last period of life for those aged 23 in 1985. pooling together all yearly observations, the whole sample contains 492116 observations, that is 7237 persons followed each year from age 2 to age 90. Since we track all individuals who are alive in 1985 with ages between 23 and 62, in each year the number and average age of individuals are not constant, but change constantly over time. For example, average age is 24 in 1950, 42 in 1985, 57 in 2000 and 74 in 2020. Therefore the model is suitable for a steady state analysis where fiscal rules remain constant through the whole life course of each individual, but cannot be used to study the intergenerational distribution determined by the pension system and/or by the public debt.

The most important step in the construction of a simulated panel of individual incomes is the imputation of annual earnings to each year of life of each individual. To do this, we have run some regressions on the pooling of the seven Bank of Italy surveys from 1987 to 2000. The dependent variable is the log of annual earnings. Since annual earning of people with different lifetime income levels evolve over time with very different profiles (Fullerton and Rogers, 1993), we have tried to reproduce this heterogeneity, using education as a proxy for the lifetime income level: separate regressions have therefore been carried out for different combinations of gender, education level (3 levels: elementary, high school, degree) and professional condition (2 levels: dependent and independent), for a total of 12 regressions. The independent variables used in each estimation are a fourth-order polynomial in age, two dummies for central and southern Italy, and time dummies. Given that the evolution of income in a single cross-section is the result of a combination of age, year and cohort effects, these regressions on a combination of cross-sections allow us to control for the time effect. The cohort effect is not derived from these estimates, but is subsequently introduced in the simulated panel data using an exogenous parameter for the yearly growth rate of incomes, which can be easily changed.

As is well known, a log income regression on micro data does not allow to capture the whole variability present in the original data, since the greater part of total variance usually remains unexplained. In constructing the panel, one would therefore run the risk of making either of two possible and opposite mistakes: if the imputation uses only the estimated parameters, the variance of imputed income would be very much lower than the original one, while if an individual error term with a variance set equal to the standard error of the regression is randomly added each year, the resulting

individual income profiles over time would be too erratic in consecutive years. To account for this problem, we conducted a log income regression over the panel data set which is derivable from the last five Bank of Italy surveys, and estimated that about 60% of the variance of the residuals is due to the individual fixed effects, while the rest is idiosyncratic. We therefore introduced in the simulated data two error terms, one specific for each individual and fixed over time, the other randomly attributed to each individual, and changing each year for all. The combination of the two is consistent with their different order of magnitude found in the panel regression, and reproduces in the simulated data the same variance of annual incomes which is observable in the original sample, while allowing individual profiles to have a certain stability over time[10]. Figg. 1-2 in Appendix 1 show, for men, the evolution over the life-cycle of the annual gross labour incomes which have been obtained from this imputation procedure, separately for dependent and self-employed workers, and for three different levels of education.

After the imputation of annual incomes for each year of life, we focus on two policy changes that could have important effects on interpersonal lifetime inequality, involving the pension system and the personal income tax.

The basic assumption on which the dynamic analysis is conducted is the hypothesis of steady state concerning the policy regime: it is assumed that people live their own entire life in a world which maintains unchanged the same set of policy rules. People get older and see their incomes changing over time according to variations in age, luck and economic growth, but, for example, the structure of the tax rates of the personal income tax never changes, as well as the rules governing the payment of payroll taxes and the computation of pension rights. This assumption allows us to concentrate on the long-run effects of a policy regime, abstracting from the short-term fluctuations. In this sense, a simulated panel is, for certain aspects, even more useful than a real panel, where the overlapping of different regimes during different time periods in the life of the same person makes it difficult to identify the effects of a specific policy scheme on lifetime incomes.

After the imputation of earnings for each working years, we calculate payroll taxes and, for the retirement period, pension benefits. In a life-cycle setting, the unit of analysis is the individual, not the household, since nobody spends his own entire life, from birth to death, within a single household unit. For each individual we compute the discounted value, at the age of 23, of the stream of annual personal gross incomes Since

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[10] In brief, imputed income for individual i at time t is given by $\hat{y}_{it} = X_{it}\hat{\boldsymbol{b}} + \hat{u}_i + \hat{e}_{it}$. In each period, the first error term is 50% greater than the other.

we focus here on the changes in social security and in the income tax, annual incomes used in the computation of this present value include only incomes from work. In this way, the classification in deciles is done according to an income measure defined before the intervention of the State. We define this income indicator as “lifetime gross income”.

Individuals in our simulated panel live from age 23 to 90, but we take account of the probability of death by weighting all annual values for earnings, payroll taxes and pensions with the respective survival probability for a given gender and age. The survival probabilities have been obtained from the mortality tables published by the Italian National Statistical Office, and are differentiated by age and gender. They represent the probability that a person is still alive at a certain age, given that he/she is alive at the age of 23.

*Imputation of pension benefits*

During the last decade, the Italian social security system has been involved in a deep process of reform, with the switch from a pay as you go system where the pension is a function of previous wage (*wage related pension scheme*), to a notional account system, still pay as you go, where the pension is a function of the total amount of social security taxes paid, and is determined according to rules formally not different from those governing the computation of private pensions (*contribution related pension scheme*). In brief, annual pension at time (t) under the earnings related pension scheme prevailing in 1985 is described as: $P_t = r\,N\,W$ where r = 2% is the so called rate of return of scheme, N is equal to the number of years of work, W is the average of the last five yearly earnings from work. In 1992 this formula has been partially changed, increasing W to the average of revalued earnings perceived during the whole active life. Further, from 1992 onwards pension benefits are indexed only to inflation, not to the nominal increase in wages as before. The formula described above is used to the computation of pension benefits of dependent workers. Pension benefits for self employed are fixed at the floor level, fixed annually by the pension law, because the computation rule used in 1985 for these workers gave very little values.

Under the contribution related pension scheme, introduced with the 1995 reform, the individual pension at time (t) is computed as: $P_t = k_{it} M_t$ where $M_t$ is the amount, capitalised at the moment of retirement using the rate of growth of nominal gdp, of payroll taxes paid during active life, and $k_{it}$ is an almost actuarially fair coefficient that transforms this sum into an annual pension, so as to equate the present value of future pensions to $M_t$. The coefficient $k_{it}$ incorporates a discount rate of 1,5%, official survival

probabilities of the recipient and his/her spouse and is positively correlated with retirement age (i): given the stock of contributions, the later a person retires, the higher will be his/her pension. The contribution rate used for the computation of benefits is fixed at 33% of the gross income for dependent workers, whereas it is 20% for the self employed[11].

We have already documented (Baldini, Mazzaferro, Onofri 2002) the main characteristics of the new pension system, studying its likely consequences on the accumulation and saving decisions of Italian households. Here we concentrate on another important aspect of the reform, its distributional effects on lifetime incomes. There are sound reasons to suspect that the pension rules prevailing in the '80s were not neutral in term of the intragenerational redistribution, since, being the benefit a function of average earnings in the last few working years, workers with a steep earnings profile over time could gain a pension representing a much higher share of overall average earnings than those with a flat earnings history. Since, as shown also by Figg. 1 and 2 in Appendix 1, a steep earnings history is typical of workers with a high education level, this system discriminated against low-income groups. The supposed regressivity of the wage related pension scheme was an argument for the substitution of this rule with a new one expected to be fair in terms of intragenerational distribution. Indeed the computation of pension benefits introduced in 1995 is neutral from this point of view: benefits are calculated as a function of the whole contributions paid during the working years. Therefore individual earnings have the same weight in the formula used to compute the pension benefits whether they are used to pay contributions at the beginning or at the end of the working years. In our simulations we make use of the steady-state nature of our panel and abstract from the long transition phase currently operating in Italy from the old to the new pension system, and concentrate on two substantially different regimes: what would be the distributional effects on lifetime incomes if people lived their entire lives either under a paygo wage related pension scheme or under a notional defined pension scheme ? The first one is the regime applying in 1985, the second one in 2000.

*Imputation of the personal income tax* We have imputed to the individuals of the simulated panel a personal income tax payment using a regression approach. We could have applied directly the formal rules of the tax to simulated earnings and pensions, which represent the tax base, but the income tax is personal, depending also on the

[11] It is worthwhile to notice that tax rates used in the computation are non equal to tax rates used in the financing of the system. This appear as another factor which move away the system from actuarial fairness.

personal characteristics of the taxpayer and of his households, an -not all of the relevant characteristics are reproduced in our simulated panel. Therefore, on the data set used to compute the cross.sectional distributive effects of the tax, we have regressed the individual average tax rate on a vector of personal characteristics.

*2.2 Changes in pensions and in the income tax: distributional effects on lifetime incomes*

To evaluate the impact on lifetime incomes of the policy changes illustrated above, we use different measures of redistribution. The first distributive indicator used is the change in the Gini index of lifetime incomes caused by first the alternative pension rules, and then by the two different patterns of the personal income tax prevailing in 1985 and in 2000. To measure the distributional impact of pensions, we compute the difference between the Ginis of lifetime gross income, and of lifetime gross incomes minus the present value of contributions, plus the present value of pensions. For the personal income tax, first the Gini of the lifetime tax base is computed (gross income plus wage related or contribution related pension), then the Gini of the tax base minus the present value of the tax itself.

We then compute the "net pension incidence" and the "income tax incidence": after the classification of the individuals in deciles of lifetime gross income, we compute for each decile the average present values of pensions received and contributions and income tax paid under the 1985 and 2000 regimes.

Net pension incidence is defined as the ratio between the present value of contributions minus the present value of pensions, divided by the present value of gross earnings:

$$\text{Net pension incidence}_t = (PVC_t - PVP_t) / PVY_t$$

where $PVC_t$ = present value (at age 23) of contributions paid; $PVP_t$ = present value (at age 23) of pensions received; $PVY_t$ = present value (at age 23) of gross earnings from work received. The index t refers to the two alternative legislation, 1985 and 2000. In our simulations we take into account both of the different rule used to the computation of benefits in 1985 and 2000, already described, and of the different level in the contribution rate, which was 27% and 10% for dependent workers and self employed respectively, in 1985 and 33% and 19% in the 2000 simulation. If the net pension

incidence is lower for the richest deciles, (decreases along the deciles distribution??) the pension system is regressive (Fullerton et al. 2000).

Income tax incidence is simply the ratio between the present value of the amount paid for the personal income tax and the present value of the tax base, given by the sum of the present values of earnings from work and of gross pensions:

$$\text{Income tax incidence}_t = PVT_t / (PVY_t + PVP_t)$$

Formulas used for the computation of all variables used in the simulations are displayed in the appendix 3.

Distributive results are first shown for pension systems, and then for the personal income tax. Table 6 shows the changes in the Gini indexes before and after the two alternative pension rules, for different combinations of parameters concerning the retirement age, the growth rate of earnings, the discount rate used to compute present values, and the application of survival probabilities.

*Table 6: Distributive effects of alternative pension regimes on lifetime incomes in the absence of survival pensions. Individual analysis.*

| *Simulation hypotheses* | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Retirement age | 57 | 63 | 65 | 63 | 63 | 63 |
| Growth rate of gross income | 0.015 | 0.015 | 0.015 | 0.03 | 0.015 | 0.01 |
| Discount rate | 0.02 | 0.02 | 0.02 | 0.02 | 0.04 | 0.0 |
| Survival probabilities different by age and sex? | yes | Yes | Yes | yes | Yes | no |
| *Gini of:* | | | | | | |
| Lifetime gross incomes | 0.282 | 0.2899 | 0.2947 | 0.3276 | 0.2914 | 0.28 |
| Lifetime gross incomes + wage related pensions – contributions | 0.2923 | 0.3013 | 0.3051 | 0.3355 | 0.3044 | 0.30 |
| Lifetime gross incomes + contribution related pensions – contributions | 0.2816 | 0.2901 | 0.2944 | 0.3252 | 0.2970 | 0.28 |
| *Distributive effects of:* | | | | | | |
| Wage related pensions | **-0.0103** | **-0.0114** | **-0.0104** | **-0.0079** | **-0.0130** | **-0.01** |
| Contribution related pensions | **0.0004** | **-0.0002** | **0.0003** | **0.0024** | **-0.0056** | **-0.00** |

We select from the initial sample only the dependent workers and self employed. We end up with 7237 individuals whose lifetime income is used to order them by deciles. We take column B as our base case, with a retirement age fixed at 63 for all. This is a value significantly higher than the current retirement age in Italy, but corresponds approximately to the objective of the government for the next decades. As hinted above, the wage related pension formula is regressive, producing an increase in the inequality of lifetime incomes, by around 1 point of the Gini index. The contribution

related pension scheme, on the other hand, is substantially neutral on lifetime inequality. This results is of course not unexpected, since in this system pensions are strictly related to contributions paid, which are a linear functions of income.

Changing the parameters which govern the simulation does not imply very significant modification of the results. If retirement age reaches it maximum level of 65, all Gini indexes increase slightly, but their differences are nearly the same as before. An increase in the rate of growth of gross incomes, while raising all inequality indicators, induces a reduction in the regressivity of the earnings related pension scheme, making at the same time the contribution related pension scheme very slightly progressive because of the not fully actuarial fairness of the coefficient $k_{it}$ used in the pension rule to compute pension benefits. Finally, the introduction in the simulation of mortality survival probabilities has a very small effect on these statistics. Interesting results can be obtained if we split total population between dependent workers and self employed. In this case we used as a measure of the effects of the reform the ratio between the present value of pension benefits and the present value of contributions (Fig. 8). The change in the ratio shows that the self employed are the group more hit by the reforms: for this category the change in the formula used to compute benefits means a bigger reduction in the level of future pensions because of the lower level of contributions they are called to pay with respect to dependent workers.

*Fig. 8: Ratio between the present value of pension benefits and the present value of contributions by professional condition*

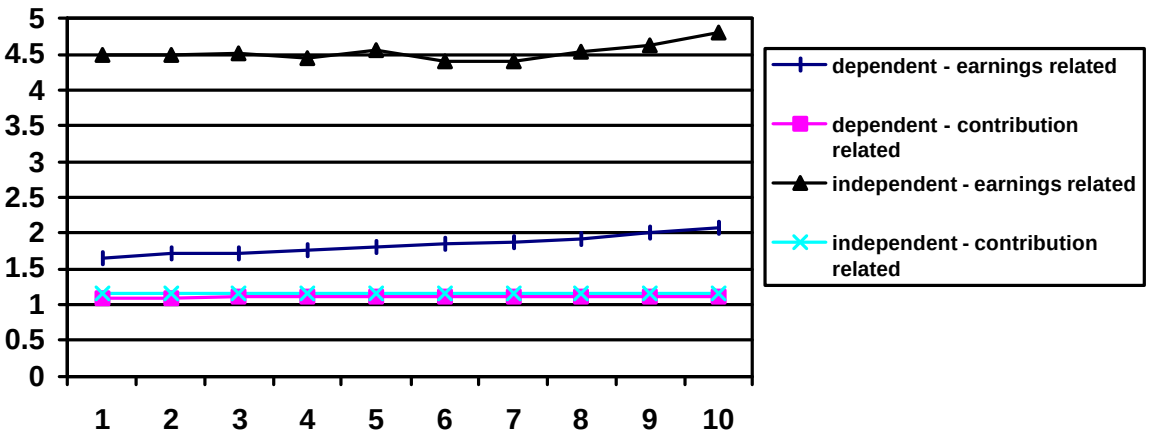
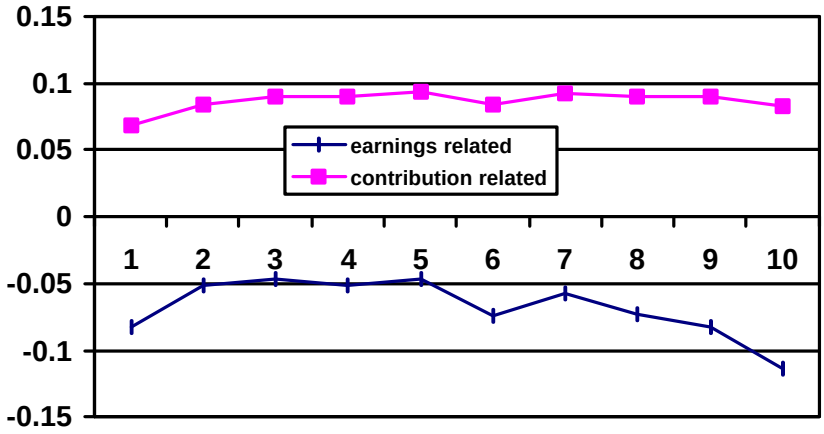



Fig. 9 shows the net pension incidence for the two regimes, corresponding to column B of previous table. The difference between the two profiles is significant: in 1985, as hinted above, the system was in absolute terms more generous than the new regime, but particularly so towards the rich, who have higher and steeper earnings profile. The new

system is, given the age of retirement exogenously fixed at 63 for all, distributionally neutral, with an amount of contributions greater, in present value terms, than that of pensions.

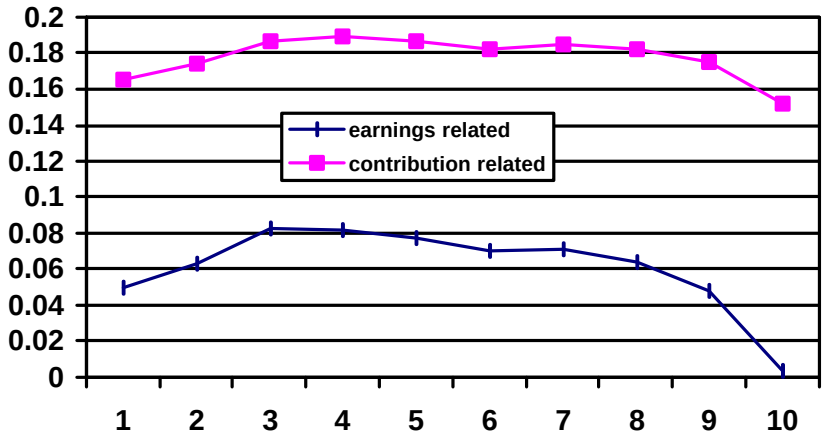
If the discount rate is set at 4% (Fig. 10, corresponding to col. E of previous table), the present value of pensions falls by more than the present value of contributions, and the net effect is a strong increase in the value of net pension incidence for both systems.

*Fig. 9: Net pension incidence for earnings related and contribution related pension systems, by deciles of lifetime gross income. Discount rate equal to 2%.*




In conclusion, the switch to the contribution related pension regime has induced a more equal redistribution of lifetime resources among individuals; the graphical analysis of net pension incidence points out a slight remaining advantage for the poorest and richest decile, not evident from the change in the Gini indexes. The second, important effect of the switch to a contribution related pension scheme is the general increase in the tax ratio for all the combinations of parameters examined in our simulations. In the future therefore Italy will have a much more intrageneretional neutral pension system. However the pension system will ask in contributions to its participants more than it will give them back in pensions. As a consequence in the base case the net tax incidence is positive for all the deciles. This means that in the future the government will not be able to use the pension system as a redistributive tool. The analysis of the redistributive effects of the personal income tax turns out to be very interesting from this point of view.

*Fig. 10: Net pension incidence for retributive and contribution related pension systems, by deciles of lifetime gross income – discount rate 4%*




Turning now to the effects of the changes in the personal income tax, table 7 below repeats the content of previous table 6. The dispersion of gross lifetime incomes increases with retirement age and with the rate of growth of earnings. In all examined cases, the 2000 personal income tax is less progressive. The fall in the redistribution measure given by the changes in the Gini index before and after tax is particularly high in the case of the rate of growth set at 3% per year. Two effects might be at work in the explanation of the reduction of the redistributive effects of the personal income tax: i) the reduction of its progressivity, already documented in the static analysis, and ii) the general reduction of the level of pension benefits operated by the pension reform in 1995. The contribution related formula cuts the average level of pension benefits but has a stronger effects on high lifecycle income. Therefore there is a reduction in the part of the distribution of incomes taxed with higher marginal tax rates (Column A: 0.0277 vs 0.0215). Further, the results are not strictly comparable to those of the static section, because of differences in the sample units and, most important, in the reference variable used to classify people into deciles (annual income vs. lifetime income).

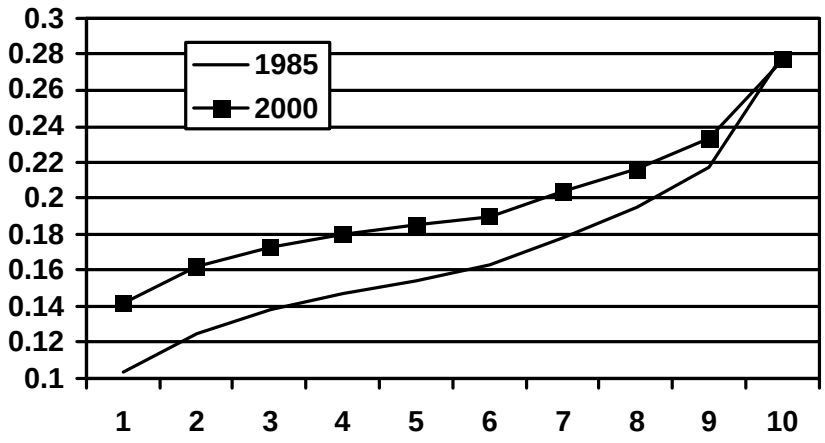
*Tab. 7: Distributive effects of the personal income tax on lifetime incomes*

| *Simulation hypotheses* | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| Retirement age | 57 | 63 | 65 | 63 | 63 | 63 |
| Growth rate of gross income | 0.015 | 0.015 | 0.015 | 0.03 | 0.015 | 0.01 |
| Discount rate | 0.02 | 0.02 | 0.02 | 0.02 | 0.04 | 0.0 |
| Survival probabilities different by age and sex? | Yes | yes | yes | Yes | yes | no |
| *Gini of:* | | | | | | |
| before personal income tax 1985 | 0.2854 | 0.2924 | 0.2965 | 0.3311 | 0.2930 | 0.29 |
| after personal income tax 85 | 0.2577 | 0.2613 | 0.2639 | 0.2867 | 0.2617 | 0.26 |
| before personal income tax 2000 | 0.2781 | 0.2854 | 0.2902 | 0.3244 | 0.2886 | 0.28 |
| after personal income tax 2000 | 0.2566 | 0.2613 | 0.265 | 0.2929 | 0.2645 | 0.26 |
| *Distributive effects of:* | | | | | | |
| Personal income tax 1985 | **0.0277** | **0.0311** | **0.0326** | **0.0444** | **0.0313** | **0.03** |
| Personal income tax 2000 | **0.0215** | **0.0241** | **0.0252** | **0.0315** | **0.0241** | **0.02** |

Finally an increase in the retirement age increases the distributive effects of the personal income tax when the pension system is contribution related whereas the opposite sign on the distribution of lifetime income is determined when the pension scheme is earnings related.

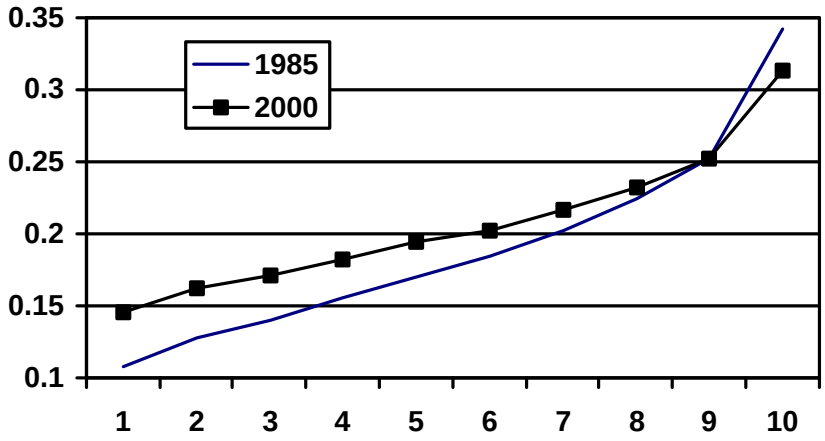
The two graphs that follow provide a clear evidence of the reduction in the distributive effect of the tax on lifetime incomes: Fig. 11 refers to our base case, and shows that from 1985 to 2000 all deciles but the richest one suffered an increase in the tax rate.

*Fig. 11: Income tax incidence on lifetime incomes (col. B – growth rate 1.5%)*




If the growth rate of incomes is doubled from 1.5% per year to 3%, the last decile would even benefit a reduction in the tax rate, and the reduction in redistributive efficiency would be more intense.

*Fig. 12: Income tax incidence on lifetime incomes (col. D – growth rate 3%)*



*Concluding remarks*

In this chapter we have studied the distributive impact on household incomes of the consolidation of the Italian budget during the last 15 years. Our simulations have been conducted both on a static and a dynamic framework. In the first case, the focus has been on the tax side of the public budget. We have estimated how the burden of the fiscal system would have changed if the households living in 1985 had been exposed first to the fiscal rules of that year, and then to those rules prevailing 15 years later.

The most noticeable result is that the consolidation seems not to have changed the overall distributive impact of the tax-benefit system. We found that the difference between the Gini coefficients before and after the set of policy measures here examined is even slightly greater in 2000 than in 1985. The decomposition of the distributive impact of the tax-benefit system in these two years shows however that during the period there has been a strong decline in the whole progressivity of the system, counterbalanced by an equally relevant increase in the incidence of net taxes.

Moving to a more disaggregated analysis, the profile of the average rate by deciles of the personal income tax did not change at all, being the 2000 incidence profile almost an upward shift of the 1985 one. On the other hand, the burden of indirect taxation increased substantially for the first decile, in general keeping its overall regressive effect on income deciles. The increase in family allowances for the poorest section of the population compensated the rise in indirect tax regressivity. The analysis by demographic characteristics confirms that the increase in the burden was equally spread across all groups considered.

During the observed period, fiscal policies were directed also to recover the long term substainability of the pension system. The distributive impact of the reforms enacted in Italy from 1992 onwards may be better appreciated using an intertemporal framework. Using a simulate panel covering the whole life-cycles of people living in 1985, we have therefore studied the steady-state effects of the switch from an earnings-related to a contribution-related payg pension scheme, taking also into account the increase in the level of contributions.

Two main results emerge from the dynamic section. First, for all deciles of lifetime income the new system is much less generous. In our base case, the difference between the present values of contributions and pensions becomes positive, meaning that current and future generations will be called to pay for the implicit debt created by the introduction of the payg system. The second important point is that the contribution-related pension scheme is more neutral in the intragenerational distribution of resources,

while the previous system was more favourable for the richest part of the population. The combination of these two findings means that in the future the government should find outside the old-age pension system the resources to sustain the living standards of the lowest part of the distribution.

We used the dynamic framework also to study the effects of the changes in the personal income tax. In this context, the personal income tax from 1985 to 2000 becomes less redistributive over lifetime incomes. This result might be influenced, at least in our model, by the reduction in the inequality of before tax lifetime incomes following the pension reform.

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