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Funding a PAYG Pension System: The Case of Italy

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Abstract

Italy is characterised by a mature pay-as-you-go social security system and by particularly adverse population projections. Given these trends, the social security contribution rate is expected to increase above its current high level. This hinders the development of employer-provided pension funds and introduces a significant wedge between labour cost and earnings that discourages both labour demand and labour supply. Any proposal to reduce payroll taxes and to reform the system in the direction of partial funding has to cope with the state of Italian public finances. Italy has to comply with the Stability and Growth Pact that imposes constraints on budget deficit and debt trends. Using micro data from the Bank of Italy's Survey of Household Income and Wealth and official population projections, we estimate future employment trends under different demographic and macroeconomic scenarios and compute the cost of the transition. We show that it would be substantially reduced if positive effects on employment were induced by the payroll tax reduction.

JEL classification: H55, H62, J11.

I. INTRODUCTION

Italy is characterised by a mature pay-as-you-go (PAYG) social security system and by particularly adverse population projections. Major social security reforms have been undertaken, starting from 1992. Under the new system introduced in 1995, the award formula for newly insured workers is based on contributions:

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each worker holds a fictitious social security account financed by a fixed share (33 per cent for employees) of earnings for the years of actual contribution. The new award formula will be fully phased in around 2035; during the transitional period, pension awards will be determined partly by the old rules and partly by the new ones. Benefits will continue to be provided on a PAYG basis, though.

Efforts to foster the development of supplementary private retirement plans have also been made. In particular, severance payments of newly insured workers (currently 6.9 per cent of earnings) may now be converted into contributions to occupational pension funds, sponsored either by the employer or by the trade union. This, however, does not imply a corresponding reduction in contributions to the first pillar. As a result, the total contribution rate to the social security system may exceed 40 per cent for new employees.

Although it is widely recognised that such a level of contribution places too high a burden on employment, any proposal to reform the PAYG system in the direction of a partial funding has to cope with the state of Italian public finances. Italy has to comply with the Stability and Growth Pact which imposes constraints on budget deficit and debt trends.

Our paper aims to contribute to the current debate on the desirability and feasibility of the development within the Italian social security system of a second funded pillar. Recent proposals in this direction are Castellino and Fornero (1997) and Modigliani, Ceprini and Muralidhar (1999). The proposal by Castellino and Fornero moves from the belief that a mixed social security system is preferable to a PAYG system; it entails leaving the total contribution to the system unchanged, while giving employees the option to shift about a quarter of total payroll tax to a funded scheme. The revenue shortfall thereby induced should be compensated by interventions aimed at reducing, for newly retired people, the generosity of the system. Modigliani et al.'s proposal is more drastic: they suggest a gradual complete shift to a public fully funded scheme, financed by a temporary additional contribution to a new social security fund. Since the market return on the fund is assumed to be significantly higher than the PAYG internal rate of return, the contribution rate to the social security system can be gradually reduced while keeping replacement rates constant. An evaluation of the costs and benefits of a gradual shift to a mixed system is also provided by Brugiavini and Peracchi (1999). They point out the opportunity of moving in the direction of a multi-pillar system with substantial room for a funded component, and present a set of simulations of future pension liabilities and tax revenues under both the current PAYG system and an alternative set-up that assumes a gradual switch to a mixed system.

Unlike the existing proposals, our approach moves from the idea that the replacement rates guaranteed by the system, as envisaged by current legislation, allow for a payroll tax reduction. The result should be a mixed system, made up by a smaller-than-current public PAYG component and a private fully funded one, possibly fed with severance payments and additional voluntary

contributions.[1] The reduction in payroll taxes together with the partial funding, through their potential positive effects on the labour market, can help to dampen the cost of the transition.

In particular, the objective of our paper is twofold. First, we compute the replacement rate that the current Italian social security system guarantees to workers with different work histories, career profiles and legislative statuses (i.e. whether their pension award is computed according to the old rules, the new rules or a combination of the two). We then explore the extent to which a reduction in payroll taxes may be compatible with 'reasonable' levels of the replacement rate.

A reduction in payroll taxes will be associated with an immediate increase in the deficit of the social security system. As pension awards will eventually be linked to total contributions, the reduction in pension expenditure will gradually offset the deficit; the speed of this process will depend on how quickly the reform is phased in. Thus, our second goal is to estimate the cost of the transition.

We show that the replacement rate guaranteed by the PAYG system to a newly insured worker, contributing for 40 years and retiring at age 65, ranges between approximately 44 and 88 per cent, depending on his career profile. However, if this worker uses his severance payments to finance a fully funded occupational scheme, then the replacement rate he obtains by the combination of both systems will be much higher (between 56 and 113 per cent). Further, we show that a payroll tax reduction of 10 percentage points can still guarantee to such a worker with a flat or medium career profile, contributing 6.9 per cent of his earnings to a fully funded pension scheme, a replacement rate above 70 per cent.

Using micro data from the Bank of Italy's Survey of Household Income and Wealth and official population projections, we estimate future employment trends under different demographic and macroeconomic scenarios and compute the cost of the transition, as measured by the size of the deficit (net of savings from lower future pension benefits) of the PAYG system induced by a 10 percentage point decrease in the contribution rate. Of course, the size of the deficit depends on how quickly the payroll reduction is phased in. We consider three alternative scenarios: (i) a gradual transition, under which only new entrants to the labour market reduce their contributions to the PAYG system; (ii) a sudden transition that requires all current and future workers to reduce their contributions to the PAYG system; and (iii) an intermediate scenario, under which only some current workers (those whose pension awards, according to the

[1]Recent papers by Feldstein (1995, 1996 and 1997) show, for the USA, long-run rates of return on financial assets well above the growth rate of earnings. The evidence from other countries is more ambiguous (see Miles (1998) and, for Italy, Fornero (1995)). Moreover, consideration also of the risk associated with these alternative forms of investment suggests that a mixed portfolio may be optimal. This would be an argument in favour of a partial privatisation of the social security system.

1995 reform, are determined partly by the old rules and partly by the new ones) and all future workers reduce their contributions to the PAYG system.

Simulations of general equilibrium models show that privatising social security can have significant growth effects and can substantially increase labour supply (Kotlikoff, 1996). Privatising social security reinforces the link between marginal retirement saving and marginal retirement income and reduces the total effective marginal tax on labour supply. Similarly, privatising social security will increase the average retirement age if social security regulations encourage early retirement (Hurd, 1990; Gruber and Wise, 1999). Using a cross-country regression, Gruber and Wise (1997) show that roughly 80 per cent of the variation in the unused labour capacity of workers aged 55–65 can be explained by the variation in implicit payroll tax after social security eligibility.[2] If the labour market is non-competitive, a decrease in unemployment will possibly add to the above effects. Daveri and Tabellini (2000) estimate that, in the period between 1965 and 1991, a 10 percentage point increase in effective labour taxes may have accounted for a 4 percentage point increase in European unemployment, and that the observed increase in labour taxes is associated with a reduction of the EU growth rate of about 0.4 of a percentage point per year.

Forecasting the likely effect of the reform on the labour market equilibrium is obviously not straightforward. A much easier task is to provide an evaluation of the employment response that would be necessary to balance the net present discounted value of the cost of the reform. In order to capture all future effects of the reform and assess the long-run financial properties of the system, once the population is assumed to become stationary, we have to consider a rather long time horizon; in fact, our forecasting period extends far beyond what would be required by those purposes (to the year 2200).

We argue that positive effects on employment possibly induced by the payroll tax reduction can substantially reduce the cost of the transition. In particular, under the hypothesis that the pension reform has no impact on total employment, we show the following:

- If the reform applies only to new employees, the cost of the transition will increase from about 0.02 per cent of GDP in 2000 to 0.4 per cent in 2010. It will further increase to 1.1 per cent in 2025, when the reduction in pension expenditure will start offsetting the contribution loss and the adverse effects of the demographic transition will be highest. The cost will essentially disappear after 2050.
- If the reform applies to all current and future employees, the cost of the transition will be around 1.8 per cent of GDP between 2000 and 2010; it will decrease to around 0.2 per cent of GDP in 2035 and become zero between 2040 and 2045.

[2]An analysis of the disincentive effects of the Italian social security system can be found in Brugiavini (1999).

- If the reform applies only to some current employees (the 'pro-rata' workers) and all future beneficiaries, the cost of the transition will be about 1.2 per cent of GDP in 2000. It will peak at about 1.5 per cent of GDP in 2005, to decrease afterwards and reach zero between 2040 and 2045.

However, if the payroll tax reduction and the incentives provided by the partial shift to funded schemes have positive effects on the labour market, then the cost of the transition will be substantially smaller. In particular, we estimate that if the employment rate increases, with respect to the baseline scenario, by 0.66 of a percentage point a year until 2025 (approximately 120,000 units per year until that date), then the reform applied to new employees would be entirely self-financing. Savings will start compensating costs as early as 2030.

II. THE ITALIAN SOCIAL SECURITY SYSTEM

Since the beginning of the 1990s, the Italian social security system has been the object of two major reforms: the first in 1992 (referred to as the Amato reform) and the second in 1995 (known as the Dini reform). A minor reform took place in 1998 (the Prodi reform). Currently, the system consists of a predominant (unfunded and in deficit) PAYG scheme and occupational pension plans. Even though the necessary legislation is already in place, occupational pension plans are developing very slowly.

1. The First Pillar

The public social security programme is administered by a number of institutions. A large majority of the population are insured by INPS (Istituto Nazionale della Previdenza Sociale), which is responsible for a number of separate and independent funds. The most important among these is the fund for private sector employees (FPLD, Fondo Pensioni Lavoratori Dipendenti). More than 90 per cent of employees in the private sector are insured by FPLD-INPS. In the analysis that follows, we will refer to this subset of workers.

Up to 1992, benefits to private sector employees were computed on the basis of 'pensionable earnings', obtained by averaging the earnings in the last five years of work. Pensionable earnings were converted into social security benefits by applying a 2 per cent factor for each year of social security contribution up to a maximum of 40 years. Hence, a worker could get at most 80 per cent of his pensionable earnings.

The 1992 Amato reform extended the number of years over which pensionable earnings were computed, made the eligibility criteria for retirement tighter (age 65 for men and 60 for women, instead of 60 and 55 respectively) and changed the basis for indexation of pension benefits from average earnings to prices.

The 1995 reform introduced a major change in the award formula. Under the new system, benefits are based on contributions: each worker holds a fictitious social security account financed by a fixed share (33 per cent for employees) of earnings. The social security benefit is the annuity equivalent to the present value at retirement of past payroll taxes, capitalised at a five-year moving average of the nominal GDP growth rate. The system financing, however, remains on a PAYG basis. The retirement age is flexible between 57 and 65. The new award formula will be fully phased in by around 2035; during the transitional period, pension awards will be determined partly by the old rules and partly by the new ones. As a result, employees are currently divided into three groups, depending on the award formula that applies to them. The formula based on contributions applies only to workers taking their first employment after 31 December 1995; the pre-1995 formula still applies to workers who had at least 15 years of contributions on 31 December 1992; finally, a formula that is a combination of old and new rules (the so-called 'pro-rata' regime) applies to workers with fewer than 15 years of contributions on 31 December 1992.

2. The Second Pillar

Workers can now enrol into supplementary occupational retirement funds. These plans have to be agreed upon by unions and employers and, at least for employees, have to be defined contribution schemes. The legislation stipulates that severance payments of newly insured workers (currently equal to 6.9 per cent of annual earnings) have to be entirely converted into contributions to occupational pension funds, if the worker chooses to join one, while those of other workers can be partly converted as specified by plan provisions. To speed up the development of these plans, tax incentives on contributions were provided: both employer and employee contributions were, until recently, deductible up to 2 per cent (together up to 4 per cent) of the employee's annual salary; however, each contribution could not exceed a total amount of approximately 1,300 euros. The Italian Parliament has recently agreed to increase the overall rate of deductible contributions to 12 per cent of salary, with an upper limit of approximately 5,000 euros. The deduction is conditional on an additional contribution of at least half of the amount from severance payments. Despite the tax incentives, a negligible fraction of employees have enrolled in occupational funds so far. Moreover, the enrolment rate is particularly low among young workers.

3. Possible Future Developments

At the moment, it is not easy to predict the development of supplementary occupational funds. The actual diffusion of such plans will depend greatly on the overall development of the entire social security system. Under the current system, occupational plans may be redundant. Payroll taxes for employees are

now at 33 per cent, which is a significant burden; additional contributions to occupational plans would increase this burden on workers. Moreover, the first pillar by itself guarantees, for most work histories, replacement rates above both the OECD and EU averages. Adding the coverage obtained by occupational plans, replacement rates can exceed 100 per cent (see Tables 1–3). Further, since employers pay, by law, a very low return on severance payments, they are reluctant to convert severance payments funds (Trattamento di Fine Rapporto, TFR) into occupational pension plans, unless this is accompanied by a reduction in payroll taxes.

In this paper, we consider the development of occupational schemes as part of a wider plan to reform Italian social security in the direction of partial privatisation. Such a plan should entail a reduction in the size of the first pillar together with a large-scale development of funded occupational schemes.

Funding a social security system financed on a PAYG basis is costly: during the transition, in addition to paying retired people's benefits, workers have to pay contributions to the funded schemes. However, because of particularly adverse population trends, pension expenditure is expected to rise from 14.2 per cent of GDP in 1998 to around 16 per cent in 2031.[3] Notwithstanding the 33 per cent payroll tax, the system is not in equilibrium — the consequences in terms of intergenerational redistribution and higher future taxes being well known.[4] In addition, partially funding social security, together with a reduction in payroll taxes, can yield positive effects on both labour supply and labour demand. This would help to reduce the cost of the transition induced by the payroll tax cut.

Since a second funded pillar will guarantee a supplemental retirement income, we are interested in assessing by how much contributions to the PAYG pillar can be reduced while maintaining a given replacement rate. We will set a target range for replacement rates (discussed in the next section) to be achieved by the combination of the two pillars and a range of levels of contribution to the funded schemes, and we will work backwards to compute the possible reduction in contributions to the PAYG pillar. Once we have an estimate of a reasonable payroll tax cut, we will compute the size of the deficit thereby induced.

[3]These figures are reported in the official projections (Department of General Accounts, Ministry of Treasury, Budget and Economic Planning, 1999), based on population and labour-force participation dynamics that may be too optimistic.

[4]The equilibrium contribution rates are estimated to be around 44 per cent and 48 per cent for employees in the private and public sectors respectively. A detailed analysis of the intergenerational redistribution induced by the social security system in the Italian case can be found in Franco et al. (1994).

III. THE REPLACEMENT RATE

1. Theory and International Comparison

What is a 'sensible' replacement rate? Should mandatory government-provided old-age benefits guarantee such a replacement rate (or rather should the mandate be smaller)? Although answering such questions is far beyond the aim of this paper, a look at the theory and at other countries' experiences may be useful to understand the Italian case better.

The first question has usually been addressed in the context of life-cycle models. Under restrictive assumptions, these models predict that rational individuals want to keep the level of consumption constant during their entire life.[5] This implies that income flows net of saving must be constant over the life cycle. Therefore, in the absence of other old-age income sources, retirement benefits must be a fraction 1–*s* of gross earnings, where *s* denotes the saving rate. In particular, consider an individual who works and saves for 30 years (aged 35–64), is retired for 15 years and then dies. Assume no wage growth and zero interest rate. Then, a saving rate of a third would finance a constant consumption flow. Allowing for taxes and work-related expenditures, a lower saving rate would suffice. The required saving rate increases with wage growth and decreases with the interest rate.[6]

Of course, as pointed out by Diamond (1977, p. 290), 'many elements in addition to a steady consumption level after retirement enter into a sensible wealth accumulation pattern. In addition to redistributing planned consumption, wealth serves to cushion unexpected large expenditures and unexpected decrease in earnings'. Further, the above example

> … has omitted early working years (before age 35), inheritance received or expected, planned bequests, and expenses for children. Consideration of these various functions served by accumulated wealth makes clear that an individual would not want all his planned retirement consumption in a wealth form which is inaccessible before retirement. As the level of Social Security benefits gets close to the optimal retirement consumption

[5]Basically, a flat consumption profile is optimal if: (i) the individual's discount factor equals the (reciprocal of the) interest rate; (ii) there is no uncertainty about future labour income or, if there is, utility is quadratic; (iii) the utility function is defined in terms of consumption only; and (iv) there are no borrowing constraints.

[6]The example is from Diamond (1977). For Italy, where employer and employee contribution rates are respectively about 24 per cent and 9 per cent of gross earnings, this simple exercise shows that an employee who only saves for retirement purposes (i.e. s = 9 per cent) will be able to maintain a constant consumption flow if his pension benefit equals 91 per cent of his gross earnings. If he saves in addition to his social security contributions, the replacement rate that provides him a constant consumption path will obviously be smaller. Further, current total payroll taxes (33 per cent of gross earnings and approximately 27 per cent of gross earnings plus employer contribution) would be enough to guarantee to an employee with a flat career, who worked for 40 years (aged 25–64) and is retired for 15 years, consumption at retirement as high as the pre-retirement one. Under such circumstances, according to the basic intuition of the life-cycle theory, there would be no room for additional saving.

> level, Social Security becomes an inefficient way to hold wealth. Thus, there is a clear efficiency justification for the conventional description of Social Security as aiming for a floor on retirement income rather than the optimal individual level.[7]

As far as the second question is concerned, conventionally there are four reasons for government social security programmes: (i) income redistribution (within and between generations); (ii) market failures (in particular, the absence of safe investment opportunities, the absence of real annuities, and moral hazard and adverse selection problems in insuring the risk associated with varying lengths of working life and of life); (iii) intergenerational risk sharing; and (iv) paternalism (that is, individuals will not save enough for retirement if left to their own devices). Nonetheless, heterogeneity in individual preferences, in terms of discount factors, life expectancy, risk aversion and others, makes mandatory retirement saving, generally characterised by a uniform saving rate and uniform retirement age, inefficient. Again, the inefficiencies associated with mandating such saving suggest the desirability of a mandate smaller than would, by itself, finance a comfortable retirement period. This leaves room for supplementary systems.

These brief considerations provide the theoretical justification behind our argument. The amount of resources that the Italian social security system requires to be devoted to retirement leaves little room for additional saving. Moreover, such resources are entirely used to finance the public PAYG system. There is a wide consensus on the fact that a mixed system (consisting of a public, mandatory, PAYG component and a private, funded one) is preferable to a fully public, mandatory, PAYG system. A mixed system allows for some risk diversification (demographic shocks, which affect the rate of return of a PAYG system, are scarcely correlated with interest rate shocks, to which a fully funded system is vulnerable). Besides, in a PAYG system, the payroll tax is perceived as an effective tax, since the link between marginal retirement saving and marginal retirement income is very loose. This, together with the pension award formula, may discourage labour supply. A reduction in the size of the main pillar may thus produce beneficial effects on employment; it would not decrease replacement rates substantially as long as a second funded pillar were introduced.

Turning to an international comparison, contribution rates and replacement income rates vary widely across countries. Table 1 reports contribution rates in the EU countries and expected old-age pension gross replacement rates in 26 OECD countries. Both sets of values refer to 1995. The figures for replacement rates are from Blöndal and Scarpetta (1998). They are theoretical values

[7]See Diamond (1977, p. 290).

TABLE 1

Contribution Rates and Replacement Rates in OECD Countries, 1995

	Contribution rates[a]			*Replacement rates*
	Employer	*Employee*	*Total*	
Australia				40.9
Austria	12.55	10.25	22.80	79.5
Belgium	8.86	7.50	16.36	67.5
Canada				51.6
Czech Republic				53.2
Denmark[b]	0.00	0.00	0.00	56.2
Finland[c]	16.20	4.00	20.20	60.0
France	8.20	6.55	14.75	64.8
Germany	9.30	9.30	18.60	55.0
Greece	13.33	6.67	20.00	120.0
Hungary				54.6
Iceland				93.0
Ireland	9.00	6.75	15.75	39.7
Italy	18.93	8.34	27.27	80.0
Japan				52.1
Luxembourg[d]	8.00	8.00	16.00	93.2
Netherlands	0.00	16.35	16.35	45.8
New Zealand				61.3
Norway				60.0
Poland				53.7
Portugal	23.25	11.00	34.25	82.6
Spain	23.60	4.70	28.30	100.0
Sweden	18.86	0.00	18.86	74.4
Switzerland				49.3
UK[e]	10.20	10.00	20.20	49.8
USA				56.0
Average of above countries	12.88	7.82	20.69	65.2

[a]Figures generally refer to the 'old-age and survivors' function. For Ireland, Portugal, Spain and the UK, they refer to the global contribution for social protection.
[b]Tax-financed.
[c]Figures refer to contributions for the 'employment pension' only. In addition, a rate of 0.55 per cent and a rate between 2.4 and 4.9 per cent are respectively paid by the insured and the employer for the 'national pension'.
[d]An additional 8 per cent is paid by the State.
[e]The employer contribution rate varies between 3 and 10.2 per cent with the level of earnings. The employee contribution rate is 2 per cent on the first £58 and 10 per cent on earnings between £58 and £440.
[f]The average replacement rate in the EU countries only is 71.2.
Sources: European Commission (1996) for contribution rates; Blöndal and Scarpetta (1998) for replacement rates.

referring to employees who enter the labour market at age 20 and work uninterruptedly until the standard age of entitlement to a public pension.[8] Contribution rates, for the 'old-age and survivors' function only, range between 14.75 per cent in France and 27.27 (now 33) per cent in Italy. The average contribution rate, which also includes figures referring to global contribution for social protection (for Ireland, Portugal, Spain and the UK), is about 21 per cent. Replacement rates generally reflect contribution rates. The average replacement rate is 65.2 per cent for the entire sample and 71.2 per cent for the EU countries only. According to these figures, the replacement rate guaranteed by the Italian social security system is 80 per cent, far above the averages. It must be noticed, however, that a simple comparison of replacement rates across countries may not be correct. Besides the fact that the rates refer to a specific type of worker, which may not be representative in every country, differences in pension indexation rules also matter. Among the EU countries, in Austria, Denmark, Finland, France, Germany and the Netherlands, pension benefits are currently indexed to wages. In Italy, the annual adjustment is based on the development of the cost of living. In such a case, the replacement rate, being based on the first pension award only, is not a good indicator of the relative living standard of retired people over their entire life. In order to account for this problem, we also compute the replacement rates guaranteed to workers subject to the Dini regime under the hypothesis that pension benefits were indexed to GDP growth.[9] The results are discussed in the following subsection.

2. The Case of Italy

The current Italian social security system allows for three different legislative statuses of insured people, depending on how many years of contributions they had when two major reforms were implemented (the Amato reform and the Dini reform, in 1992 and 1995 respectively). In particular, as already pointed out in Section II(1), the pension award formula varies according to whether the worker belongs to the Amato regime (workers with at least 15 years of contributions on 31 December 1992), the pro-rata regime (workers with fewer than 15 years of

[8]The replacement rates are computed as averages of four cases: two earnings levels (average and two-thirds of average) and two household compositions (single worker and worker with a dependent spouse). The earnings profile is assumed to be flat and earnings are revalued according to changes in average earnings. The rates refer to basic pensions, means-tested supplements and mandatory occupational pensions only.

[9]Under the Dini regime, the first pension award is computed in order to guarantee the actuarial equivalence between total contribution and the expected stream of benefits. Instead of indexing such benefits to the real growth of the economy, it has been decided to incorporate the expected long-run GDP growth rate (1.5 per cent) in the coefficients that transform total contribution into the first pension award, and to let future benefits adjust to changes in prices only. By setting the expected long-run GDP growth rate equal to 0 in the 'transformation coefficients', we are able to estimate what the first pension award would be if benefits were indexed to the real growth rate.

contributions on 31 December 1992) or the Dini regime (workers hired after 31 December 1995).

For each one of these regimes, we compute the replacement rate (defined as the ratio of the first pension award to the last wage) that the system guarantees to workers entering the labour market at age 25, characterised by different career

TABLE 2

Income Replacement Rates for Individuals Entering the Labour Market at Age 25

(a) Pre-Dini Regimes

Career profile[a]	*Age at retirement*	*Pre-Amato*	*Amato*[b]	*Pro-rata*[b]	*Pro-rata*[b] *(life expectancy in 2010)*
Flat	57	—	—	—	—
	60	68.6	68.4	65.0	62.4
	65	78.4	79.5	83.1	79.7
Medium	57	—	—	—	—
	60	67.3	65.7	60.0	57.6
	65	76.9	76.1	75.0	71.9
Brilliant	57	—	—	—	—
	60	63.6	58.9	48.6	46.8
	65	72.7	67.5	57.5	55.3

(b) Dini Regime

Career profile[a]	*Age at retirement*	*Price indexation*	*Price indexation (life expectancy in 2025)*	*Real indexation*	*Real indexation (life expectancy in 2025)*
Flat	57	53.9	48.1	44.2	38.5
	60	64.8	57.8	54.2	47.3
	65	88.2	76.6	75.8	64.4
Medium	57	46.2	41.3	38.0	33.1
	60	54.8	48.9	45.8	40.0
	65	72.8	63.2	62.6	53.2
Brilliant	57	30.9	27.6	25.4	22.1
	60	35.4	31.6	29.6	25.9
	65	44.5	38.7	38.3	32.5

[a]The flat career profile refers to an individual earnings growth rate 0.5 of a percentage point lower than the GDP growth rate. The medium and brilliant career profiles refer to individual earnings growth rates 0.5 and 3.5 percentage points higher than the GDP growth rate respectively.
[b]Figures refer to workers with 20 and 10 years of contribution on 31 December 1992 for the Amato and the pro-rata regimes respectively.
Source: Authors' calculations.

profiles and ages at retirement. The baseline individual earnings growth rate (the 'medium' career profile) is assumed to be slightly (+0.5 per cent) above the GDP growth rate. The 'flat' and 'brilliant' career profiles refer respectively to individual earnings growth rates slightly lower (–0.5 per cent) and substantially higher (+3.5 per cent) than the GDP growth rate. A detailed description of the award formulae is provided in Appendix A. The results are reported in Tables 2 and 3 respectively for the case in which retirement income comes from the first pillar only and for the case in which contribution to a second pillar is also envisaged. In particular, Table 3a presents the results for workers subject to the Amato and the pro-rata regimes, who start contributing to the second pillar in 2000. In Tables 3b and 3c, we report the replacement ratios provided by the system when the Dini reform is fully phased in both under the current set-up, characterised by a 33 per cent contribution rate and price-indexed pensions, and under three alternative scenarios: one in which the contribution rate is 23 per cent, another in which the indexation of pensions is to real growth and a third in which both circumstances occur together. According to the Dini reform, the 'transformation coefficients', which are used to convert the present value at retirement of total past contributions into the pension annuity, will be updated every 10 years to take into account changes in life expectancies and in long-term GDP growth expectations. Thus, for the pro-rata and the Dini regimes, we report the replacement ratios computed using transformation coefficients based on both life expectancies in 1995 and those in 2010 and in 2025, the years when respectively pro-rata and Dini workers start retiring.

As far as the first pillar is concerned, at low ages at retirement, for all career profiles, the replacement rate generally decreases as we move from the pre-Amato regime to the Dini regime. It must be noted, however, that, due to differences in the indexation mechanism envisaged by different regimes, the only meaningful comparison is among the pre-Amato and our 'modified' Dini regime, both characterised by real indexation. The comparison among the other regimes (Amato, pro-rata and Dini) is also correct, as all of them allow for price indexation only. However, for these cases, the replacement ratio is a much less powerful indicator of retired people's standards of living in a life-cycle perspective.

Under the Dini regime, early retirement is strongly penalised. In contrast, since pension benefits will eventually be linked to total effective contributions, in the presence of relatively flat careers and high ages at retirement, replacement rates for workers hired after 31 December 1995 (Dini workers) can be substantially higher than those guaranteed by the Amato regime. Under the Dini regime, which envisages price-indexed benefits, the replacement rate from the first pillar ranges between 31 per cent (for an individual retiring at age 57 with a brilliant career) and 88 per cent (for an individual retiring at age 65 with a flat career). If the pension benefit for individuals retiring around 2030, after

TABLE 3

Income Replacement Rates for Individuals Entering the Labour Market at Age 25

(a) Pre-Dini Regimes: Individuals Start Contributing to the Second Pillar in 2000

Contribution to second pillar	*Career profile*[a]	*Age at retirement*	*Amato*[b]	*Pro-rata*[b]	*Pro-rata*[b] *(life expectancy in 2010)*
4%	Flat	57	—	—	—
		60	70.6	70.0	67.1
		65	83.6	90.8	86.9
	Medium	57	—	—	—
		60	67.8	64.6	61.9
		65	79.9	81.7	78.3
	Brilliant	57	—	—	—
		60	60.7	52.2	50.2
		65	70.7	62.4	60.0
6.9%	Flat	57	—	—	—
		60	72.2	73.6	70.5
		65	86.6	96.3	92.1
	Medium	57	—	—	—
		60	69.3	67.9	65.0
		65	82.7	86.6	83.0
	Brilliant	57	—	—	—
		60	62.1	54.7	52.6
		65	73.0	66.0	63.3
12%	Flat	57	—	—	—
		60	75.0	80.0	76.5
		65	91.8	106.0	101.3
	Medium	57	—	—	—
		60	72.0	73.7	70.5
		65	87.6	95.3	91.1
	Brilliant	57	—	—	—
		60	64.5	59.3	56.9
		65	77.1	72.2	69.3

[a]See note a to Table 2.
[b]See note b to Table 2.

Table 3 continues

TABLE 3 continued

(b) Dini Regime (transformation coefficients computed with life expectancies in 1995)

Contribution to second pillar	*Career profile*[a]	*Age at retirement*	Contribution to first pillar: 33%		Contribution to first pillar: 23%	
			Price indexation	*Real indexation*	*Price indexation*	*Real indexation*
4%	Flat	57	62.5	52.4	46.2	40.0
		60	75.3	64.1	55.6	47.7
		65	102.6	89.5	75.9	66.5
	Medium	57	53.6	44.9	39.6	33.4
		60	63.6	54.2	47.0	40.3
		65	84.5	73.7	62.5	54.7
	Brilliant	57	35.7	29.9	26.4	22.2
		60	40.9	34.9	30.2	25.9
		65	51.4	44.8	37.9	33.2
6.9%	Flat	57	68.8	58.3	52.5	44.9
		60	82.9	71.3	63.2	54.9
		65	113.0	99.3	86.3	76.4
	Medium	57	59.0	49.9	44.9	38.4
		60	69.9	60.2	53.3	46.3
		65	93.0	81.7	71.0	62.8
	Brilliant	57	39.2	33.2	29.9	25.5
		60	44.9	38.6	34.2	29.7
		65	56.5	49.6	43.0	38.0
12%	Flat	57	79.8	68.7	63.5	55.3
		60	96.2	84.0	76.6	67.5
		65	131.4	116.7	104.7	93.8
	Medium	57	68.4	58.8	54.3	47.3
		60	81.1	70.8	64.5	56.9
		65	108.0	95.9	85.9	76.9
	Brilliant	57	45.4	39.0	36.0	31.3
		60	52.0	45.3	41.2	36.3
		65	65.3	57.9	51.8	46.3

[a]See note a to Table 2.

Table 3 continues overleaf

TABLE 3 continued

(c) Dini Regime (transformation coefficients computed with life expectancies in 2025)

Contribution to second pillar	*Career profile*[a]	*Age at retirement*	Contribution to first pillar: 33%		Contribution to first pillar: 23%	
			Price indexation	*Real indexation*	*Price indexation*	*Real indexation*
4%	Flat	57	56.0	46.0	41.4	34.4
		60	67.3	56.3	49.8	42.0
		65	89.3	76.5	66.1	57.0
	Medium	57	48.0	39.5	35.5	29.4
		60	56.8	47.6	42.0	35.4
		65	73.6	63.0	54.4	46.9
	Brilliant	57	32.0	26.3	23.6	19.6
		60	36.6	30.6	27.0	22.8
		65	44.8	38.3	33.0	28.5
6.9%	Flat	57	61.6	51.5	47.1	39.8
		60	74.1	62.9	56.6	48.6
		65	98.5	85.3	75.3	65.8
	Medium	57	52.8	44.1	40.3	34.1
		60	62.6	53.1	47.8	40.9
		65	81.1	70.2	61.9	54.1
	Brilliant	57	35.2	29.3	26.8	22.6
		60	40.2	34.1	30.6	26.2
		65	49.2	42.5	37.5	32.7
12%	Flat	57	71.6	61.0	57.1	49.4
		60	86.2	74.4	68.7	60.1
		65	114.7	100.7	91.5	81.2
	Medium	57	61.3	52.2	48.8	42.2
		60	72.7	62.7	57.9	50.6
		65	94.2	82.8	75.1	66.6
	Brilliant	57	40.7	34.7	32.3	27.9
		60	46.6	40.1	37.0	32.3
		65	57.0	50.0	45.2	40.1

[a]See note a to Table 2.
Source: Authors' calculations.

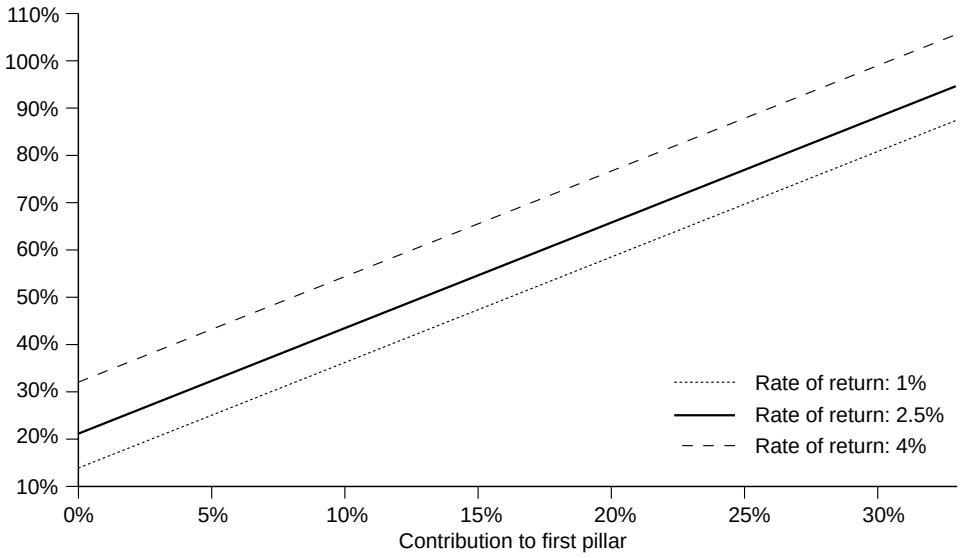
approximately 35 years of contributions, were computed using life expectancies observed in 2025, then the first pension award would range between 28 and 77 per cent of their last wage. Finally, if pensions were indexed to wages instead of prices, then, in order to guarantee the actuarial equivalence between total contribution and expected streams of benefits, the first pension award would obviously be lower. In particular, depending on the age at retirement, replacement rates would range between 44 and 76 per cent, between 38 and 63 per cent and between 25 and 38 per cent respectively for workers with flat, medium and brilliant careers.

In the presence of additional contributions to the second pillar, the replacement rate is obviously higher. Under the current Dini regime, a medium-career worker who devotes his severance payments to a fully funded occupational scheme (whose rate of return is assumed to be 2.5 per cent on average) will obtain a pension award ranging between 59 and 93 per cent of his last wage, depending on the age at retirement (see Table 3b). If this worker wanted to take advantage of the total tax incentives envisaged by the current legislation (by contributing 12 per cent to the pension fund), then he could achieve a replacement rate as high as 108 per cent. These values would be lower if pensions were indexed to real growth or were based on updated life expectancies. In the presence of a contribution to the second pillar of 6.9 per cent, replacement rates would range between 50 and 82 per cent in the first case and between 53 and 81 per cent in the second case. A 10 percentage point decrease in the contribution to the PAYG system would bring the replacement rate, for a medium-career worker, hired after 31 December 1995, retiring at 65 and contributing 6.9 per cent to a fully funded scheme, down to approximately 71 per cent (62 per cent if pensions were computed using life expectancies in 2025). In the presence of real indexation, the system would guarantee to this worker a replacement rate of 63 per cent (54 per cent with life expectancies in 2025).

Of course, the replacement rates guaranteed by the mixed system depend heavily on the assumption about the rate of return of the funded pillar — that is, the market interest rate. In order to provide an assessment of the risk associated with such a source of uncertainty, we plot in Figure 1 the replacement ratios obtained by a medium-career worker who contributes for 40 years (between the ages of 25 and 65) to a pension fund using 6.9 per cent of his wage, for any level of contribution to the first pillar ranging between 0 and 33 per cent. We assume three possible real rates of return from the pension fund: 1 per cent, 2.5 per cent and 4 per cent. The replacement ratio guaranteed by the second pillar ranges between 13.2 and 31.5 per cent, depending on the rate of return. Each additional point of contribution to the first pillar allows for an increase in the replacement ratio of 2.2 percentage points. Therefore, in the worst scenario envisaged in our

FIGURE 1

Replacement Ratios for a Medium-Career Worker, Retiring at 65 and Contributing 6.9 Per Cent of His Wage to a Pension Fund



exercise, a medium-career worker who contributes for 40 years to the pension system — 6.9 per cent and 23 per cent of his wage respectively to the first and second pillars — will obtain a replacement ratio of approximately 64 per cent.

IV. THE COST OF THE TRANSITION

In this section, we report the results of our estimation of the tax loss from a reduction in the contribution rate to the first pillar, net of the savings induced by the corresponding decrease in future pension benefits. Our baseline case consists of a 10 percentage point payroll tax cut. As we showed in the previous section, a contribution rate of 23 per cent to the public pension scheme, together with one of 6.9 per cent to the occupational fund, allows an individual with an average career profile, working 40 years and retiring at age 65, to achieve replacement rates in line with the EU average (about 70 per cent).

We assume that the reform only applies to employees in the private sector. The reason why we choose to deal with this subset of workers only is twofold. First, an assessment of the cost of social security privatisation should exclude public employees because a reduction in their contributions does not entail a revenue loss for the general government. Second, employees in the private sector represent a large fraction (about 50 per cent) of total employment and total pension expenditure. Therefore our intermediate goal is, given official

population projections, to estimate future employment and earnings levels in the private sector.

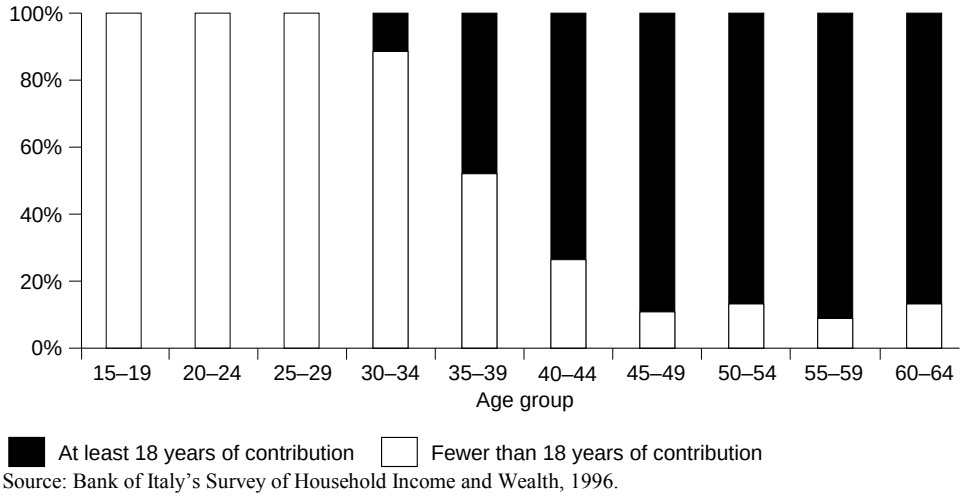
1. Population, Employment and Earnings Projections

Population projections are from ISTAT (1997a) and cover the period 1996–2050. They refer to three demographic scenarios (defined as 'main variant', 'high variant' and 'low variant'), each constructed assuming different evolutions of fertility, mortality and migration flows. The main variant is based on the most likely evolution of each demographic factor, given the trends observed in recent years.

In order to project the population from the 2050 ISTAT horizon onwards, we have to make assumptions about fertility and mortality rates and migration flows beyond that date. In particular, ISTAT assumes that the total fertility rate, currently equal to 1.2 children per woman, stabilises at 1.45 after 2020 in the main variant and at 1.1 and 1.75 respectively in the low and high variants. We keep these rates constant after 2020 throughout our forecasting period. Similarly, ISTAT assumes that mortality rates increase linearly so that, in 2020, men and women reach average life expectancies of 78.3 and 84.7 years respectively in the main variant. Life expectancies in 2020 will be 80.1 for men and 86.3 for women in the high variant, and 76.9 and 83.3 in the low variant. Consistent with the ISTAT hypothesis, we project mortality rates linearly up to 2050; we keep them constant beyond 2050. As for migration flows, ISTAT assumes that, in 2020, net

FIGURE 2

Percentages of Private Sector Employees with At Least and Fewer Than 18 Years of Contributions at 31 December 1995



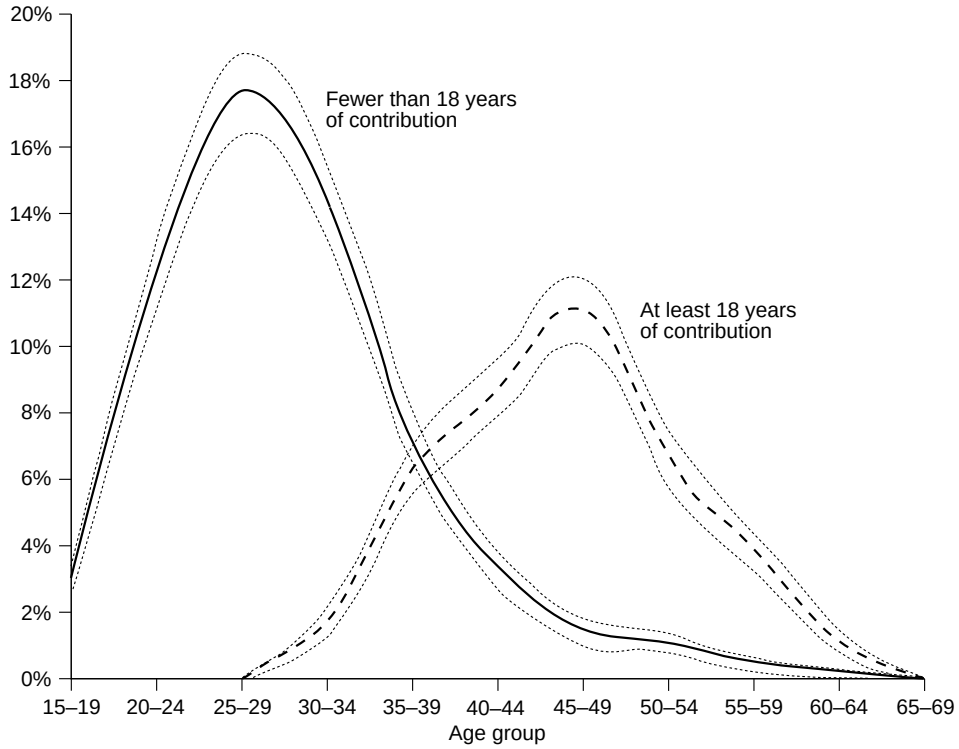
Source: Bank of Italy's Survey of Household Income and Wealth, 1996.

inflows reach 56,000 units in the main variant and 35,000 and 76,000 in the low and high variants respectively. We keep these figures constant after 2020. Under these assumptions, the population reaches the steady state, characterised by a constant age structure, in approximately 2080.

The distributions by sex and age of employment and earnings in the private sector are obtained using micro data from the Bank of Italy's 1996 Survey of Household Income and Wealth (SHIW). The SHIW refers to a sample of more than 8,000 households interviewed about their economic condition during 1995. We use the structure by sex and age as in the SHIW and rescale it according to total employment and wage bill in the private sector as reported in National Accounts data. The SHIW also allows us to distinguish, among private employees, those who had at least 18 years of contributions at the end of 1995

FIGURE 3

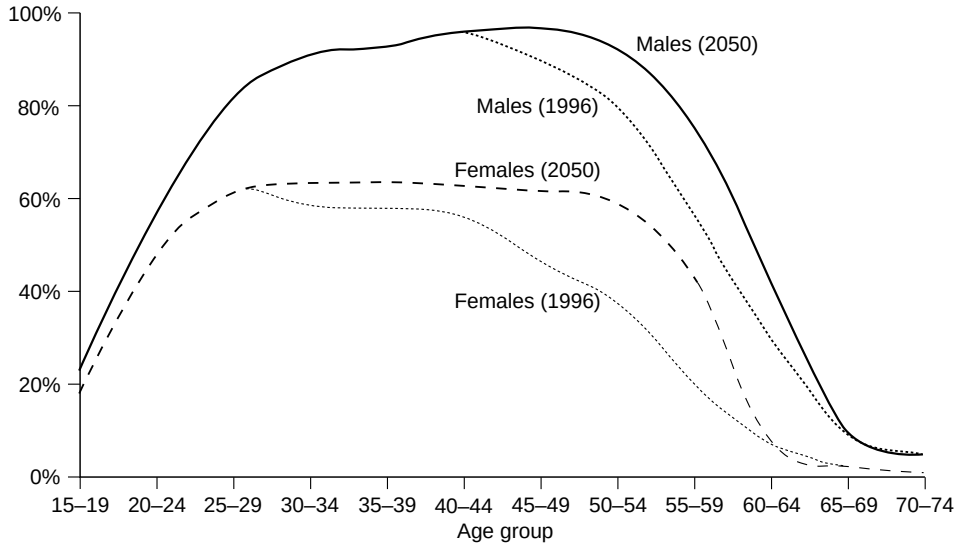
Private Sector Employees with At Least and Fewer Than 18 Years of Contributions at 31 December 1995, by Age Group, as a Percentage of Total Employees



Notes: Survey means. The pale dotted lines show the 95 per cent confidence interval.
Sources: Bank of Italy's Survey of Household Income and Wealth, 1996; ISTAT (1997b).

FIGURE 4

Labour-Force Participation Rates



Sources: ISTAT (1997b); authors' projections.

(see Figures 2 and 3), so we can classify them correctly according to their different pension statuses (i.e. whether they were subject to the Amato or the pro-rata regime).

Given the level and structure by sex and age of employees in the private sector in 1996 and the population projections, in order to forecast future private sector employment, we project participation rates and unemployment rates. We obtain participation rates by sex and age in 1996 from ISTAT labour statistics (ISTAT, 1997b). Such a structure is likely to change substantially in the highest age brackets, as a result of an expansion in the labour force among older people due to an increase in the average age at retirement induced by the recent pension reforms. The participation rates for males and females in 1996 and 2050 for our baseline scenario are shown in Figure 4.[10]

The level and structure by sex and age of unemployment rates are less predictable than those of the participation rates. Therefore we assume that they remain constant at their 1996 values. However, since we believe that a reform in our pension system towards a partial privatisation will deliver positive effects in the labour market (in terms of both demand and supply of labour), Section IV(3) presents results obtained by performing our exercise under the hypothesis that

[10]This projected structure of participation rates is analogous to the one adopted in the official pension expenditure forecasts (Department of General Accounts, Ministry of Treasury, Budget and Economic Planning, 1999).

employment rates will increase in the following decades. We assume that changes in total employment rates will correspondingly affect employment in the private sector.[11]

We project the 1996 earnings profile (in the private sector) assuming a 1.5 per cent increase in average labour productivity and tenure effects constant at 1996 levels. This implies that the shape of the earnings curve (i.e. the age structure of the distribution) remains the same as in 1996, except for the fact that each original value is multiplied by a constant, which is the average productivity growth rate. In order to test the sensitivity of our results to different hypotheses concerning productivity growth, we also compute the cost of the payroll tax cut under the assumption that average labour productivity grows at 2 per cent.

Once we have employment (in the private sector) and average earnings at all future dates, we easily compute the tax loss induced by a payroll tax reduction. Such a decrease will, of course, deliver savings in future pension expenditure, depending on how gradually the hypothetical contribution cut is phased in. We estimate the number of newly retired people as the negative flows out of employment in age brackets 45–49 to 65–69. Taking into account the pension regime that each type of worker belongs to and assuming a standard career of 30 years, we compute average pension benefits and thus the impact of the reform on pension expenditure. A detailed description of the net cost estimating procedure is provided in Appendix B.

2. Reform Scenarios and Results

We consider three reform scenarios:

- *Reform 1* — a gradual transition, under which only new entrants to the labour market reduce their contributions to the PAYG system;
- *Reform 2* — an intermediate scenario, under which only some current workers (those whose pension awards, according to the 1995 reform, are determined partly by the old rules and partly by the new ones) and all future workers reduce their contributions to the PAYG system; and
- *Reform 3* — a sudden transition that requires all current and future workers to reduce their contributions to the PAYG system.

The results are shown in Tables 4–6 and in Figures 5 and 6. Table 4 presents, for each reform scenario, revenue loss, savings and net effect from a 10 percentage point payroll tax cut under the hypothesis of a 1.5 per cent growth in productivity (the baseline case). For this case, we report the results obtained for the three demographic scenarios. Differences among them are not notable. In particular, compared with the main demographic variant (Table 4a), the revenue

[11]In doing so, we neglect any effect that the hypothetical reduction in the contribution rate of employees may have on the composition of total employment.

loss, which affects the cost of all reforms from the beginning, is slightly higher under the low variant (Table 4b); in fact, in this scenario, the population is characterised by a larger fraction of individuals in age brackets 40–44 and older, whose earnings, because of tenure effects, are relatively higher. For analogous reasons, the revenue loss is relatively lower in the high variant (Table 4c).

Table 5 shows the results obtained by assuming productivity growth of 2 per cent instead of 1.5 per cent. The differences with respect to the baseline case are negligible and depend entirely on the effect of growth on the internal rate of return of the system and therefore on pension expenditure. In general, savings from the tax cut are higher and the net cost is lower in the presence of faster productivity growth.

The cost of the reform is linear in the size of the payroll tax reduction; thus the results provided in Table 6, which refer to a 1 percentage point payroll tax cut, are useful to assess the cost induced by any possible reduction in the contribution rate.

TABLE 4

Revenue Loss, Savings and Net Cost: 1.5 Per Cent Productivity Growth

(a) Main Demographic Variant

Per cent of GDP

	Reform 1			Reform 2			Reform 3		
	Revenue loss	*Savings*	*Net cost*	*Revenue loss*	*Savings*	*Net cost*	*Revenue loss*	*Savings*	*Net cost*
2000	0.02	0.00	0.02	1.21	0.00	1.21	1.79	0.00	1.79
2005	0.18	0.00	0.18	1.47	0.00	1.47	1.82	0.00	1.82
2010	0.36	0.00	0.36	1.50	0.13	1.37	1.84	0.13	1.71
2015	0.59	0.00	0.59	1.59	0.32	1.26	1.85	0.32	1.53
2020	0.85	0.00	0.85	1.70	0.60	1.10	1.86	0.60	1.26
2025	1.11	0.00	1.11	1.81	0.93	0.88	1.85	0.93	0.92
2030	1.12	0.76	0.36	1.84	1.32	0.52	1.84	1.32	0.52
2035	1.29	1.12	0.17	1.84	1.62	0.22	1.84	1.62	0.22
2040	1.62	1.44	0.18	1.84	1.81	0.04	1.84	1.81	0.04
2045	1.85	1.68	0.16	1.85	1.87	–0.02	1.85	1.87	–0.02
2050	1.85	1.84	0.01	1.85	1.90	–0.05	1.85	1.90	–0.05
2060	1.85	1.86	–0.01	1.85	1.86	–0.01	1.85	1.86	–0.01
2070	1.85	1.94	–0.09	1.85	1.94	–0.09	1.85	1.94	–0.09
2080	1.85	1.95	–0.10	1.85	1.95	–0.10	1.85	1.95	–0.10
2090	1.85	1.95	–0.10	1.85	1.95	–0.10	1.85	1.95	–0.10
2100	1.85	1.93	–0.09	1.85	1.93	–0.09	1.85	1.93	–0.09

Table 4 continues overleaf

TABLE 4 continued

(b) Low Demographic Variant

Per cent of GDP

	Reform 1			Reform 2			Reform 3		
	Revenue loss	*Savings*	*Net cost*	*Revenue loss*	*Savings*	*Net cost*	*Revenue loss*	*Savings*	*Net cost*
2000	0.02	0.00	0.02	1.21	0.00	1.21	1.79	0.00	1.79
2005	0.17	0.00	0.17	1.47	0.00	1.47	1.82	0.00	1.82
2010	0.36	0.00	0.36	1.50	0.13	1.36	1.84	0.13	1.71
2015	0.58	0.00	0.58	1.59	0.33	1.26	1.85	0.33	1.53
2020	0.83	0.00	0.83	1.70	0.61	1.09	1.86	0.61	1.25
2025	1.10	0.00	1.10	1.82	0.95	0.87	1.86	0.95	0.91
2030	1.09	0.78	0.31	1.86	1.38	0.48	1.86	1.38	0.48
2035	1.25	1.16	0.09	1.86	1.71	0.15	1.86	1.71	0.15
2040	1.61	1.52	0.09	1.87	1.95	–0.08	1.87	1.95	–0.08
2045	1.88	1.83	0.04	1.88	2.05	–0.18	1.88	2.05	–0.18
2050	1.88	2.06	–0.18	1.88	2.14	–0.26	1.88	2.14	–0.26
2060	1.88	2.09	–0.21	1.88	2.09	–0.21	1.88	2.09	–0.21
2070	1.87	2.09	–0.21	1.87	2.09	–0.21	1.87	2.09	–0.21
2080	1.87	2.13	–0.25	1.87	2.13	–0.25	1.87	2.13	–0.25
2090	1.87	2.08	–0.21	1.87	2.08	–0.21	1.87	2.08	–0.21
2100	1.87	2.06	–0.18	1.87	2.06	–0.18	1.87	2.06	–0.18

(c) High Demographic Variant

Per cent of GDP

	Reform 1			Reform 2			Reform 3		
	Revenue loss	*Savings*	*Net cost*	*Revenue loss*	*Savings*	*Net cost*	*Revenue loss*	*Savings*	*Net cost*
2000	0.02	0.00	0.02	1.21	0.00	1.21	1.79	0.00	1.79
2005	0.18	0.00	0.18	1.47	0.00	1.47	1.82	0.00	1.82
2010	0.37	0.00	0.37	1.50	0.13	1.37	1.84	0.13	1.71
2015	0.60	0.00	0.60	1.59	0.32	1.27	1.85	0.32	1.53
2020	0.86	0.00	0.86	1.70	0.58	1.12	1.85	0.58	1.27
2025	1.13	0.00	1.13	1.80	0.90	0.90	1.84	0.90	0.94
2030	1.14	0.74	0.40	1.82	1.27	0.56	1.82	1.27	0.56
2035	1.32	1.08	0.24	1.82	1.53	0.29	1.82	1.53	0.29
2040	1.62	1.35	0.27	1.82	1.68	0.14	1.82	1.68	0.14
2045	1.83	1.56	0.27	1.83	1.77	0.06	1.83	1.77	0.06
2050	1.83	1.70	0.13	1.83	1.75	0.08	1.83	1.75	0.08
2060	1.83	1.76	0.07	1.83	1.76	0.07	1.83	1.76	0.07
2070	1.83	1.79	0.04	1.83	1.79	0.04	1.83	1.79	0.04
2080	1.83	1.92	–0.10	1.83	1.92	–0.10	1.83	1.92	–0.10
2090	1.83	1.96	–0.13	1.83	1.96	–0.13	1.83	1.96	–0.13
2100	1.83	1.94	–0.11	1.83	1.94	–0.11	1.83	1.94	–0.11

TABLE 5

Revenue Loss, Savings and Net Cost: 2 Per Cent Productivity Growth (Main Demographic Variant)

Per cent of GDP

	Reform 1			Reform 2			Reform 3		
	Revenue loss	*Savings*	*Net cost*	*Revenue loss*	*Savings*	*Net cost*	*Revenue loss*	*Savings*	*Net cost*
2000	0.02	0.00	0.02	1.21	0.00	1.21	1.79	0.00	1.79
2005	0.18	0.00	0.18	1.47	0.00	1.47	1.82	0.00	1.82
2010	0.36	0.00	0.36	1.50	0.14	1.36	1.84	0.14	1.70
2015	0.59	0.00	0.59	1.59	0.34	1.25	1.85	0.34	1.52
2020	0.85	0.00	0.85	1.70	0.61	1.09	1.86	0.61	1.24
2025	1.11	0.00	1.11	1.81	0.94	0.87	1.85	0.94	0.91
2030	1.12	0.77	0.34	1.84	1.33	0.51	1.84	1.33	0.51
2035	1.29	1.14	0.15	1.84	1.62	0.21	1.84	1.62	0.21
2040	1.62	1.45	0.17	1.84	1.80	0.04	1.84	1.80	0.04
2045	1.85	1.69	0.15	1.85	1.86	–0.02	1.85	1.86	–0.02
2050	1.85	1.84	0.01	1.85	1.90	–0.05	1.85	1.90	–0.05
2060	1.85	1.88	–0.03	1.85	1.88	–0.03	1.85	1.88	–0.03
2070	1.85	1.96	–0.11	1.85	1.96	–0.11	1.85	1.96	–0.11
2080	1.85	1.97	–0.12	1.85	1.97	–0.12	1.85	1.97	–0.12
2090	1.85	1.97	–0.12	1.85	1.97	–0.12	1.85	1.97	–0.12
2100	1.85	1.95	–0.10	1.85	1.95	–0.10	1.85	1.95	–0.10

Under the baseline assumptions (Table 4a), the revenue loss, as a percentage of GDP, increases from 0.02 and 1.21 in 2000 under Reforms 1 and 2 respectively, to 1.85 in the long run. Under Reform 3, yearly revenue loss is a constant fraction (approximately 1.8 per cent) of GDP from 2000 to 2100: earnings and GDP grow, in fact, at the same rate. Note that the tables show figures up to 2100 since, by that date, the population has reached the steady state and the values for the revenue loss, savings and net cost have already stabilised at their long-run levels. Since we assume a standard working career of 30 years and pension benefits are related to contributions only for workers under the pro-rata and Dini regimes, savings will start showing up in 2030 under Reform 1 and in 2010 under Reforms 2 and 3. They reach a long-run level of 1.93 per cent of GDP. In the long run, the population is stationary (i.e. the structure by age is constant) and pensions are paid entirely by the Dini award formula. Therefore the system should be in equilibrium: long-run yearly savings should perfectly offset yearly revenue losses. In fact, as Table 4 and Figure 5 show, the yearly net cost is close to zero in the long run, but not exactly zero; this is mainly due to some degree of approximation in the simulating procedure.

TABLE 6

Revenue Loss, Savings and Net Cost for a 1 Percentage Point Payroll Tax Cut (Main Demographic Variant, 1.5 Per Cent Productivity Growth)

Per cent of GDP

	Reform 1			Reform 2			Reform 3		
	Revenue loss	*Savings*	*Net cost*	*Revenue loss*	*Savings*	*Net cost*	*Revenue loss*	*Savings*	*Net cost*
2000	0.00	0.00	0.00	0.12	0.00	0.12	0.18	0.00	0.18
2005	0.02	0.00	0.02	0.15	0.00	0.15	0.18	0.00	0.18
2010	0.04	0.00	0.04	0.15	0.01	0.14	0.18	0.01	0.17
2015	0.06	0.00	0.06	0.16	0.03	0.13	0.19	0.03	0.15
2020	0.08	0.00	0.08	0.17	0.06	0.11	0.19	0.06	0.13
2025	0.11	0.00	0.11	0.18	0.09	0.09	0.19	0.09	0.09
2030	0.11	0.08	0.04	0.18	0.13	0.05	0.18	0.13	0.05
2035	0.13	0.11	0.02	0.18	0.16	0.02	0.18	0.16	0.02
2040	0.16	0.14	0.02	0.18	0.18	0.00	0.18	0.18	0.00
2045	0.18	0.17	0.02	0.18	0.19	0.00	0.18	0.19	0.00
2050	0.19	0.18	0.00	0.19	0.19	–0.01	0.19	0.19	–0.01
2060	0.19	0.19	0.00	0.19	0.19	0.00	0.19	0.19	0.00
2070	0.18	0.19	–0.01	0.18	0.19	–0.01	0.18	0.19	–0.01
2080	0.18	0.20	–0.01	0.18	0.20	–0.01	0.18	0.20	–0.01
2090	0.18	0.20	–0.01	0.18	0.20	–0.01	0.18	0.20	–0.01
2100	0.18	0.19	–0.01	0.18	0.19	–0.01	0.18	0.19	–0.01

Figure 5 plots the values reported in Table 4a. Figure 6 shows the yearly net cost of the transition under the three reform scenarios. It is evident that a payroll tax cut applied to workers under the earnings-based systems (Amato and partly pro-rata workers) would have immediate revenue losses that are not compensated by future expenditure savings (since benefits are not related to contributions).[12] Moreover, a payroll tax cut applied to these categories of workers is likely not to deliver significant positive effects on employment: it will not have any effect on new hires (since Amato and pro-rata workers are already employed), nor a significant one on elderly participation rates (since award formulae would not change as a consequence of the reduction in payroll tax).[13]

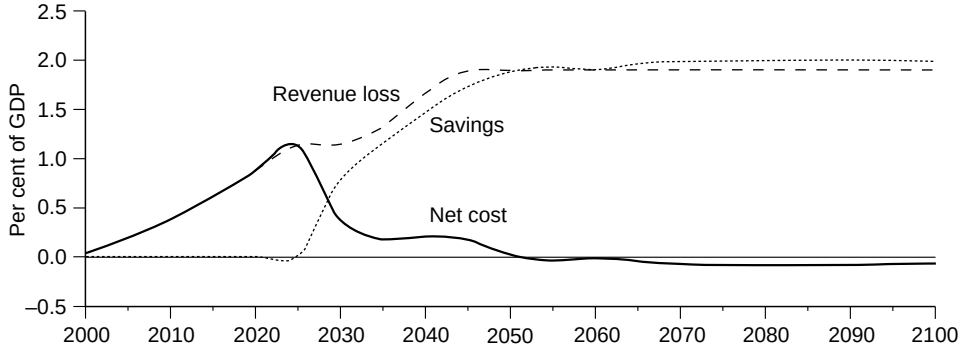
[12]An extension of the pro-rata award formula to all 1995 workers, regardless of the number of years of contribution they had at that time, would increase the savings induced by the payroll tax reduction. We simulated the model under this set-up. The results, however, are not substantially different from the ones reported in the paper: savings would be higher by approximately 0.2 per cent of GDP between 2010 and 2030.

[13]For pro-rata workers, the payroll tax reduction would decrease pension wealth and possibly induce these workers to retire at a later date.

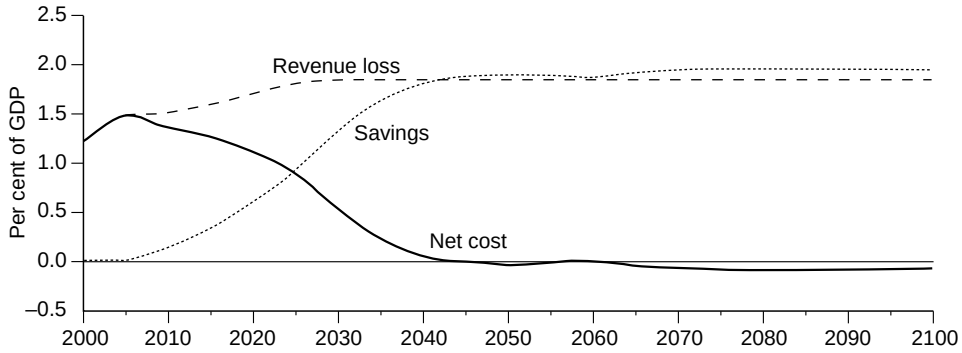
FIGURE 5

Revenue Loss, Savings and Net Cost

(a) Reform 1: New Hired after 2000



(b) Reform 2: 'Pro-Rata' and New Hired after 2000



(c) Reform 3: All Employees at 2000 and New Hired after 2000

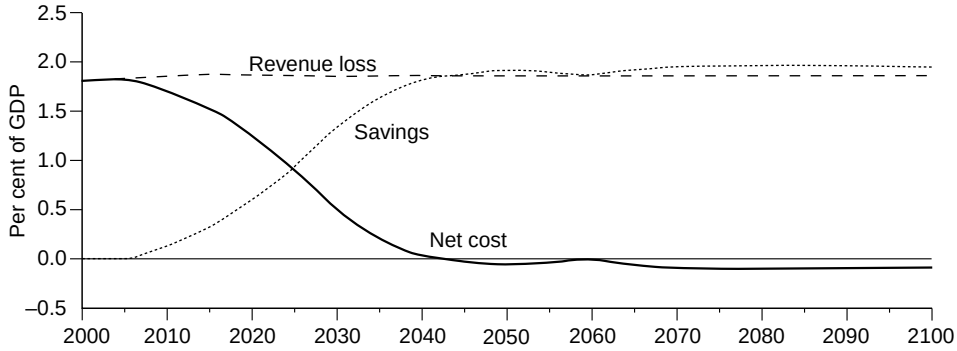
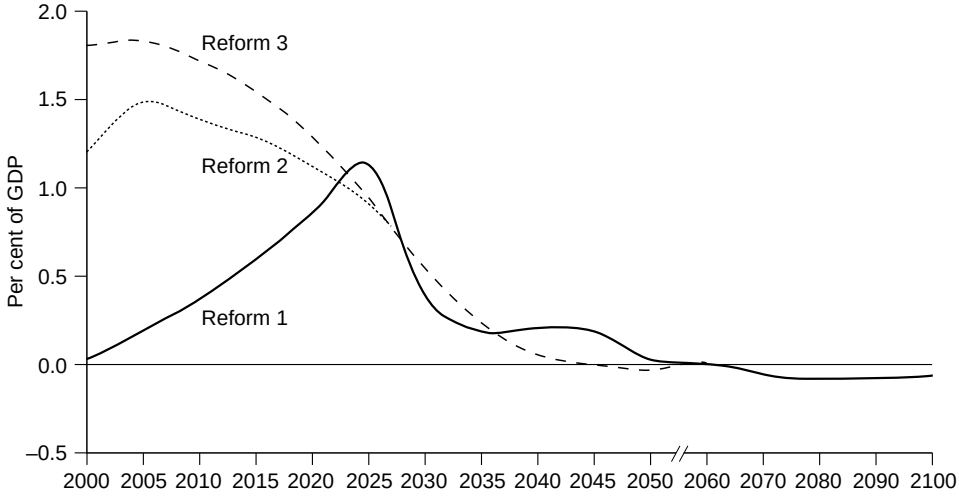


FIGURE 6

Baseline Net Costs



3. Sensitivity of the Results to Possible Employment Responses to the Reform

Funding the PAYG pension system may not change the fundamentals of the economy. In fact, once the reform has been introduced, workers start earning the market return on their contributions, but they have at the same time to pay the outstanding obligations of the system (that is, the elderly's retirement benefits and workers' accrued rights). Under the hypothesis that the government issues debt to pay for these obligations and that each young and future generation pays the interest on this debt, the funded system would generate exactly the same cash flows as the PAYG system. The two systems would be essentially equivalent.[14] Partial funding of a PAYG system will be Pareto improving if it entails some 'efficiency gains'. These gains have to be interpreted as the increase in the economy's potential output stemming from the change in workers' incentives to supply labour and to save.

A reform of the pension system that moves toward funded schemes by reducing payroll taxes on new hires should favour employment growth, via both higher young employment rates and higher elderly participation rates. The same reform might also reduce the interest rate, via an increase in saving.

In what follows, we rely on the general consensus that developed economies are dynamically efficient and assume that the market rate of return remains, after the reform, higher than the rate of growth of the economy (we assume a 2.5 per

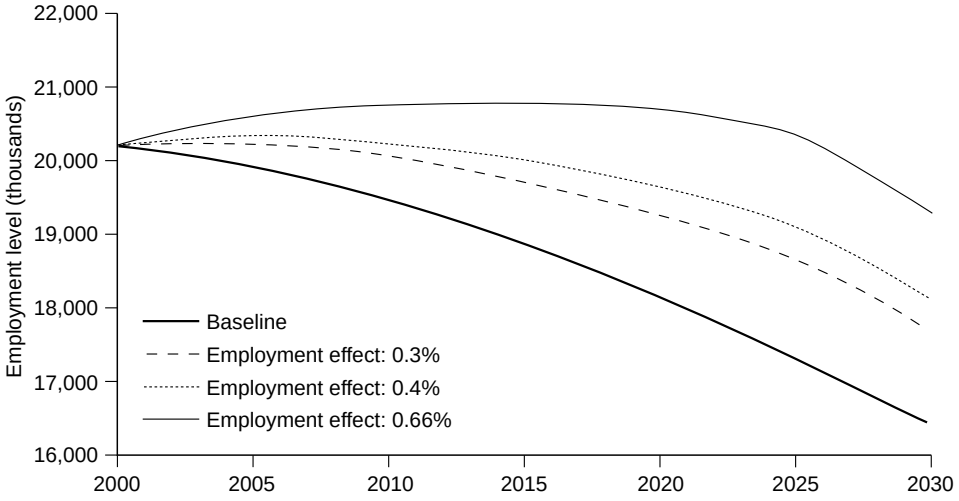
[14]On this issue, see, among others, Kotlikoff (1996).

cent real rate of return, while the real GDP growth rate averages roughly 1 per cent over the simulation horizon).[15] Also, among the possible general equilibrium effects, we focus on the effects on employment, since these could significantly change the budgetary cost of the reform. We compute the cost in our first reform scenario (i.e. the case of a payroll tax reduction applied to new hires only) under different assumptions about the employment growth induced by the payroll tax cut.

In the baseline case, we keep unemployment rates constant at the current levels throughout the simulation period and assume specified dynamics for participation rates. Since the payroll tax reduction may deliver effects on both unemployment and participation rates, we characterise the three alternative scenarios by differences in the overall employment rates. In the baseline case, total employment decreases by about 3 million units (approximately from 20 million to 17 million) between 2000 and 2025. In the alternative scenarios, we increase yearly employment growth rates from the baseline by 0.3, 0.4 and 0.66 of a percentage point until 2025, and keep them as in the baseline case beyond 2025. This implies that, in the most favourable case (an increase of 0.66 of a point), total employment up until 2025 would essentially remain constant at the 2000 level (Figure 7). That is, in this case, there would be, on average, about

FIGURE 7

Employment Effect



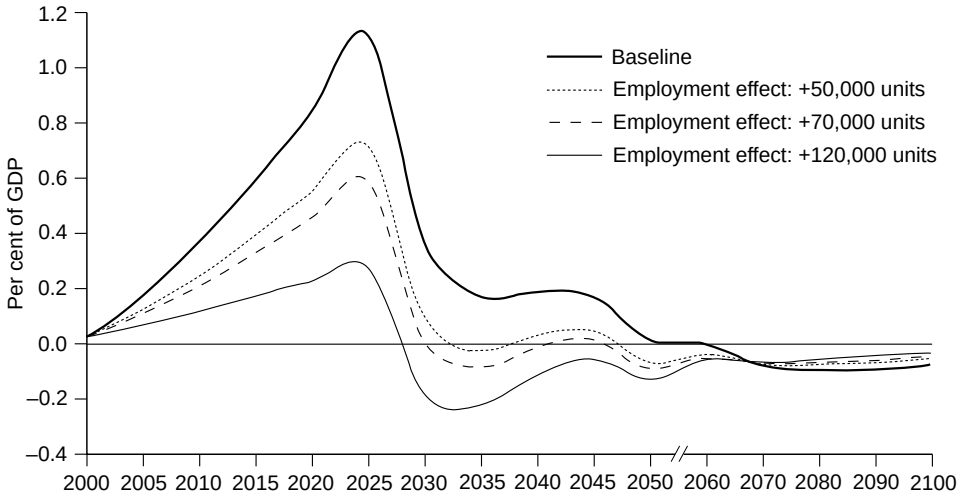
[15]The interest rate effect could reduce the benefits of funding but should not significantly alter the yearly budgetary cost of a given payroll tax reduction. On the other hand, a higher (lower) interest rate would increase (decrease) the size of the payroll tax cut that is able, under our reform scenario, to guarantee given replacement rates.

120,000 more workers than in the baseline case every year up to 2025; the gap between the two scenarios would then stabilise at about 3 million units from 2025 onwards. In the intermediate cases, characterised by increases in employment growth rates of 0.3 and 0.4 of a percentage point, there would be, on average, 50,000 and 70,000 more workers respectively than in the baseline case every year up to 2025.

In Figure 8a, we plot the net cost of Reform 1 assuming different labour market responses. The figure shows that, in the baseline case, the net cost would peak at 1.1 per cent of GDP in 2025 and then decline as workers under the Dini regime, subject to a contribution rate of 23 per cent instead of 33 per cent, start retiring. If the reform delivered the maximum effect on employment, the peak would be reached in 2025 at a value of 0.27 per cent of GDP. Furthermore, under this scenario, net savings would show up as early as 2028, approximately 20 years earlier than in the baseline case.[16]

FIGURE 8a

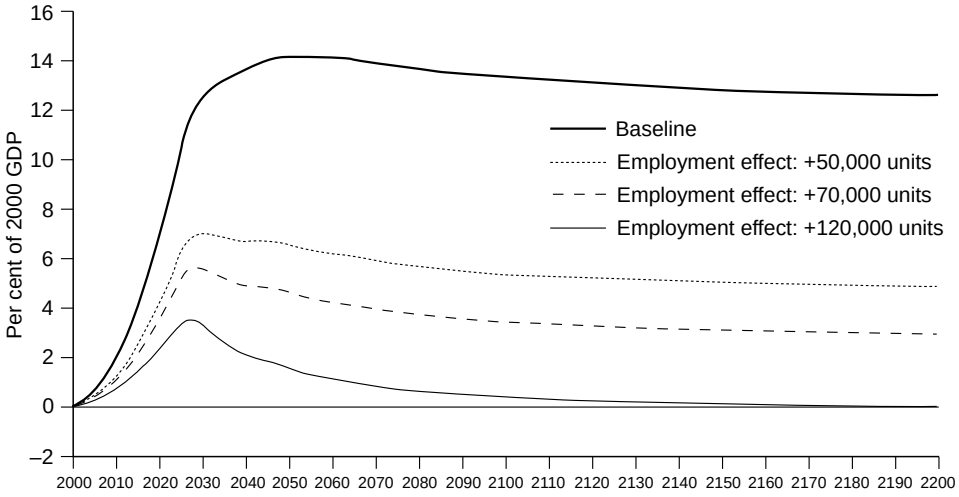
Net Cost of Reform 1



[16]We investigated the relationship between the net discounted cost (as a percentage of GDP in 2000) and the employment responses to the payroll tax cut. The relation is approximately linear for reasonably small employment effects, implying that a 0.1 percentage point increase in yearly employment growth up to 2025 would reduce the net discounted cost by approximately 2 per cent of 2000 GDP. In general, however, the effect of improvements in labour market conditions on the cost of the reform, measured in terms of GDP, tends to reduce slightly with the size of the improvement. In fact, while both revenues and expenditure of the social security system grow at the same rate as GDP, the level of pension expenditures is higher the faster GDP growth is, as the internal rate of return of the system increases with it.

FIGURE 8b

Net Discounted Cost of Reform 1

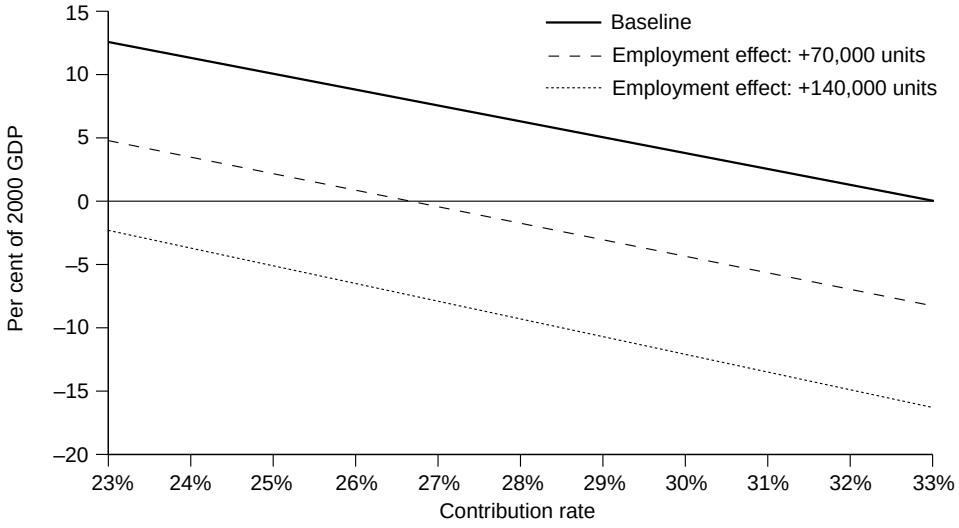


Forecasting the likely general equilibrium effect of the reform on the labour market is obviously not straightforward. A much easier task is to provide an evaluation of the employment response that would be required to balance the net present discounted value of the cost of the reform. Thus, in Figure 8b, we plot the cumulated sum from 2000 to 2200 of net future costs from Reform 1, discounted back to 2000 at a 2.5 per cent rate, as a percentage of GDP in 2000. The measure simply represents, for each year, the value of the debt (as a percentage of 2000 GDP) that, by that year, the government would have issued to cover the costs of the reform (assuming a 2.5 per cent average cost of the debt). As Figure 8b shows, an increase in employment of 120,000 units per year up to 2025 induced by the payroll tax cut would make the reform entirely self-financing. In this case, the debt, as a proportion of 2000 GDP, would peak at 3.5 per cent around 2030; in the baseline case, it reaches its maximum of 14 per cent around 2050.

Up to now, we have presented results for Reform 1, which assumes a 10 percentage point payroll tax reduction. Finally, Figure 9 plots the discounted net cost at 2000 resulting from payroll tax cuts ranging between 0 and 10 percentage points (i.e. for payroll taxes between 23 and 33 per cent). In order to present some sensitivity analysis with respect to the labour market scenario, we also plot the results for two employment responses (+70,000 and +140,000 units per year

FIGURE 9

Contribution Rates and Long-Run Net Discounted Cost: Reform 1



until 2025). The net discounted cost is linear, so that a 1 percentage point cut in new hires' payroll tax in the baseline case would cost approximately 1.25 per cent of 2000 GDP in present discounted value.[17]

V. CONCLUDING REMARKS

Italy is characterised by a mature PAYG social security system and by particularly adverse population projections. Given these trends, the contribution rate to the social security system is expected to stay at the current high level, or even increase. This hinders the development of employer-provided pension funds and introduces a significant wedge between labour cost and earnings that discourages both labour demand and labour supply.

The paper has explored the feasibility for the Italian public finances of a reduction in the contribution rate to the social security system. In particular, having computed the replacement ratios guaranteed by the current system to individuals characterised by different work histories and career profiles, we have argued that a payroll tax reduction of 10 percentage points to finance fully funded private pension schemes can guarantee replacement rates in line with the EU average.

[17]The fact that the net discounted cost of the payroll tax cut is linear in the amount of the reduction should not be a surprise, since both revenues and expenditures are linear in the contribution rate for workers under the Dini regime.

We have shown that, if the 10 percentage point payroll tax cut did not deliver any positive effect on employment, the revenue shortfall would start being completely offset by the savings from the corresponding reduced benefits between 2040 and 2050, depending on how gradually the reform is phased in. The net cost will reach its peak in 2025 (at 1.1 per cent of GDP) if the reform applies only to newly hired workers, and in 2005 (at 1.5 and 1.8 per cent of GDP) if it applies also to current pro-rata workers and to all workers respectively. If, instead, the payroll tax reduction and the incentives provided by the partial shift to a funded scheme increase total employment, then the cost of the transition could be substantially smaller. In particular, we estimate that if the reform raised total employment by 120,000 units per year until 2025 with respect to the baseline scenario (increasing the employment rate by approximately 20 per cent, from 41 per cent to 48 per cent, by that date), then savings would start offsetting costs as early as 2030. Such a response by the labour market would make the reform entirely self-financing.

APPENDIX A
PENSION AWARD FORMULAE

In this appendix, we illustrate the formulae that we use to compute benefit awards and replacement rates. Currently, three award formulae coexist, according to the pension regime the worker belongs to: the Amato regime, for workers with at least 15 years of contributions on 31 December 1992; the pro-rata regime, for workers with fewer than 15 years of contributions on 31 December 1992; and the Dini regime, for workers employed after 31 December 1995.

We report the formulae to compute benefits at retirement. After retirement, under all regimes, benefits are indexed to inflation only.

1. The Amato Regime

The award formula for Amato workers is based on the number of years of contributions and on the average wage in the last five or more years of work. Let $\overline{w}_1$ and $\overline{w}_2$ denote the 'pensionable earnings' associated with contributions paid before 31 December 1992 and contributions paid after 31 December 1992 respectively:

$$\text{(A1)} \qquad \overline{w}_1 = \frac{\sum_{i=RA-5}^{RA-1} w_i}{5},$$

$$\text{(A2)} \qquad \bar{w}_2 = \frac{\sum_{i=d}^{RA-1} w_i[1+0.01(RA-i)]}{RA-d},$$

where w_i is the real wage at age i, RA is retirement age and $d = \max\{RA-15, RA-(RA-A92)/1.5+5\}$, where $A92$ is the age at 31 December 1992.

Benefits at retirement for Amato workers are computed as

$$\text{(A3)} \qquad b_{RA}^{A} = 0.02\left[\bar{w}_1(A92-EA)+\bar{w}_2(RA-A92)\right],$$

where EA is the age of entry (into the labour market) and $RA–EA \leq 40$. Additional years beyond a total of 40 do not count for benefit computation; however, they are included in pensionable earnings as they replace earnings of earlier years.

2. The Dini Regime

Under the new system, benefits are based on contributions. Let M_{RA} denote the present value at retirement of total past contributions (uprated by means of a five-year moving average of nominal GDP growth). Then

$$\text{(A4)} \qquad M_{RA} = \sum_{i=EA}^{RA-1} \iota w_i (1+\gamma_i)^{RA-1-i},$$

where ι is the contribution rate (currently 33 per cent for employees) and γ_i is the five-year moving average of the nominal GDP growth rate. Benefits are computed by multiplying M_{RA} by the 'transformation coefficient', which, for each age at retirement, converts the capitalised value in an annuity on an actuarially fair basis, i.e. considering both the retired person and survivor life expectancies and assuming an implicit rate of return of 1.5 per cent. That is,

$$\text{(A5)} \qquad b_{RA}^{D} = c_{RA} M_{RA}.$$

The transformation coefficients, c_{RA}, are defined by law; they are supposed to be revised every 10 years to take into account variations in life expectancies and in long-run GDP growth expectations. The coefficients can be approximated by factors of actualisation inclusive of the hypothesis of survivor benefits equal to 60 per cent of the insured's benefits, assuming a three-year difference in age between the insured and the spouse (the approximation follows Peracchi and Rossi (1996)):

$$\text{(A6)} \qquad c_{RA} = 1 \Bigg/ \left(\sum_{i=1}^{LEI} \frac{1}{(1+r_i)^i} + 0.6 \sum_{i=LEI+1}^{LES} \frac{1}{(1+r_i)^i} \right),$$

where r_i is the legal rate of return (set by law at 1.5 per cent) and *LEI* and *LES* are the life expectancies at retirement of the insured worker for himself and his spouse respectively. Table A1 shows our approximated coefficients and the legal ones, as well as life expectancies at retirement of the insured and the spouse drawn from ISTAT 1996 population projections (ISTAT, 1997a).

The discrepancies between our estimated coefficients and the legal ones are due, beside approximation, to the fact that we use updated values for life expectancies, which were not available when the law was introduced in 1995. In particular, our life expectancies are, in general, higher than the ones assumed in the legal coefficients; therefore our transformation coefficients (except at age 61) are relatively smaller.

TABLE A1

Life Expectancies and Transformation Coefficients at Retirement

Age of insured	Life expectancies (ISTAT)		Transformation coefficients	
	Insured	*Spouse (3 years younger)*	*Ours*	*Law*
57	21.42	28.86	4.720	4.720
58	20.61	27.95	4.809	4.860
59	19.82	27.04	4.973	5.006
60	19.03	26.14	5.152	5.163
61	18.27	25.25	5.347	5.334
62	17.52	24.36	5.468	5.514
63	16.78	23.48	5.694	5.706
64	16.06	22.61	5.797	5.901
65	15.36	21.74	6.057	6.136

3. The Pro-Rata Regime

Once we have benefits based on the Amato and Dini rules, it is easy to compute benefits for the so-called 'pro-rata' workers, as the sum of two components. Benefits are calculated according to the Amato rules for contributions paid before 31 December 1995 and according to the new rules for contributions paid after 31 December 1995. More precisely,

$$\text{(A7)} \qquad b_{RA}^{PR} = b_{RA}^{A} + b_{RA}^{D},$$

where: b_{RA}^{A} is computed as in (A3) except that, in $\bar{w}_2$, RA is substituted by $A95$ (the age of the insured worker on 31 December 1995) and d no longer has the 15-year upper limit; and b_{RA}^{D} is computed as in (A5) except that, in M_{RA}, EA is substituted by $A95$.

APPENDIX B
COST OF THE TRANSITION: ESTIMATING PROCEDURE

We consider 12 five-year age groups (15–19, 20–24, ..., 70–74) and 41 periods (every five years from 2000 to 2200 inclusive).

For each sex ($s = f, m$), let

- POP_s = population, 2000–2200 (12×41 matrix);
- $POP96_s$ = population in 1996 (12-element vector);
- $LF96_s$ = labour force, average 1996 (12-element vector);
- $EMPL96_s$ = employees in private sector, end of 1995 (12-element vector);
- $MIN18_s$ = employees in private sector with fewer than 18 years of contribution on 31 December 1995 (12-element vector);
- $EARN96_s$ = average earnings of employees in private sector, 1996 (12-element vector).

1. Labour-Force and Employment Projections

Let $PR96_s$ and $ER96_s$ be 12-element vectors of, respectively, the labour-force participation rate and the fraction of employment in the private sector out of the total labour force in 1996. That is,

$$\text{(B1)} \qquad PR96_s = \frac{LF96_s}{POP96_s};$$

$$\text{(B2)} \qquad ER96_s = \frac{EMPL96_s}{LF96_s}.$$

Labour-force participation is assumed to change over time, according to sex-specific dynamics, while the fraction of employment in the private sector is assumed to be constant at the 1996 level. Given these dynamics, we compute PR_s and ER_s, 12×41 matrices containing, respectively, labour-force participation rates and the fraction of employment in the private sector out of the total labour force for the 12 age groups over the 41 periods.

We project the number of employees in the private sector separately by their social security status — that is,

1. all employees ($EMPL$);

2. workers hired after 31 December 1995 (*NE*);
3. employees with fewer than 18 years of contribution on 31 December 1995 (*PRORATA*).

Let a denote the age group. Then, for t = 2000, 2005, 2010, …, 2200, we compute

(B3) $EMPL_s(a,t) = POP_s(a,t)PR_s(a,t)ER_s(a,t)$;

(B4) $NE_s(a,t) = NEF2000_s[a-(t-2000)] + NEF_s[a-(t-2005),2005]$
$+NEF_s[a-(t-2010),2010] + ... + NEF_s[a,t]$,

where $NEF2000_s(a) = EMPL_s(a,2000) - EMPL96_s(a-5)$

and $NEF_s(a,t) = EMPL_s(a,t) - EMPL_s(a-5,t-5)$ for $t = 2005,2010,...,2200$;

(B5) $PRORATA_s(a,t) = NE_s(a,t) + MIN18_s[a-(t-1995)]$.

In order to compute *NE*, in *NEF*2000 and *NEF* (respectively the vector and the matrix containing the net flows into and out of employment in 2000 and in the following years), we set equal to zero all negative flows from age 45–49 and before 2025 (we assume that such exits out of the labour force refer to people who entered before 31 December 1995, to whom the reform does not apply). When computing *PRORATA*, we set equal to zero all negative flows from age 45–49 and before 2010.

2. Earnings Projections

Let ω denote the average labour productivity growth rate. Then, for t = 2000, 2005, …, 2200, we compute

(B6) $EARN_s(t) = EARN96_s(1+\omega)^{t-1996}$.

3. GDP Projections

GDP is computed as the product of average labour productivity and total employment.

4. Pension Expenditure Projection

Let *PEXP* denote expenditure for new pension flows. Then, for a = 45–49, 50–54, 55–59, 60–64 or 65–69 and t = 2015, 2020, …, 2200, we compute

(B7) $PEXP_s(t) = \sum_a PEXP_s(a,t)$,

where $PEXP_s(a,t) = \rho EARN_s(a,t)NEF_s(a,t)$. This expression defines new pension expenditure by age and year as the product of average pension ($\rho EARN$) and the number of newly retired people (*NEF*). ρ is the replacement ratio, computed taking into account the pension regime and the age at retirement of the worker. *NEF* is the negative flow out of employment in age brackets 45–49 to 65–69 (we treat flows in age brackets 45–49 and 50–54 as individuals exiting the labour force at those ages but starting to receive the pension at age 57). As we do not know the age at entry into the labour market of each individual, we have to make assumptions about the average length of the working period. We assume a standard working career of 30 years; this choice in fact guarantees the long-run equilibrium of the system. Under this hypothesis, people retiring in 2010–25 will be subject to the pro-rata regime and those retiring from 2025 onwards to the Dini regime.

Given *PEXP*(*t*), we compute total expenditure in each year from 2015 on, by bringing the flows onwards, until the expected year of death of the retired person or, for 90 per cent of cases (90 per cent being the observed marriage rate in 1996 among employees), until the expected year of death of the survivor (having appropriately reduced the average pension), and summing them.

5. Reform Scenarios

We analyse three reform scenarios:

- *Reform 1* — a reduction in the contribution rate applies, starting 1 January 2000, only to new employees (*NE*).
- *Reform 2* — a reduction in the contribution rate applies, starting 1 January 2000, to employees with fewer than 18 years of contribution on 31 December 1995 (*PRORATA*).
- *Reform 3* — a reduction in the contribution rate applies, starting 1 January 2000, to all employees (*EMPL*).

Let *LOSS*1, *LOSS*2 and *LOSS*3 denote the revenue loss associated with the reform scenarios described above and let *a* denote the age bracket. Further, let *dt* denote the percentage point reduction in the contribution rate. Then

$$\text{(B8)} \qquad LOSS1(t) = dt\left[\sum_a EARN_f(a,t)NE_f(a,t) + \sum_a EARN_m(a,t)NE_m(a,t)\right],$$

$$\text{(B9)} \qquad LOSS2(t) = dt\left[\sum_a EARN_f(a,t)PRORATA_f(a,t) + \sum_a EARN_m(a,t)PRORATA_m(a,t)\right],$$

(B10) $LOSS3(t)$

$$= dt\left[\sum_a EARN_f(a,t)EMPL_f(a,t) + \sum_a EARN_m(a,t)EMPL_m(a,t)\right].$$

Similarly, we compute expenditure savings under Reforms 1, 2 and 3. These are calculated as the difference between total pension expenditure with a contribution rate of t and total pension expenditure with a contribution rate of $t–dt$.

Finally, the net cost of the transition is given, for each year from 2000 to 2200 and under each reform scenario, by the difference between revenue losses and expenditure savings.

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