

**Are the Human Capital and the Labour Market
Relevants in the Generational
Accounting? The Spanish Case^{*}**

by

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Abstract

This work intends to demonstrate the importance of introducing the agents' heterogeneity in the models of generational accounting and in all those who want to measure the effects of an ageing population. In the present case, the educational level and the labour situation (especially the women's case) appear as fundamental elements to realise a correct exercise.

In this paper a methodology that considers this heterogeneity for generating projections to be used in generational accounting models is presented.

Key words: Generational accounting, ageing, education, labour market.

Code J.E.L.: H60, J11, J21, I22.

Introduction

Over the last ten years, the generational accounting models showed up with strength. After the pioneer work of Auerbach et al. (1991 y 1994) many others followed, using the same methodology for different countries and have been published in important revues (see Auerbach and Kotlikoff (1999)). Also some international organizations such as The Congressional Budget Office, the European Commission and the OCDE, have produced studies using generational accounting models.

The aim of these models is to calculate the public budget deficit given the tax rates structure and the one to be generated in the future (the one future generations should face) if the same tax and expenditure structure remained. The models of generational accounting show that a public budget should be financially sustainable not only in the present but also in the future from an intergenerational perspective, helping to define the fiscal policies that would contribute to maintain in equilibrium the intertemporal public budget. The first publications produced about this theme even foresee the replacement of the present concept of public budget by the one of generational accounting.

In a simplified way, those models use the following formulation¹:

$$\sum_{k=t-D}^t N_{t,k} + (1+r)^{-(k-t)} \sum_{k=t+1}^{\infty} N_{t,k} = \sum_{s=t}^{\infty} G_s (1+r)^{-(s-t)} - W_t^g \quad (1.1)$$

where $\sum_{k=t-D}^t N_{t,k}$ is the total net balance of the State payments by all the generations presently alive (taxes paid minus received transfers). The second part of left side equation is the present value at r interest rate of the difference between the payments and the transfers of all the successive. The second part of the equality is the present value of the public consumption in the year (G) minus the debt from the initial year (W).

$N_{t,k}$ is calculated as follows:

$$N_{t,k} = \sum_{s=\kappa}^{k+D} T_{s,k} P_{s,k} (1+r)^{-(s-\kappa)} \quad (1.2)$$

where $\kappa = \max(t, k)$. $T_{s,k}$ is the projection in the year s of the average of the net payments (taxes paid less received transfers) made to the State by a member of

¹ For more information see Auerbach and Kotlikoff (1999).

the generation born in the year k . $P_{s,k}$ is the number of persons born in year k that are still alive in the year s . As indicated by Auerbach and Kotlikoff (1999), the generational accounting is based in the calculation of the values of $N_{t,k}$ for the present generation and for successive generations. It should be stressed the values obtained depend on the dimension of the different population cohorts $P_{s,k}$, which in the projections reflect both the effect of the ageing and of the structure assumed by the behaviour of $T_{s,k}$ which is assumed to be constant over time.

In the generational accounting methodology, the balance per capita of each generation $T_{s,k}$ grows at the same rate as productivity whereas the public consumption of the year s , G_s increases at GDP growth rate.

The generational accounting models are especially useful to study the demographic effects over fiscal balances. The answers this type of models intent to provide is of the type: which generation will pay the deficit generated by the current tax structure? Or by modifying the social security contributions how much will contribute each of the different generations and how much will they receive in the future. Those models intend to demonstrate that present fiscal policies have most important effects in the future deficit due to an ageing population. From a fiscal perspective, the future costs and the present debts burden will fall over certain future generations of contributors, less numerous from a quantitative point of view, compared to others coetaneous in age of receiving benefits more numerous.

The generational accounting models suffered some critics. For example, Haveman (1994) emphasise the fact that in the model only the present is considered and not the tax history of the living generations. On the other side, there are some very important public expenses that are not considered in generational accounting models such as health expenditure, education², etc. About the model itself, the main critic is that the fiscal effects of the projection have no effect over the macroeconomic variables and its prices, nor the economic agents can react to them. On the other side, the fact that the same fiscal policy is maintained does not imply that the individuals would pay the same in the future. Amplifying this last critic, in my opinion, the individuals will not pay the same due to the different characteristics they will present (especially of human capital and labour situation).

As indicate Kotlikoff and Leibfritz (1999), Banks et al (2000) and Berenguer et al (1999), the results could be sensitive to the labour market behaviour and especially to the increase of the women rate of activity.

² In future works, those costs are reflected.

According to this authors, the fact that a significant increase of the number of employed and a reduction of the unemployed and the inactive people would suppose and increase of the fiscal revenues trough the labour tax income and the TVA tax, along with a reduction of the transfers. This would entail a significant modification of the net tax income $T_{s,k}$ (equation 1.2) and the final result could be very sensitive to this change.

On the other side, in the generational accounting models the surviving population $P_{s,k}$, is generation after generation, homogeneous and equal to its predecessors. This means that the generations would have the same contributing capacity. However, was observed in the past in most of the countries that the new generations reach a higher educational level than its predecessor generations, due to the continuous improvement of the educational systems and of the training programs. A higher level of education provides an increase in productivity, and the value of $T_{s,k}$ would again be affected.

In the beginning of the debate, the models of generational accounting were foreseen as a possible alternative to the public budget methodology presently used. As above mentioned in the critics to the model, the results depend on the plausibility and the realism of the assumptions used. This fact leads us to propose the introduction of heterogeneity by educational level reached in future generations and the projection of the labour market reacting to a certain economic environment, as a best approximation to a possible reality for future generations. Although it seams that a consensus about the fact that generational accounting models can not replace for the time being the public budget, in the sense it is used today, these models are a magnificent tool to help defining the major fiscal policy tendencies reflecting the demographic shock generated by an ageing population.

This paper is organised as follows:

In the Chapter 1 (V1 projection) the characteristics of a typical population projection used in the generational accounting exercises is simulated. These characteristics reflect only the different population cohorts derived from the ageing of the population. The evolution. The evolution of the occupied people (contributors) and the unemployed people (benefit's receivers) is shown in aggregated terms.

In Chapter (V2 projection) the educational system is simulated using the MEDTRA96³ model. Heterogeneity in the population by educational level reached is introduced and results on the occupied people, unemployed people, etc are observed.

³ Simulation model of the Spanish educational system that will be explained in following Chapters.

In Chapter 3 (V3 projection) a methodology of projection of the tendencies followed by the labour market is proposed, through the description of the active population rate and the unemployment rate and the economic growth is also introduced. In this projection the heterogeneity of the individuals, according to its labour situation is included, emphasising the important effect generated in this case by the women's labour evolution. New results are presented.

In Chapter 4 (V4 projection) previously obtained projections are compared and a simple exercise is presented on the different effects that each of the projections would have on the work related contributions supporting the idea that heterogeneity should be included in the estimations carried out using generational accounting models.

Each of the projection is incremental in the sense that the previous simulations are included, except in the case of the V4 simulation, which is a comparison. The results obtained with the introduction of the heterogeneity show important differences in the number of employed and unemployed people that those economies would generate respect to the ones obtained with the simulations currently used in generational accounting. The effects on the resulting fiscal income are very significant. This implies that those models and in general the ones studying different aspects of populations ageing should include the heterogeneity by educational level and a simulation of the labour market in its projections in order to improve accuracy and better reflect the effects of a possible demographic future of ageing. It also implies that the fiscal policy recommendations that do not take into account those effects might be false in those aspects.

1. The ageing of the population. A typical projection using generational accounting models (V1).

The population's ageing consists of a demographic shock characterized by the existence of large periods with low fertility and mortality rates, together with an increase of the life expectancy. The final result of the combination of this three factors is an increase of the proportion of the elderly on the total of the population (see Table 1.1).

Table 1.1 Projection of the ageing population rate*						
	2000	2010	2020	2030	2040	2050
Germany	15.9	19.3	20.9	25.2	28.3	27.7
Spain	16.6	17.6	19.6	23.6	28.7	31.5
France**	15.9	16.8	20.5	24.5	26.5	26.8
Italy	17.8	20.1	22.7	26.3	30.9	31.3
Netherlands	13.6	15.2	19.3	23.2	25.6	24.4
United Kingdom	15.6	16.4	19.3	23	25.7	25.4
* Population older than 65 as a percentage of total population. ** Population older than 60 as a percentage of total population. Source: European Commission (2000) page 5. Eurostat Projections.						

The majority of the countries almost double the percentage of persons older than 65 years respect to the total of the population. One should consider especially the cases of Spain and Italy and observe the spectacular increase produced from 2030 onwards, due mainly to the progressive arrival to the retirement age of the baby boom generations that presently register also the record of low fecundity rate⁴.

Spain is one of the countries where the ageing of the population effect will be more pronounced. Juan A. Fernández Córdón has produced the projection of the Spanish population used in the simulations⁵. The assumptions used⁶ are: a smooth increase of the fertility rates from the present levels up to 1,72 sons per woman in 2020, keeping this value constant from that year onwards. The life expectancy at birth increases up to 84,95 years for the women and to 78,49 years for the men in 2050. The results obtained are presented in Table 1.2.

⁴ See Comisión Europea (1999) for a more detailed description of the problem and for some projections for the European Union.

⁵ See Herce and Alonso Meseguer (2000). The variant used is the A without adjustments due to immigration. Those projections are available in the web site of FEDEA: <http://www.fedea.es/hojas/servicios.html>

⁶ The data vary slightly because we have adapted the 2000 population to the population observed in the EPA, so that the projections were consistent with the data observed for the labour market.

In general it could be observed that the population between 16 and 64 years old decreases rapidly from approximately year 2015 onwards, reducing by 7 million effectives until 2050. This reduction is accompanied by a smooth increase of the average age of the working people, changing from 37,9 years old in 2000 to 42,57 years old in 2025.

The population older than 65 years old keeps on growing and almost doubles in 2050, thus generating that the dependency rate of the elderly grows from 25 up to almost 60 in 2050. This is a typical and pronounced effect of the ageing population.

In the first projection prepared (V1), the possible effects that the demographic composition of the population by age will have on the labour market. The exercise consists of fixing a cross section by age, sex, qualification level and labour situation in 1999 and project in into the future. The only change produced in the model is the dimension of the different population cohorts. The flows will depend on the population's projection that includes low fecundity rates, the ageing of the *baby boom* generations and exit rates from the labour market depending both of the survival rates and of the current exit rates of the labour market after reaching the retirement age, either by normal or early retirement, that would reflect the ageing of the population.

This projection is the one that would be used on a typical exercise of generational accounting and on the one the tax balances $T_{s,k}$ of the equations 1.1 and 1.2 would be calculated. As a matter of fact, in the Figure 1.1 it can be observed that the number of occupied and unemployed people, and consequently the active population decreases significantly due to the ageing of the population. The number of occupied people in 2000, 14 millions, reduced up to 10 millions in 2050. The unemployed people also diminish in about 800000. However, the unemployment rate only reduces by 1,2 p.p. for the men and 1,8 p.p. for the women, reaching a minimum of 14 percent around 2018. The decrease of the unemployment rate is due to the effects of population composition per age. The ageing of the population will generate a reduction of the number of occupied and unemployed people but the unemployment problem will not be solved.

Table 1.2
Spanish projection of population and dependency rates (thousands people and percentage) (a)

	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Total Population	39941	40158	40406	40476	40292	39913	39429	38893	38240	37391	36324
Population between 0-15 years old.	6386	6147	6271	6495	6498	6190	5840	5681	5692	5730	5653
Population between 16-64 years old.	26837	26976	26763	26160	25596	24913	23976	22756	21326	19943	19179
Population of 65 and older.	6718	7035	7372	7822	8198	8809	9613	10456	11223	11718	11492
Dependency rates of younger (b)	23.80	22.79	23.43	24.83	25.39	24.85	24.36	24.97	26.69	28.73	29.48
Dependency rates of older (c)	25.03	26.08	27.55	29.90	32.03	35.36	40.10	45.95	52.62	58.76	59.92
Demographic dependency rate (d)	48.83	48.86	50.98	54.73	57.42	60.21	64.45	70.91	79.31	87.49	89.40
Age average between 16-64	37.9	39.09	40.29	41.35	42.24	42.57	42.52	42.26	41.73	40.96	40.5

Source: FEDEA

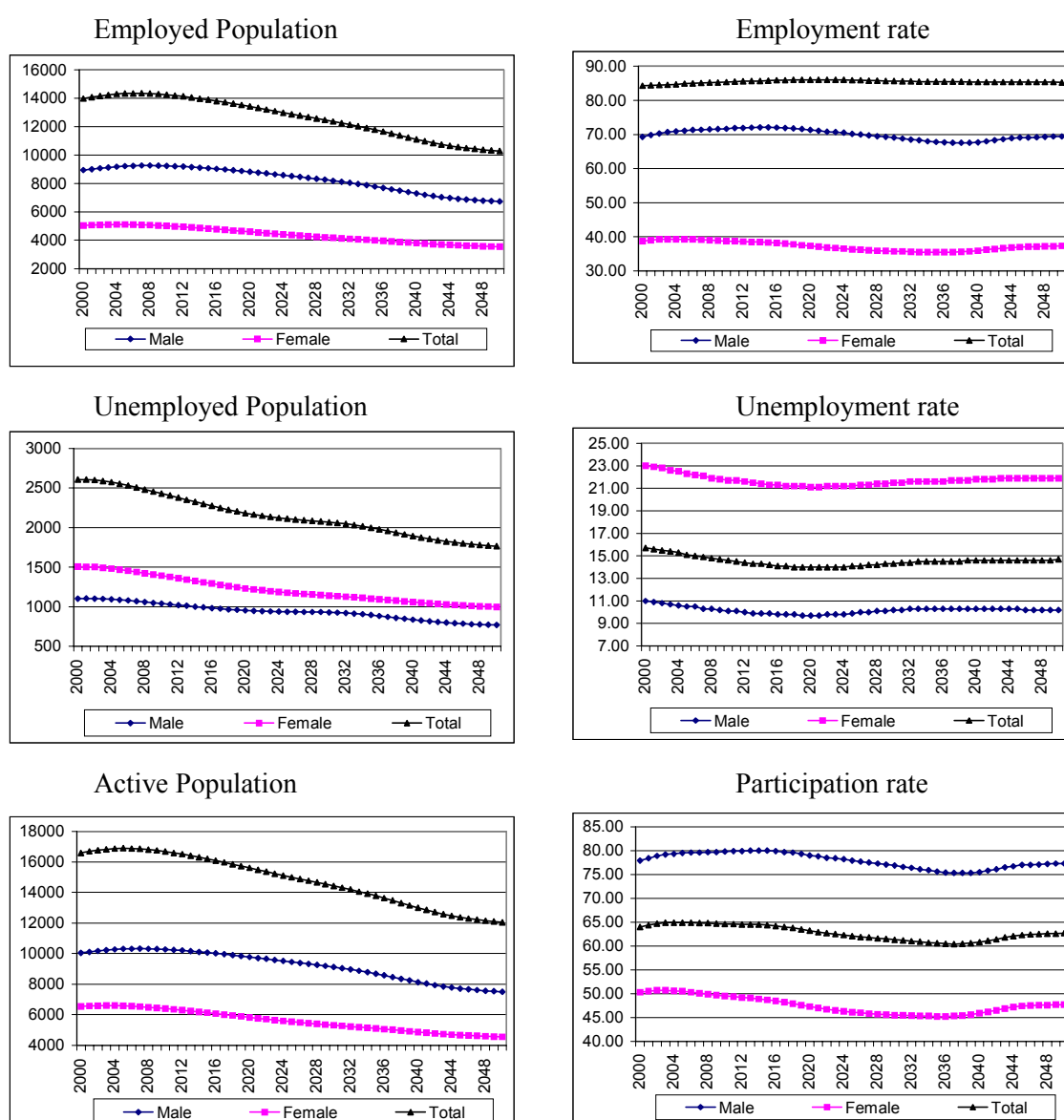
(a) Projection provided by Juan A, Fernández Cordon in Mach, 2000, Instituto de Economía y Geografía (IEG) del CSIC. Population accounted at 12/31.

(b) Population between 0-15 as a percentage of population in working age.

(c) Population of 65 and older as a percentage of population in working age.

(d) Population between 0-15 and 65 and older as a percentage of population in working age.

Figure 1.1. Projection V1 (thousand people and percentage)



2. The improvement of the educational level. (V2 projection)

As it could be observed in V1 projection, described in Chapter 1, the future demography will be a limiting factor of the number of available effectives to work if the composition of the labour market and the educational level would remain stable year after year.

There is another important factor that was not taken into account up to now and that probably will strongly influence on the studies that intend to reflect the ageing of the population process, and on those using the generational accounting methodology. The fact that the educational systems have been

significantly improved in the past, extending to broader social levels, generated generations better prepared than its predecessors.

One of the forms this fact can be observed in through the labour market where better qualified individuals have a higher activity rate and a lower unemployment rate than those with lower qualification (see Table 3.2 and 3.3 of the following Chapter). Thus, whilst generations with lower qualification leave the labour market, generations better qualified enter the labour market, the participation and the global unemployment rates should be affected, increasing the first and diminishing the second. Dolado et al. (2001) observe that the main differences between EEUU and Europe respect to participation rates and unemployment rates are due mainly to the different qualification of the population, especially those of the women.

Another possible effect that could generate the improvement of the qualification level is a higher productivity in individuals better skilled, thus increasing the global productivity as a consequence of the change in the population composition per qualification level. On the other side, and following the endogenous growth theories, the growth and therefore the global productivity might be favourably affected by an improvement of the human capital through a technological improvement.

To observe the effect that an improvement of the qualification level of the population would have, a faithfully model was developed by the author, reproducing the Spanish educational system, using the same population projection used in V1 projection (see Table 1.2) in order to obtain its future composition.

2.1. The MEDTRA96 model.

The MEDTRA96 model simulated the Spanish educational system in all its levels and specialization branches⁷. Starting from the enrolment data published by the “Ministerio de Educación”, some probabilities have been calculated, associated with the possible evolution within the educational system of its student. In this model, the students can act depending on the real probabilities observed of: passing and continuing its studies; passing and leave the educational system with the last educational level achieved; repeat and start in the same level or fail and exit the educational system with the last level completed. Thus, the enrolled students for each year and each course would be obtained through the following formulation:

$$M_{t,e,c,s} = (M_{t-1,e-1,c-1,s} \cdot PAC_{c-1,s}) + (M_{t-1,e-1,c,s} \cdot PRC_{c,s}) \quad (1.3)$$

⁷ The educational system projections and a more detailed description of the model can be found in Alonso Meseguer (2001).

Where the enrolled ($M_{t,e,c,s}$) of the year t , age e , sex s and course c are determined through the enrolled in the course, age and previous year ($M_{t-1,e-1,c-1,s}$) multiplied by the probability of approving and continuing the studies per sex for that course ($PAC_{c-1,s}$), plus the enrolled in that same course ($M_{t-1,e-1,c,s}$) classified by sex and age multiplied by the probability of repeating and continue in the same course ($PRC_{c,s}$).

The students leaving the educational system, having passed or not, because they do not wish to continue studying, will become part of the population per level of qualification reached (PNC):

$$PNC_{t,e,n,s} = PNC_{t-1,e-1,n,s} + (M_{t-1,e-1,c-1,s} \cdot PAS_{c-1,s}) + (M_{t-1,e-1,c,s} \cdot PRS_{c,s}) \quad (1.4)$$

$$\forall c, c-1 \in n$$

that totalises the population that is not studying in that period of time, classified per qualification level (n) (see note 7) and sex (s), with the newcomers from the educational system of the last course completed (c) belonging to each group (n).

In finishing a due cycle, a probability of continuing to the following cycle or leaving the educational system⁸ is assigned as stated in equations 1.3. and 1.4.

The MEDTRA96 model treats the generational pyramid per qualification level of completed studies, separately for men and women so that each generation $P_{s,k}$ (see equation 1.2) used in the generational accounting models is classified, not only per educational level but also, as it will be observed in V3 projection, by its market labour situation.

⁸ To homogenize the system data with the information included in the “Encuesta de Población Activa”, the distinct levels were grouped in four groups:

Without studies.- (ISCED 0/1) Include all those that leave school before reaching the last compulsory year.

Compulsory studies.- (ISCE 2) Include all students enrolled in the last course of compulsory secondary education (ESO), having or not obtained its. From the old plans includes persons with ‘graduado escolar’ (EGB), ‘certificado escolar’ and ‘Bachiller elemental’ having completed it or having been enrolled in the fourth course..

Secondary education.- (ISCE 3/4) in this level are included people having completed its post-compulsory secondary school with a ‘bachiller’ title (LOGSE y BUP). Are also included people with professional training average grade ‘Módulos II’ and ‘Formación Profesional I y II’.

Tertiary education (ISCE 5/6).- includes all the persons having obtained the degree of ‘Licenciado’, ‘Ingeniero’ or ‘Arquitecto y técnico superior’ (Módulos III).

In the Figures 2.1 A, B and C the projections of the composition of the educational level of the Spanish population, obtained from 1997⁹ onwards with MEDTRA96 model can be observed. It's worth mentioning the important percentage representing today the population without studies or with the minimal compulsory studies of the total population, phenomena affecting both men and women¹⁰. This is one of the causes generating such a low participation rate (mainly for women) in Spain and it partially explains also such a high level of unemployment. The extension of the compulsory studies to all the population and a higher access to secondary and tertiary studies in the eighties, allowed the baby boom generation to enter the labour market with a much better qualification level than its parents, that was even in some cases excessive when the economic crisis stroke especially the younger generation. The present educational system disposes of some quantitative parameters comparable with those of the OCDE (see OCDE, 2000). The future demographic evolution will imply that the less qualified generations will leave the labour market, being replaced by the new and better-prepared generations. In the Figures 2.1 A, B y C this process can be observed, where the populations percentage without studies decreases rapidly, being replaced by generations with the levels of education that now a days are offered by the educational system. The change in the qualitative composition of the population is very important.

⁹ Last year with data available on an aggregated level.

¹⁰ The 38.5% of the population does not have studies, 24.1% has compulsory studies, another 24% has secondary studies and a 13.2% have tertiary studies. These values are mainly due to the delay in extending the compulsory education to all the population.

Figure 2.1.A Men Qualification Composition in Working age

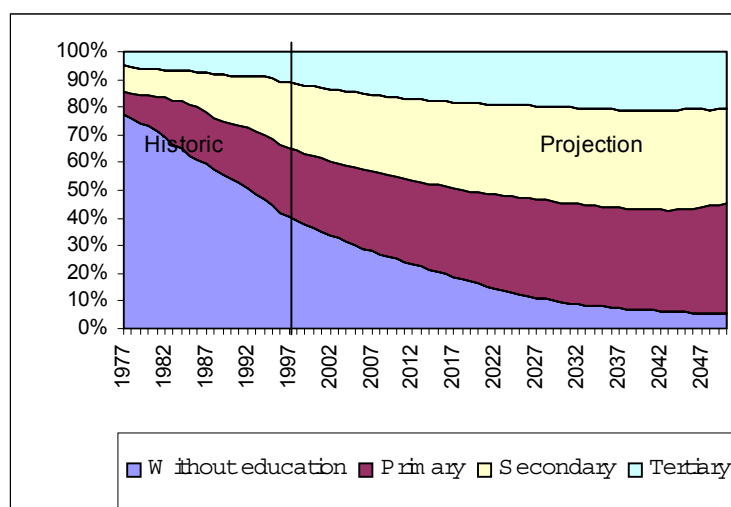


Figure 2.1.B Women Qualification Composition in Working age

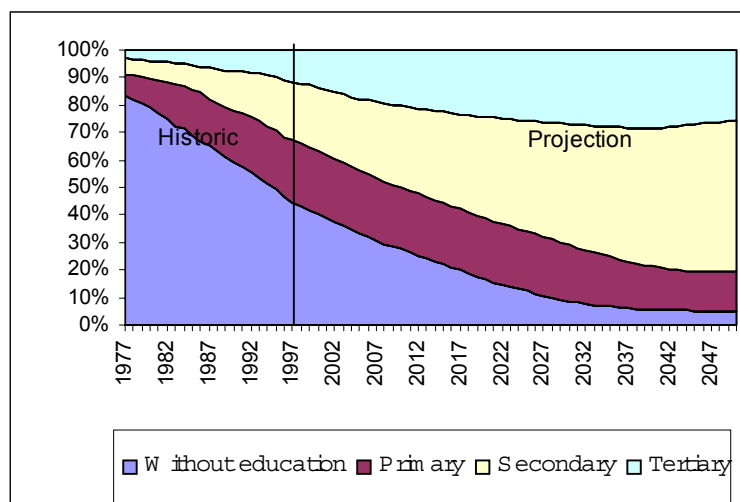
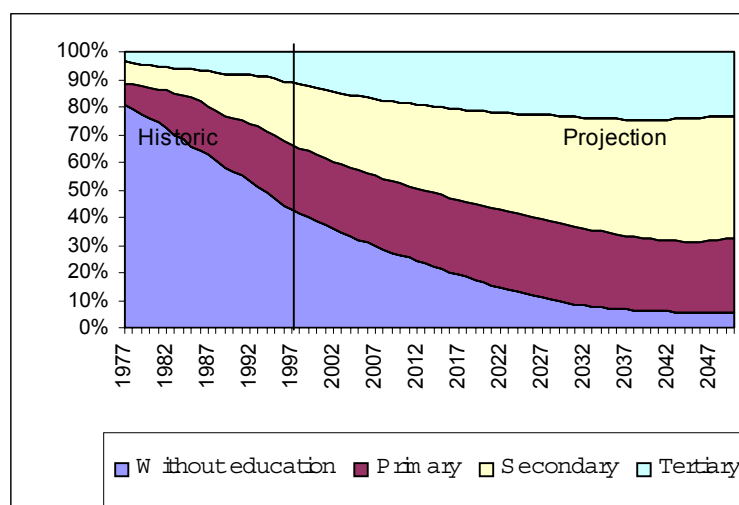


Figure 2.1.C Total population Qualification Composition in Working age



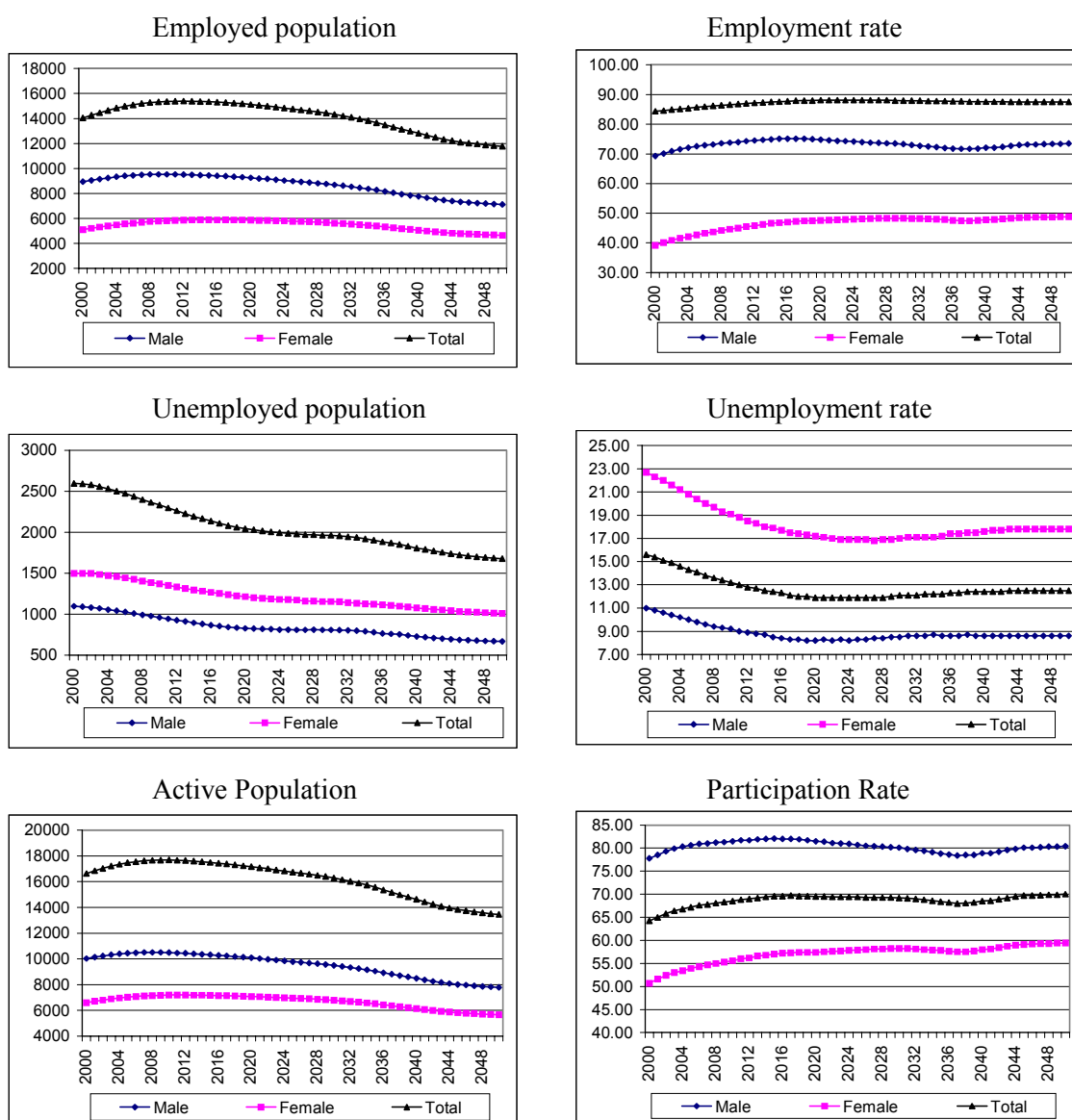
Its worth mentioning the formidable evolution of the women, that starting from lower levels of qualification than men, will surpass with the time, by the better academic results achieved (see Ministerio de Educación y Cultura, 1999).

2.2. Projection with improvement of the qualification level (V2 Projection)

In order to include the effect that an ostensible increase of the populations qualification level we will simulate, with the MEDTRA96 model the scenario of the V1 projection V1, but this time we will allow the population to increase its qualification level as shown in Figure 2.1.A, B y C. Given that we know that with a better qualification level, the workers have a bigger activity rate and a lower unemployment rate, the results generated by the model should behave in the same direction.

As can be observed in Figure 2.2, the number of total employed people increase up to 15.3 millions around 2010, smoothly decreasing until 11,7. By sex, we observe that employed men start decreasing before women (around 2009 with a maximum of 9,5 millions) and reach the maximum around 2017 with 5,8 millions.

Figure 2.2. Projection V2 (thousand people and percentage)



The number of unemployed people decreases almost a million people over all the period, split almost equally between men and women. The total unemployment rate decreases from 15,6 in 2000 to 12 in 2017. In this 3,6 p.p. it is included the effect of an ageing population, as reflected in V1 projection described in point 3.1. Given that the decrease by this effect was of 1,7 p.p., the net effect of the improvement of the education on the global unemployment rate would be about 2 percent points approximately. However, the effect of the educational level on the female unemployment is spectacular, the unemployment rate being reduced from 22,7 to 17 percent around 2022. The reduction experienced by the male population is more modest, decreasing from 11 to 8,2 in 2017. After reaching the minimum values, the unemployment rate present a slight increase due to the effects of the age distribution of the population's composition.

The most significant effect of the increase of the qualification level is in the increase of the employment rate. While this rate diminished 2,5 p.p. for the female population, for the male population it remained stable due to the ageing effects (see Figure 1.1), the increase of the qualification level generates an increase in the employment rate of the male population by 2,6 percentual points and the one of the female population in 8,7 percentual points. The net effect of the education would therefore increase both the employment rate for women in 11 points¹¹ and the one for men in the 2,6 previously obtained until the year 2050.

3. The introduction of the labour market and the growth.

The amount of labour factor available in an economy depends firstly on its population. Given this first demographical constraint, it should be then considered the number of people deciding to offer its work in the market. According to the economical theory, the agents decide the labour offer given some preferences about leisure and consumption and a budget constraint. Empirically, this preferences and constraints are shown in the evolution of the active population. On the other side, the new composition of the qualification and of the economic growth will reduce the number of unemployed people and will increase the number of employed people. Therefore one should observe a priori, an increase of the tax payments and a reduction of the State transfers. The net balance of the tax income $T_{s,k}$ (equation 1.2) would be affected.

A) The activity rate

The trend showed by the last 23 years present different behaviours for men and women. In the superior part of the Table 3.1 the evolution of the activity rate for men classified by age and qualification levels is shown.

¹¹ This result does not imply that the individual activity rate by sex and age increase. The observed increase is due to the fact that the proportion of population with higher levels of education is higher.

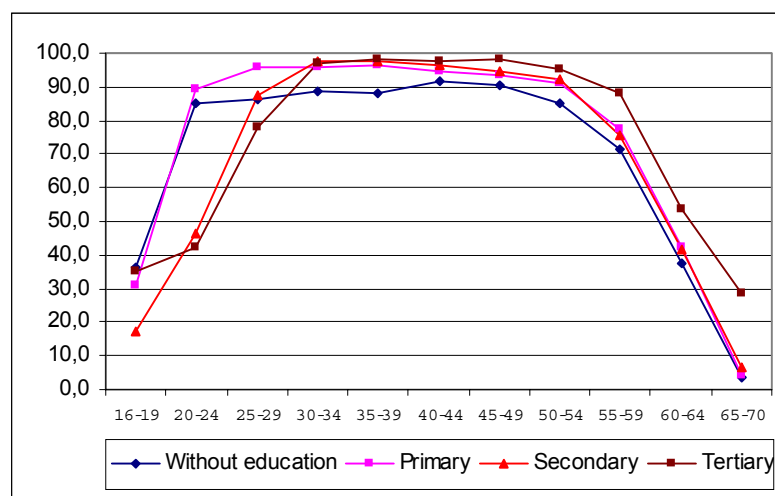
Table 3.1 Variation of male participation rate by achieved studies level.								
	Without education		Primary education		Secondary education		Tertiary education	
	Total of the period. 77-99	Average of period 94-99*	Total of the period. 77-99	Average of period 94-99*	Total of the period. 77-99	Average of period 94-99*	Total of the period. 77-99	Average of period 94-99*
16-19	-50.6	-4.04	-9.7	-0.52	-2.15	0.55	-28.75	4.62
20-24	12.1	-0.27	24.6	0.20	11.55	-0.32	-20.71	1.09
25-29	-11.1	-0.66	-2.3	0.03	3.13	-0.39	-12.79	-0.69
30-34	-8.7	-0.61	-3.3	0.00	1.63	0.23	0.28	0.04
35-39	-9.5	-0.85	-2.2	0.04	-1.87	0.03	0.21	0.12
40-44	-4.5	-0.09	-3.0	-0.42	-2.20	-0.26	-1.69	-0.26
45-49	-5.1	-0.14	-6.7	-0.47	-3.70	-0.25	-0.59	0.00
50-54	-7.0	-0.09	-5.9	-0.60	-5.21	0.15	-4.18	-0.27
55-59	-15.0	0.15	-10.0	-0.91	-18.93	-0.97	-6.50	1.42
60-64	-31.8	-0.44	-33.1	-1.04	-33.72	-0.42	-27.79	-2.99
65-70	-25.2	-0.06	-38.0	-0.37	-32.35	-0.86	-37.17	1.13
Variation of female participation rate by achieved studies level.								
	Without education		Primary education		Secondary education		Tertiary education	
	Total of the period. 77-99	Average of period 94-99*	Total of the period. 77-99	Average of period 94-99*	Total of the period. 77-99	Average of period 94-99*	Total of the period. 77-99	Average of period 94-99*
16-19	-35.3	-4.46	-14.2	-0.67	-2.0	-0.18	-50.0	-0.67
20-24	12.3	0.14	4.8	0.05	6.2	-0.68	-21.7	0.91
25-29	23.9	0.24	17.4	1.09	21.9	0.01	11.0	0.33
30-34	23.7	0.34	22.5	0.15	34.5	1.21	16.7	-0.45
35-39	22.7	0.07	25.3	0.21	25.5	-0.20	26.7	-0.36
40-44	18.7	0.74	28.6	0.30	26.1	0.50	26.1	0.22
45-49	11.7	0.82	15.4	0.57	27.2	0.93	20.4	0.79
50-54	5.6	0.61	12.3	0.53	19.5	0.59	24.0	2.50
55-59	0.3	0.52	5.9	-0.03	10.6	2.17	7.1	0.56
60-64	-5.8	-0.03	-12.0	-1.21	-0.7	-0.24	-33.8	-4.02
65-70	-7.9	-0.19	-13.9	0.58	-14.4	0.61	-21.0	-0.35
* Annual growth average (1994-1999). Source: Encuesta de Población Activa (EPA). Instituto Nacional de Estadística.								

At the first sight, a decrease almost generalized for the 77-99 period is observed. By ages, a biggest descent is presented for the younger ages (16-19) deriving from the extension of the secondary and tertiary studies to a broader part of the population. For the central ages, the descent is bigger for the men without studies or having only the compulsory studies while reducing slightly or remain stable, depending on the age, up to 50 years old. From that age onwards, a rapid decline starts, mainly due to the to the policy of pre-retirement and anticipated retirements followed by numerous enterprises.

In the case of women, decreases in the activity rate are also produced in the younger ages and in the older ages, by the same reasons observed for the male population. However, for ages between 20 and 25 years old and depending on the educational levels reached, a rapid growth of the activity rate is observed up to 55-60 years old, where again the decline starts.

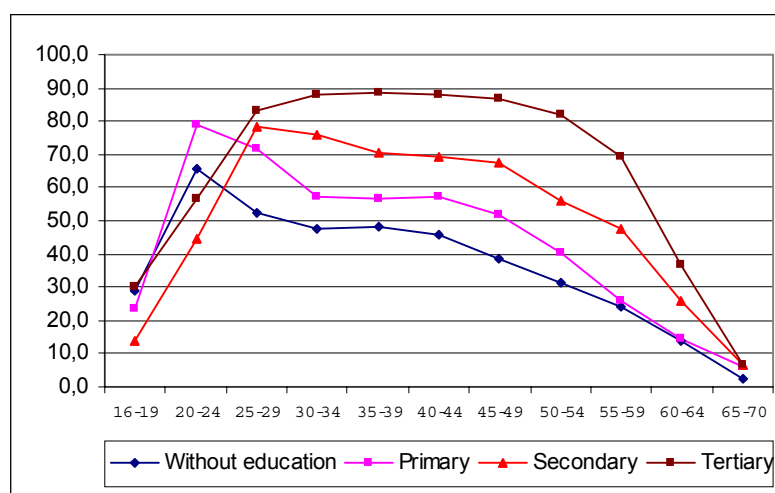
Therefore two different profiles appear.

Figure 3.1. Male participation rate-age profile (in percentage)



The first one could correspond to a mature market, corresponding to all the male related educational levels and to the ones of the female population having reached a tertiary education, presenting an inverted “U” shape. In this profile, the superior level of the tertiary studies can be observed, but always following the same profile than those of the rest of the studies.

Figure 3.2 Female participation rate-age profile (in percentage)



The second profile (not mature) is presented by the women population, with an educational level between ‘without studies’ and ‘secondary studies’. This profile presents a maximum between 20 and 30 years old (according to the educational level) from which the activity rate starts decreasing surely due to marriage and to motherhood. However, the growth trend presented by the activity rates for those educational levels and central ages, previously pointed out, leads us to think that the women entering the labour market stay in it longer

than the women of the same ages of preceding generations. Therefore, this groups profile will become more similar to the inverted “U” mature profile, presented by men and women with tertiary education. The questions that might arise are the following: first, at what speed this phenomena will be produced and secondly, which level will reach the women’s participation rate.

To answer this question, a possible solution is to observe the experience of other developed countries where the woman joined the labour market previously and that presently present the characteristics of a mature market.

Observing Table 3.3. presenting the activity rate by gender and level of studies reached; we observe a big variability around Europe. Concerning men, the highest the variability, the lowest the level of studies completed. Concerning women, the most interesting is the behaviour of its participation rate.

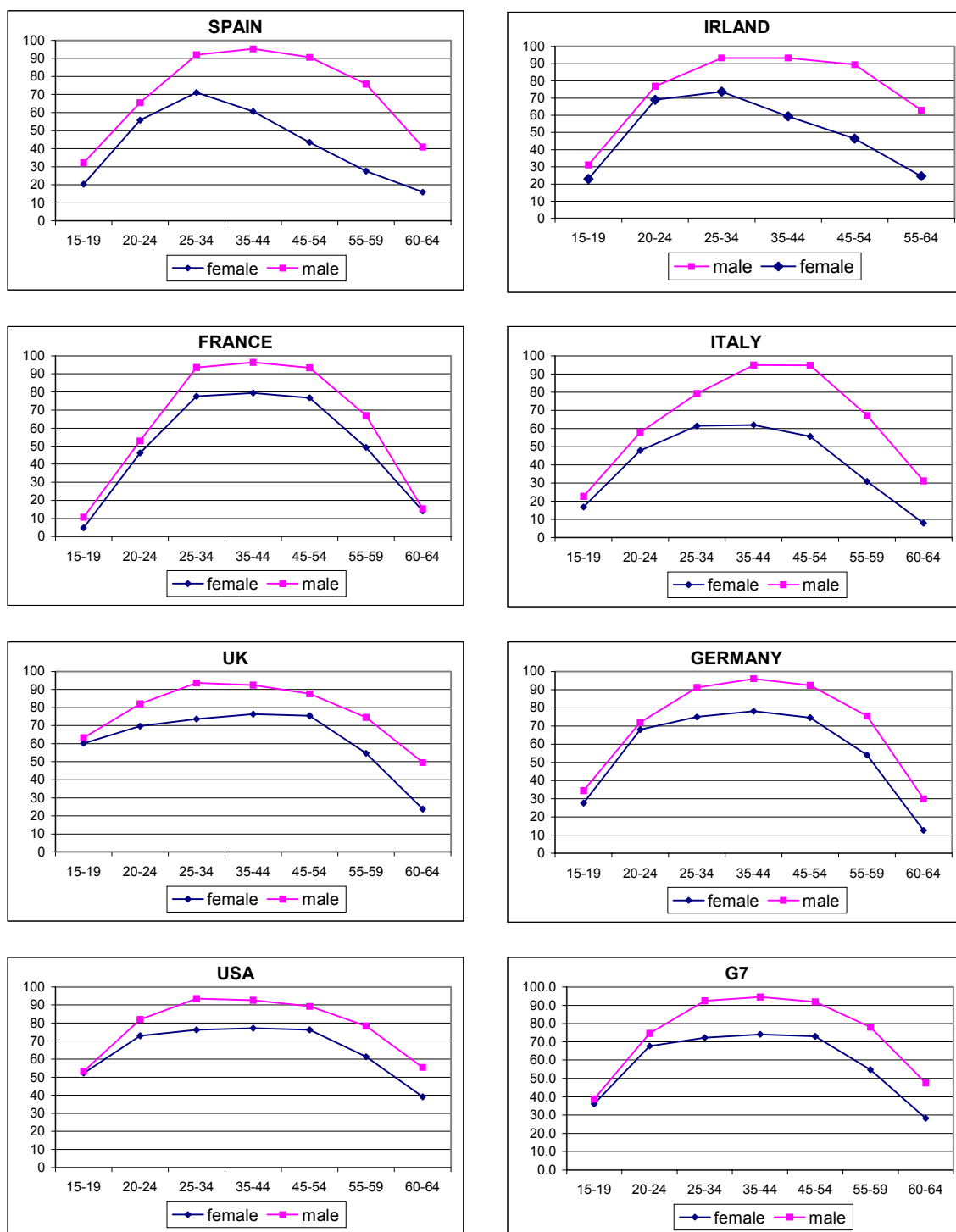
Table 3.3 Participation rate* by educational attainment								
	Lower than Secondary.		Secondary Education		Tertiary Education		Total	
	Male	Female	Male	Female	Male	Female	Male	Female
Spain	82	39	91	68	92	85	86	51
Sweden	80	67	89	83	93	92	87	81
Germany	77	46	84	69	88	83	85	66
UK	68	52	88	76	93	87	86	73
France	77	57	89	76	91	83	85	69
Portugal	90	69	87	80	96	93	90	72
Italy	74	33	86	64	91	81	80	47
Eire	81	38	92	63	95	80	87	55
USA	75	50	88	73	94	82	88	73
G7	77	50	89	70	93	80	82	64
OECD	78	51	89	69	93	83	87	64
* Age from 25 to 64. Source: OECD(2000) page 269.								

Here, the variability is superior also the lowest the level of studies reached. It is difficult to find out an economical-geographical-cultural pattern as a reference. Countries with similar rent per capita have different female activity rates. For example, in Germany, the women participation for the primary and the secondary levels is of 11 and 7 percentual lower than the French one and 6 and 7 percentual points lower than the U.K. one. The differences between Germany respect to a northern high-rent country such as Sweden increase significantly to 21 percentual points in the primary schooling, 14 percentual points in the secondary schooling and 9 in the tertiary. Differences that on the other hand are also significant respect to a lower rent southern country such as Portugal (23 percentual points in the primary schooling, 11 in secondary and 10 in tertiary). A clearer pattern can be found in the values of the so-called

“catholic” countries. Spain, Italy and Ireland have activity rates significantly lower than average mainly in the group with primary schooling. As this qualification level is predominant in the population, mainly between the oldest, the total activity rate is significantly lower than the OCDE average.

Observing the profiles of the activity rate of some of the pointed out countries, we realise that in most of them (excepting for the “catholic” ones) present a profile characterized by an inverted “U” shape, being that labour market profiles present a certain parallelism for both men and women. The differences marking the diversity previously stressed are observed mainly in both extremes of the curve, meaning that the slope and the level reached between 15 and 25 years old (training period) and the downward tendency and level reached between 50 years old and the retirement date (usually 64 years old or less in the cases of pre-retirement or early retirement). This profile contrasts with the one presented by the so-called “catholic” countries where a difference between the inverted “U” shaped mature profile presented by men and the inverted “V” shaped approaching maturity profile presented women (see Figure 3.3).

Figure 3.3: Age Participation rates Profiles, 1998



Source: “Labour Force Statistics 1978-1998”. OECD(1999) and author’s calculation.

An approaching maturity profile means that according to the increments in the women's activity rate presented by women in the central ages and in all educational levels shown in Table 3.1, the new generations replace the old ones with a higher permanence in the labour market, approaching therefore the mature profile.

The marked tendency will continue until it reached an activity level considered mature. Even though the trends are clear, it is very difficult to predict the approximate profile that the activity rates will present in the future. Any objective profile, reasonably argued could be valid to execute the projections. In our simulations we will assume that the profile women will assume will be of similar level and shape that the observed for the G7 group (see Table 3.3 and Figure 3.3).

In the men's case, given the belong to a mature market similar to the one of the remaining developed countries, the activity rate profile will resemble the presently observed, adjusting it to the level observed for the G7 countries (see Table 3.3). It is worth mentioning that in the secondary educational level the activity rate should go down by two points in the secondary it should reduce by five. However, in the tertiary it should increase by one point. This trend on the other hand can be observed in the 1994-1999 average period as seen in Table 3.1. Therefore, the activity profile of the tertiary education workers will remain stable.

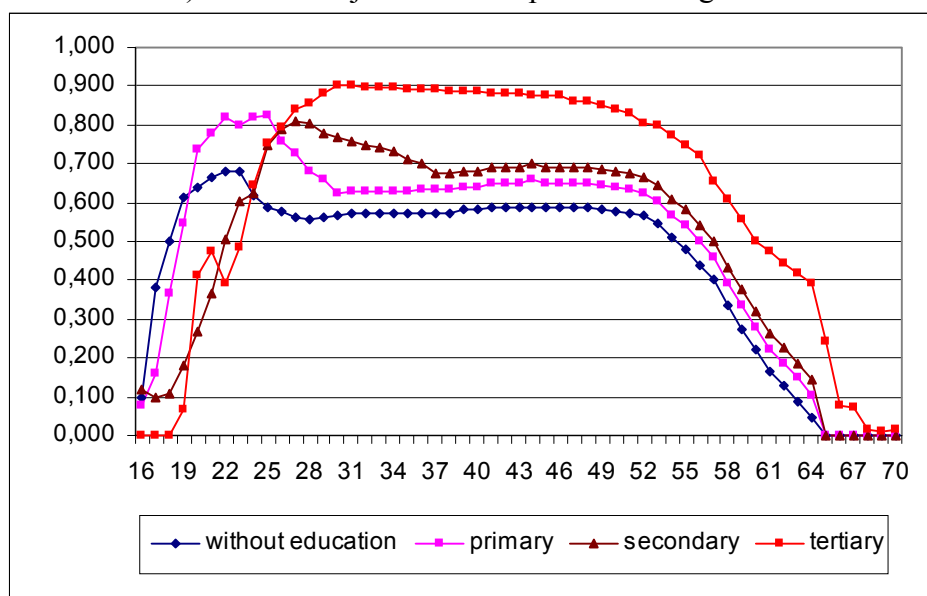
Given that the main differences between the countries arise in the initial and final ages, we will assume that the Spanish Educational system is mature and the activity rates for the initial ages will be maintained in the future. For the final ages, we will also adopt the structure observed in the Spanish labour market to include its peculiarity in terms of pre-retirements and early retirements¹².

Joining all these criteria and smoothing the curves to correct some statistical defects of the EPA, we will obtain profiles by educational level that must be coherent on an aggregate basis.

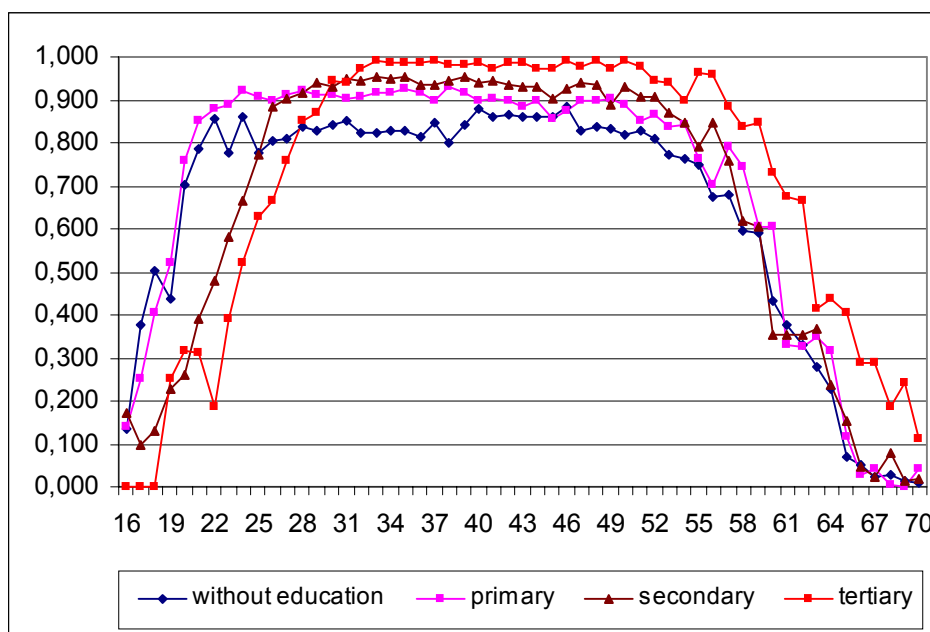
In the Figure 3.4 and 3.4 B we have the profiles to be applied in the model for men and women by qualification level, that generate the activity rate results specified in Table 3.4.

¹² Projections on population's ageing effect done by OCDE (1998) reveal that the elimination of the early retirements have an important effect in the future increase of the aggregated activity rates for the OCDE countries. In this paper we will assume, as a base criteria that the early and pre-retirement rates are the ones presently observed, splited by sex and qualification level.

Figure 3.4
A) Female Objective Participation rate-Age Profile



B) Male Objective Participation rate-Age Profile



As we can observe, the profiles by ages and qualification level have been adjusted in order to obtain activity rates similar to the ones observed for the G7 (see first row of Table 3.4). However, the resulting total (second row, of the two last columns) is lower than the total objective, mainly due to the fact that in the present structure of the Spanish active population qualification level the weight of the lower qualified and with lower activity rates is higher.

Table 3.4 Calibrated Participation Rate (in percentage)										
	Without education *		Primary education		Secondary education		Tertiary education		Total	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Objective 25-64	70	45	88	63	89	70	93	80	82	64
Result 25-64	70	45	88	63	89	70	90	84	81	60
Result 16-64	69	45	77	57	71	56	85	80	74	55
* The objectives of participation rate in ages 25 to 64 corresponding to “without education” and “Primary education” attainment levels, reproduce the rates of “lower than secondary “ of the G7 group in Table 2.2.										
Source: Encuesta de Población Activa (EPA). Instituto Nacional de Estadística and author’s calculations										

According to the criteria adopted in the training of the population from the educational system, the total rates will gradually raise until the European level is reached, as will be seen in the projections.

B) The decrease of the unemployment.

Many and varied factors influence the jobs creation in one country. On the long term, there seems to be an empirical relationship between the economic cycle, meaning between GDP and potential GDP growth, and the unemployment rate evolution. This relationship was proposed by Okun in the beginning of the 60’s (see Okun, 1962) and related the variation of the unemployment rate respect to the difference between observed GDP and potential GDP. This is a reduced and simple form allowing to relate, from an empirical point of view, the reduction of the unemployment with the economic growth without need to develop a complex structural model of the labour market, that most probably would lead us to the same empirical conclusions reached using the mentioned law. Some estimations of this relationship have been produced showing different elasticity’s, depending on the observed country and on the considered period (see Attfield and Silverstone (1996), Weber (1995) and Moosa (1999)).

For Spain, some estimates exist, such as the ones produced by Blanchard and Jimeno (1999) using data for 1978-91, 1978-94 and 1978-97 periods. The results obtained vary, depending on the considered period and on the estimated equation¹³, between –0,80 and –1,05.

¹³ See Table 1A and 1B, page 46 in Blanchard and Jimeno (1999).

As we can see from Table 3.5, estimations have been produced for men¹⁴, by ages and groups of finished studies. Generalizing we find that the coefficients and R^2 are higher for lower ages and in lowest educational levels. This fact could be explained by the labour market duality, where the youngest and less qualified aced to the labour market with temporary contracts strongly depending on the economic cycle. However, the oldest and higher qualified obtain before a permanent contract that protects them from lay-off's in economic crisis periods, furthermore of enjoying more facilities to find a job. In fact, in men older than 45 years old and posseing a tertiary level of studies the coefficient turns out to be slightly significant or no significant.

In the case of women (see Table 3.6) the obtained coefficients are in general lower that its male equivalents. The results are interpreted by the lower maturity of Spanish the feminine labour market characterised by a fast increase of the participation rate and the difficulties to find a job, even in economical prosperity periods, prevent the reduction of the unemployment rate at the same velocity as for the male population.

Table 3.6 Okun's Law								
Female								
	Without education		Primary education		Secondary education		Tertiary education	
Age	β	$\bar{R}^2$	β	$\bar{R}^2$	β	$\bar{R}^2$	β	$\bar{R}^2$
16-24	-1.57* (-4.34)	0.42	-1.64* (-4.65)	0.50	-1.70* (-4.85)	0.53	-2.03* (-2.92)	0.29
25-49	-0.63* (-2.69)	0.06	-0.88* (-3.55)	0.30	-0.59** (-2.37)	0.11	-0.80* (-4.86)	0.51
50-64	-0.29* (-2.69)	-0.13	-0.34 (-1.05)	0.00	0.04 (0.08)	-0.01	-0.11 (-0.92)	0.00
Total								
16-24	-1.66* (-4.45)	0.47	-1.71* (-4.23)	0.47	-1.72* (-5.18)	0.57	-1.83* (-2.93)	0.29
25-49	-0.63* (-3.48)	0.31	-0.73* (-3.7)	0.36	-0.57* (-2.97)	0.25	-0.59* (-6.05)	0.62
50-64	-0.43* (-3.74)	0.35	-0.20 (-1.18)	0.02	-0.26*** (-1.59)	0.07	-0.13*** (-1.38)	0.03
Notes:								
¹ Results estimated with Ordinary Less Square for the equation: $\Delta U_t = \beta(\Delta GDP_{t-1} - \Delta GDP_{pot,t-1}) + \varepsilon_t$ (T-statistic in brackets).								
² *, ** and *** denote significant levels to 1%, 5%, 10% and 20 degrees freedom.								

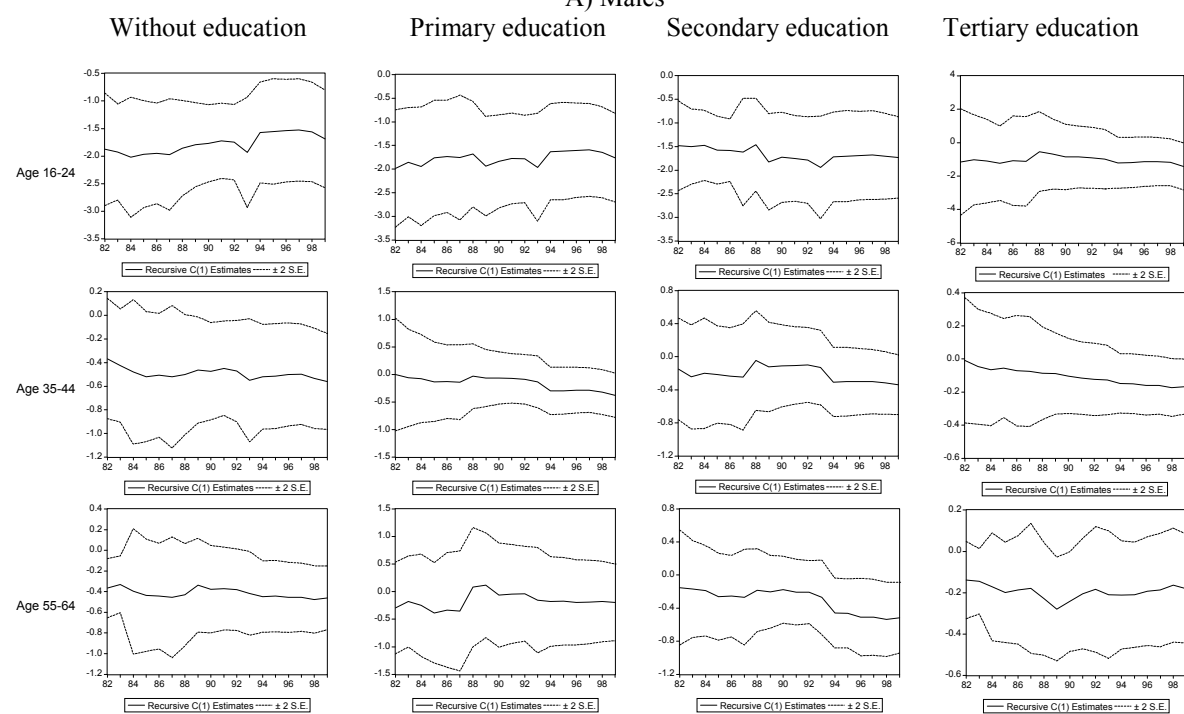
A desirable property to produce estimates using Okun's coefficients, is the stability of the coefficients with time, so that they can be used as a rule in

¹⁴ The same estimate, with the same desegregation level done for the women, reveals that the majority of the coefficients are non significant. Therefore we preferred not to include them.

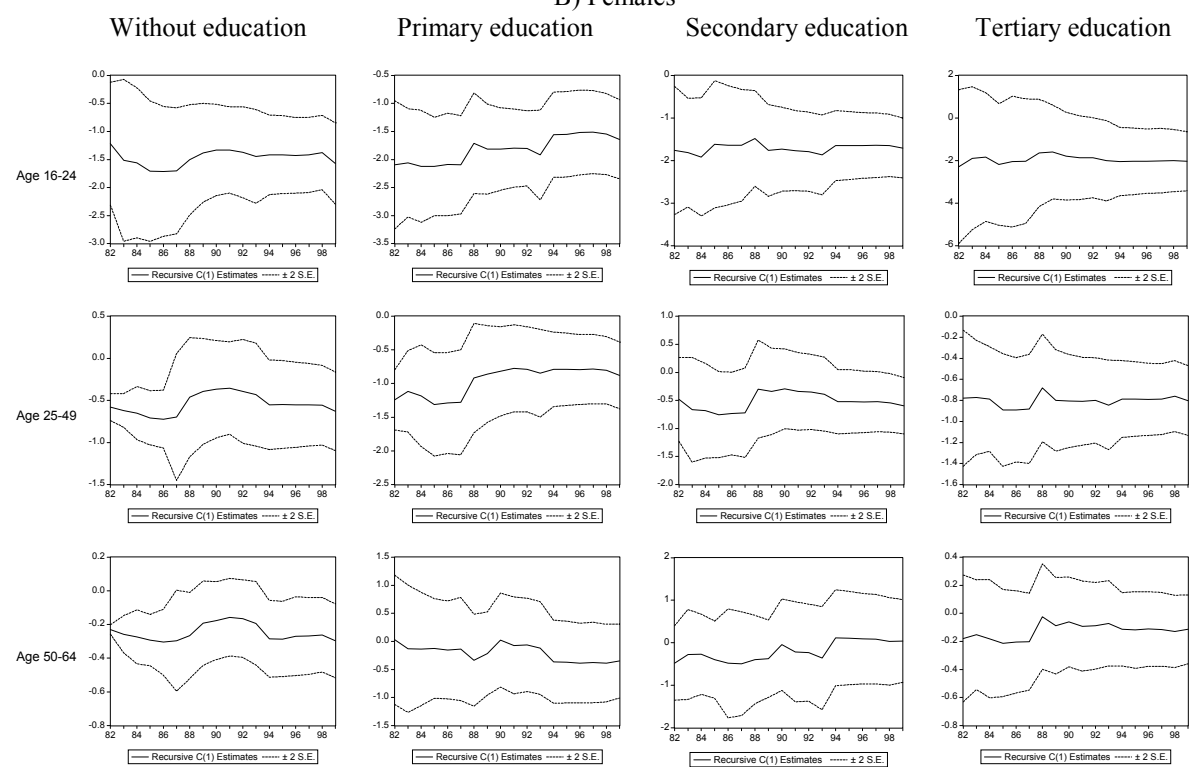
the future. As a contrast, we have produced a recursive estimate of the coefficients. In the Figure 3.5 a selection of all the results obtained by different age, level of education and sex groups is shown. In any case the coefficient comes out of the bands calculated as two standard errors and its values are fairly stable, which (apparently) reaffirms that the Okun's coefficient can be used as a behaviour rule to project the unemployment's rate evolution.

Figure 3.5: Okun's Law coefficient stability.

A) Males



B) Females



C) The model MEDTRA96 with projection of the labour market indicators

The assumptions previously explained on the behaviour of the activity and unemployment rate will be used to project those labour market indicators.

The assumption used for the behaviour of the men's activity rate will be the average annual decreasing ($\alpha_{i,j,s}$) of the period 1994-1999 by age, qualification level as seen in Table 3.1. For the ages presenting growth and whose goal profile is lower than the one observed in 1999, is applied the annualised reduction of its corresponding age for the whole period. For the women the same procedure will be used, using the growth described in Table 3.1.

$$TA_{t,i,j,s} = (1 + \alpha_{i,j,s})TA_{t-1,i,j,s} \quad (1.6)$$

where $TA_{i,j,s}$ is the activity rate, $\alpha_{i,j,s}$ is the growth rate for the group aged i , with qualification level j and sex s . The aggregated level of the active population is the sum of all the activity rates obtained by age, sex, and qualification level of equation 1.6 by the population of that age, sex and qualification level obtained by the MEDTRA96 projections.

Aggregating, the active population (PA):

$$PA_{t,s} = \sum_{i,j} (TA_{t,i,j,s} \times Pob_{t,i,j,s}) \quad (1.7)$$

where Pob is the population of the group aged i , qualification level j and sex s . The growth rate of the active population is calculated from 1.7.

$$\frac{\Delta PA_{t,s}}{PA_{t,s}} = \frac{PA_{t,s} - PA_{t-1,s}}{PA_{t-1,s}} \quad (1.8)$$

The variation of the unemployment rate is calculated from the coefficients ($\beta_{i,j,s}$) generated by the estimation of the Okun law shown in Table 2.5. by ages, sex and variation of unemployment rate. The GDP and potential GDP growth rates (in brackets) are determined using the macroeconomic equations (1.15 y 1.16) presented latter on.

$$\Delta TU_{t,i,j,s} = -\beta_{i,j,s} \left(\frac{\Delta PIB_{t-1}}{PIB_{t-1}} - \frac{\Delta Pibpot_{t-1}}{PIBpot_{t-1}} \right) \quad (1.9)$$

From 1.9 the unemployment rate by sex, age and qualification rate $TU_{t,i,j,s}$.

$$TU_{t,i,j,s} = TU_{t-1,i,j,s} + \Delta TU_{t,i,j,s} \quad (1.10)$$

Multiplying the unemployment rate according to sex, age and qualification level obtained in equation 1.10 by the active population observed in 1.7 and adding-up the active population per classes the total unemployed population (PU) is obtained.

$$PU_t = \sum_{i,j,s} (TU_{t,i,j,s} \times PA_{t,i,j,s}) \quad (1.11)$$

The employed people are calculated as the difference between the active population obtained in 1.7 and the unemployed population obtained in 1.11 by age, sex and qualification level.

$$PO_{t,i,j,s} = PA_{t,i,j,s} - PU_{t,i,j,s} \quad (1.12)$$

and then the total active people is obtained aggregating:

$$PO_{t,s} = \sum PO_{t,i,j,s} \quad (1.13)$$

The growth rate of the employed people is calculated using 1.13.

$$\frac{\Delta PO_{t,s}}{PO_{t,s}} = \frac{PO_{t,s} - PO_{t-1,s}}{PO_{t-1,s}} \quad (1.14)$$

b) The macroeconomic formulation is specified using the following formulation:

The GDP growth rate is specified using the following accounting identity:

$$\frac{\Delta PIB_t}{PIB_t} = \frac{\Delta PO_t}{PO_t} + \frac{\Delta Pr od_t}{Pr od_t} \quad (1.15)$$

The growth of the occupied population $\left(\frac{\Delta PO_t}{PO_t} \right)$ was previously calculated in (1.14).

Analogously, the potential GDP growth rate is given by the following identity:

$$\frac{\Delta PIB_{pot_t}}{PIB_{pot}} = \frac{\Delta PA_t}{PA_t} + \frac{\Delta Pr od_t}{Pr od_t} \quad (1.16)$$

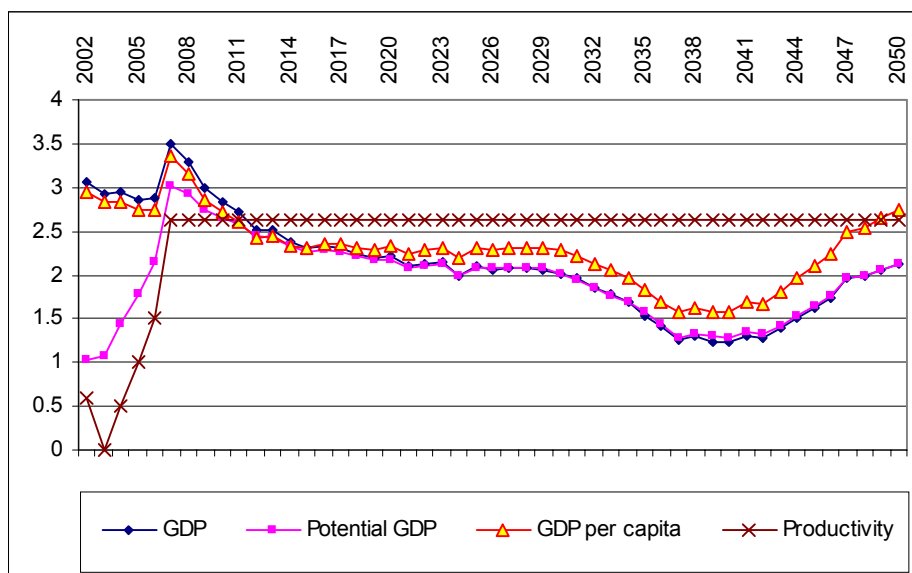
where $\left(\frac{\Delta PA_t}{PA_t}\right)$ is calculated in (1.8) and the productivity's growth rate $\frac{\Delta Prod_t}{Prod_t}$ is specified in the macroeconomic scenario. The equations 1.15 and 1.16 will be used to calculate the next period unemployment rate using equation (1.9)

3.1 Effects labour market and economic growth (Projection V3)

To the demographic effect (V1) and to the composition of the labour market qualification improvement effect (V2), two other fundamental tendencies that will emerge in the long term should be added. On one hand, the change in the male and female workers preferences by entering or leaving the labour market evidenced by the activity rate. On the other hand, the unemployment rate evolution that will decrease with the increase with economic activity.

The macroeconomic scenario used in this projection fixes the productivity's annual growth rate trend at 2.6%; the one experimented by Spanish Economy over the period 1960-2000. The remaining variables are calculated using the formulation described in item C. The obtained results are shown in the Figure 3.6.

Figure 3.6: Macroeconomic Scenario. (In growth rates)

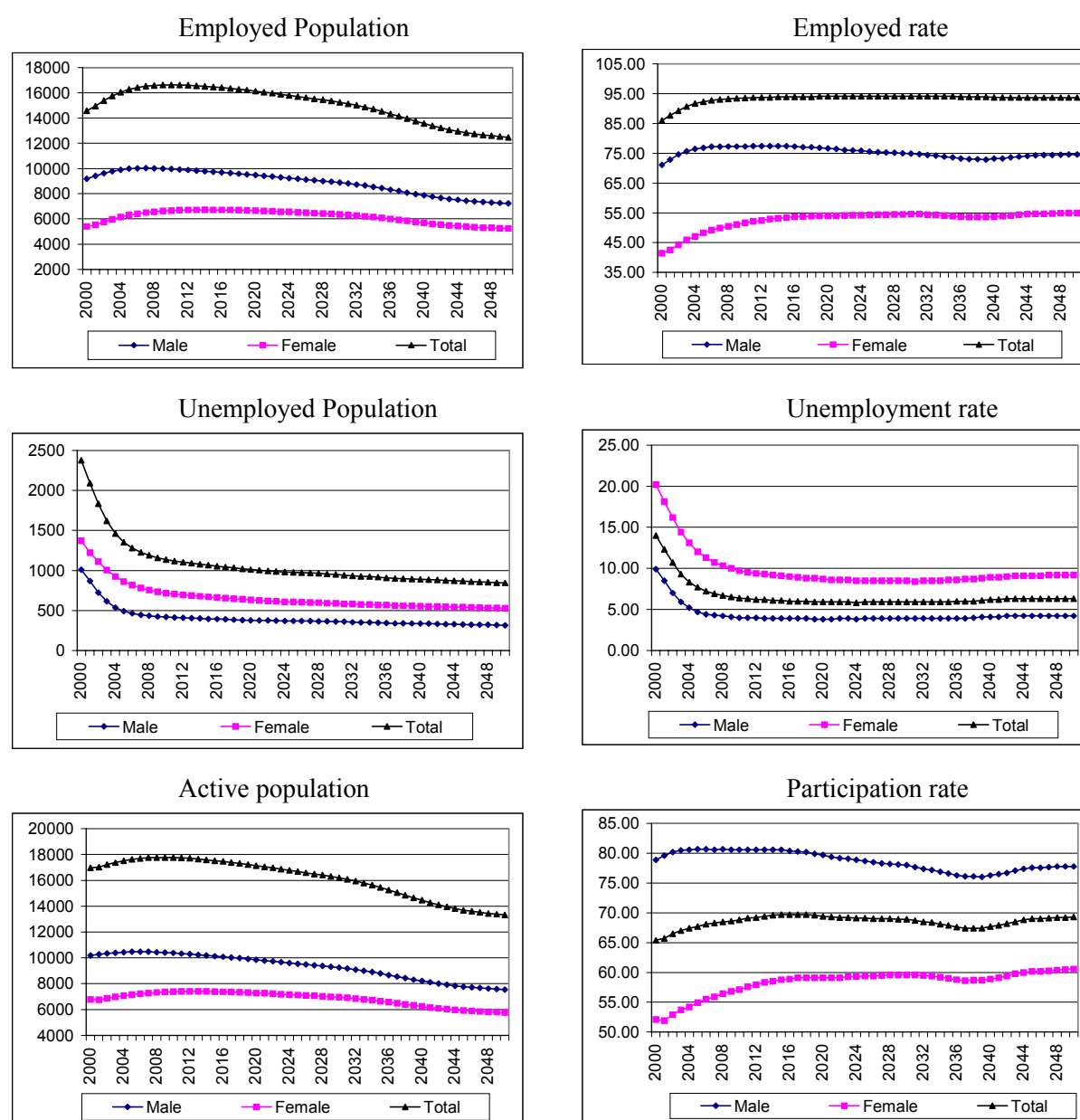


As can be observed, the productivity's growth was progressively increased from present levels up to the productivity's trend with an annual growth rate of 2.6%, guaranteeing the GDP growth rate compatibility with short-term Government forecasts. Until 2010 a difference between the growth rate of the GDP and the potential GDP is rapidly observed thus generating the unemployment rate. From that year onwards, and despite the generous growth of the total productivity, the GDP, potential GDP and GDP per capital growth rates keep a diminishing trend, especially accentuated from 2029 until 2038 where it stabilizes. From 2042 onwards, the three indicators start growing again. This figure adopts this evolution due mainly to the reduction of the number of effectives available to work in the future derived from the ageing of the population's effect, as shown in V1 and V2 projections. Another fact that can be observed is that a GDP per capita growth could be superior to the GDP growth due mainly to the fact that the population growth rates will converge to zero or might possibly be negative.

Using the previously obtained results on the labour market using the prior macroeconomic scenario¹⁵ the V3 projection is obtained as shown in Figure 3.7. The results reveal the estimated behaviour of the labour market under the previously explained assumptions. The number of total occupied people reach a maximum of 16,6 millions around 2010 due mainly to the strong increase of the employed women. From that year onwards, the ageing effect prevails and the number diminishes until 12,4 millions in 2050.

¹⁵ It should be pointed out that this projection is used, for each period, by the macroeconomic scenario, according to the equations in part C.

Figure 3.7. Projection V3 (thousand people and percentage)



The unemployed men diminish and reach full employment values (3-4%) around 2013. The women attain 8% around 2024. The global unemployment rate reaches a minimum of 6% in 2011.

The activity rate increases four points, reaching a maximum of 80,7 per cent in 2005 where a downward trend generates a decrease to 76 per cent in 2039. The women's activity rate presents a spectacular upward trend increasing from 52,1 per cent to 60,0 per cent in 2050.

4. Comparison of results and estimations on the labour tax income.

4.1 Comparison of the projections V1, V2 and V3.

Comparing the three projections of the main indicators of the labour market, the distinct effects of the different assumptions are observed. It should be mentioned, as already mentioned, that the successive projections include the effect of the previous (see Figure 4.1)

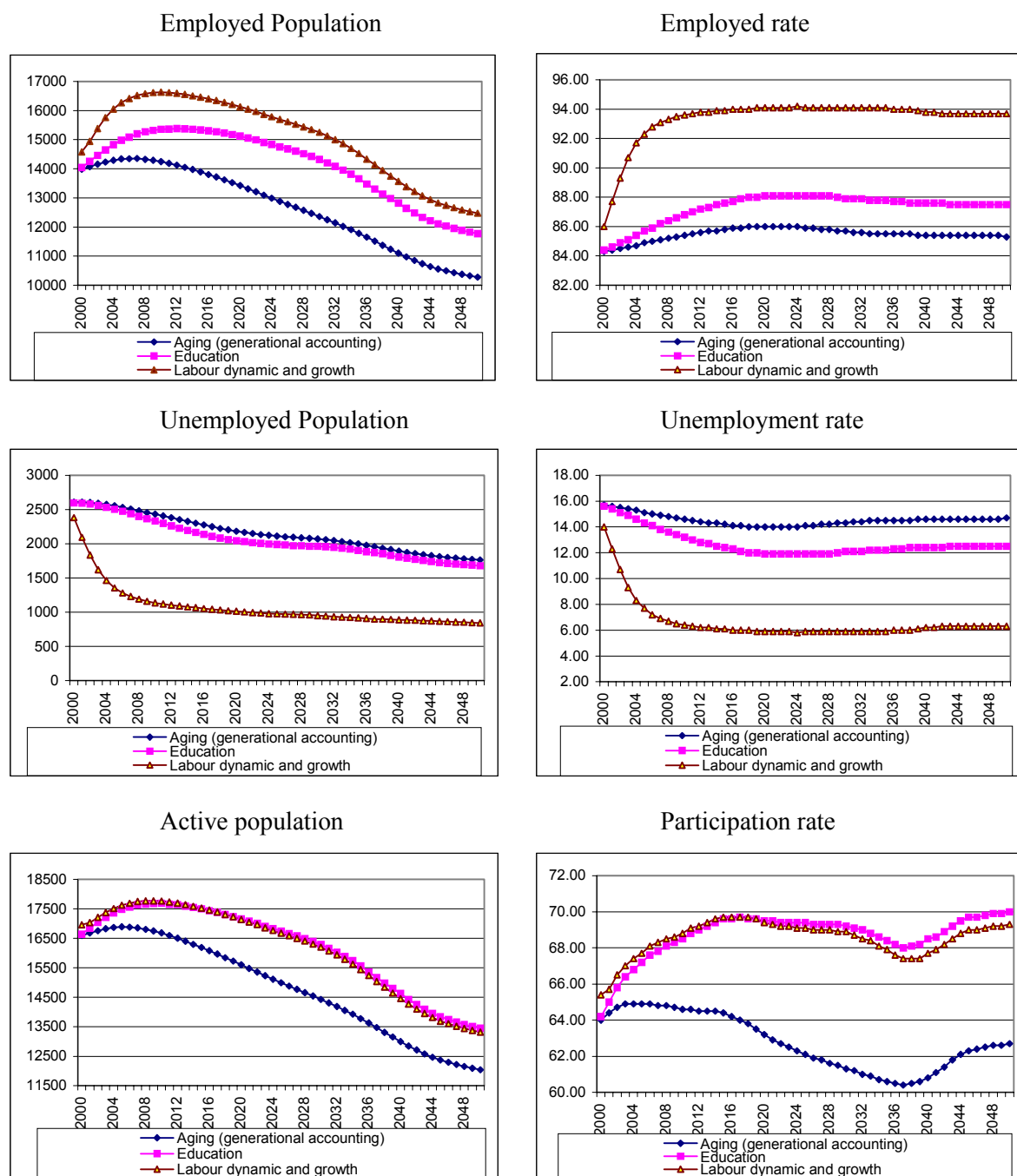
The ageing of the population on its own causes the number of employed and unemployed people to decrease by the reduction of the number of effectives reaching the labour market, although we can not state that this only effect will be strong enough to solve the unemployment rate problem. The actives would reduce in about 5 million people while the activity rate would start decreasing from 2018 due to the arrival of the first *baby boom* generation to old ages with higher inactivity rates.

The improvement of the educational system determines a considerable increase of the number of employed people partially attenuating the ageing effect. The number of unemployed also diminishes having a more powerful effect on the women's unemployment's rate. Therefore, the main effect of the educational factor is an increase of the actives number and of the activity rate. Whereas with the ageing effect alone the number of employed and unemployed people would be lower than the actual in 2012, introducing the educational effect, that period would be delayed until 2027.

The fact that the activity rate of the V3 projection is lower until 2012 and higher from that year onwards to the one obtained using only the increase of the educational level effect (V2), is only due to the decision on the shape and elected profile by ages of the activity rate selected for this simulation and to the rate of decrease (increase) of this rate up to that level for men (and women). This demonstrates that the educational level is the main factor generating an increase of the indicator.

The biggest effect of the labour market simulation and the growth (V3 projection) is the increase of the number of employed people presenting a difference in the maximum number of employed around 2008 of 1,3 millions respect to V2 projection and 2,2 millions respect to V1 projection. With the ageing effect, the number of employed people would be lower than the actual around 2014, while by introducing the educational effect, this outcome would be delayed until 2033 and until 2038 including the growth and increase dynamics. This mainly derives from the positive effect of the education and especially the growth on the unemployment reduction.

Figure 4.1: Compared total effects. (thousand people and percentage)



The important differences found in the three projections respect to the number of employed (contributors) and unemployed people (benefit's receivers) would significantly alter the projections made on a typical simulation using generational accounting models thus recommending its introduction in those models to allow for a better approximation of a possible future reality.

4.2 Compared projection of the labour fiscal income.

As it could be observed in point 4.1, the number of effectives is substantially different depending on the assumptions used using generational accounting models.

In this epigraph, a simple exercise is done in order to quantify the real effects of the labour tax collection income. We use the tax rate levels legally in force in Spain in 2000 on labour income (see Table 4.1) and apply them to the gross salary curves¹⁶ obtained from the Encuesta de Estructuras Salariales (INE, 1995) for the four levels of training obtained in the model¹⁷.

Table 4.1: Tax level for labour income in Spain (2001)

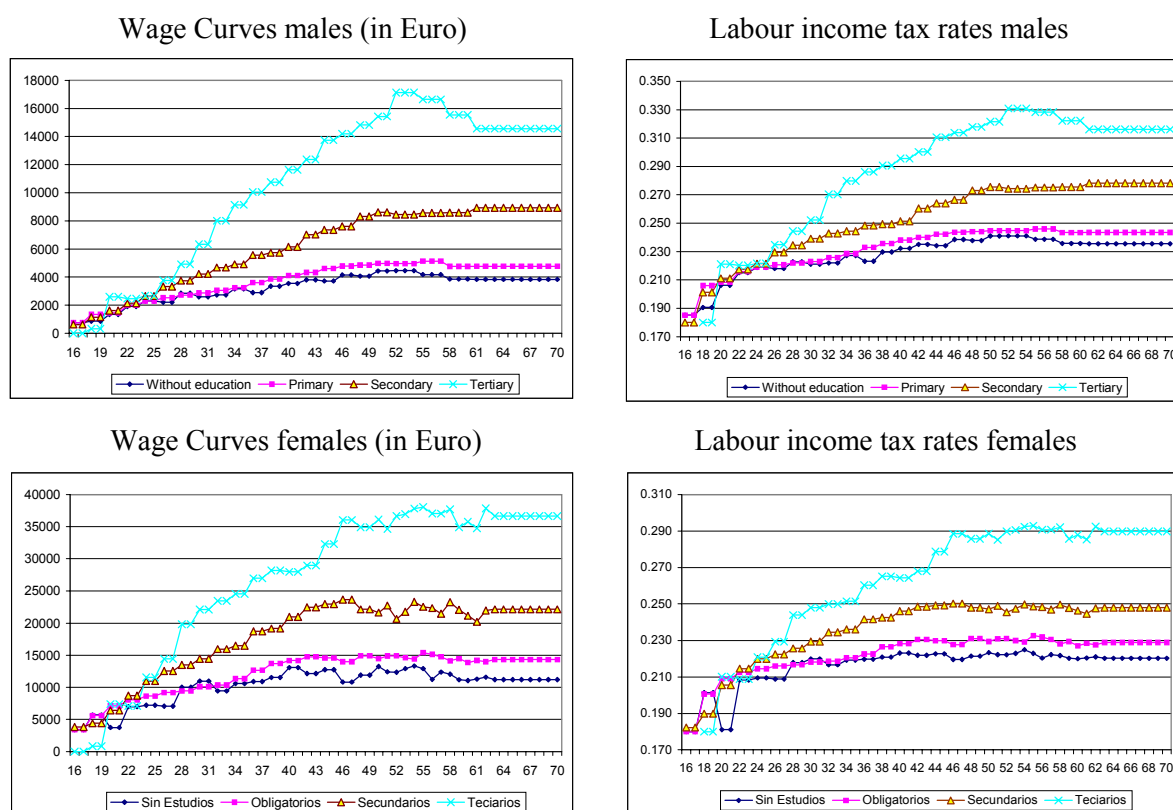
More than (In Euros)	Quota (In Euros)	Tax rate for the rest.
0.0	0	0.180
3678	662	0.240
12873	2869	0.283
25134	6339	0.372
40460	12040	0.450
67433	24178	0.480
Source: Ministerio de Hacienda.		

The wage curves are shown in Figure 4.2 (left figures). On the right hand side of the table are shown the effective tax income deriving from the legal tax rates of the Table 4.1, by level of qualification. In fact, we observe that to a higher level of education corresponds higher salary level (productivity). Analogously, we can observe the lowest women remuneration respect to men for the same educational level. It can also be observed the progresivity of the Spanish tax structure, where the most educated (with higher income) have higher tax rates reaching an average of 33% for men and 29% for women.

¹⁶ In this gross salary are not included social security quotes nor individuals exemptions or fiscal deductions. In none of the projections the salary level grows with productivity so that all projections are comparable.

¹⁷ The results were smoothed mainly for women due to sample problems and a rescaling has been done to obtain the average salary observed for men and women in the second half of 2000.

Figure 4.2: Wage Curves and labour income tax rates.

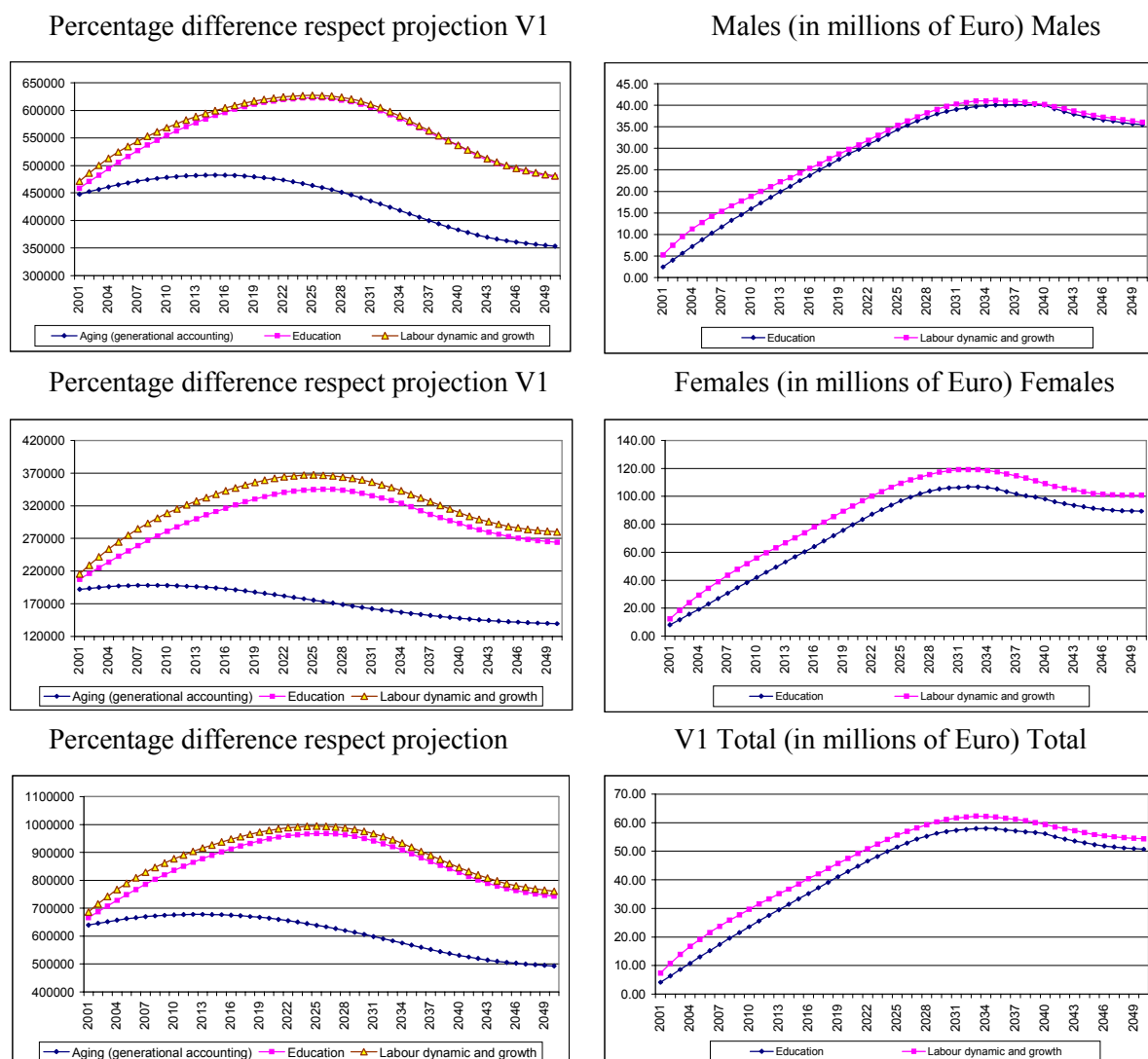


Applying the tax rate curve to the gross wages from 4.2 for each employed, according to its education level, age and sex, the State labour tax income is obtained depending on the projection used (see Figure 4.3).

The results are easily interpretable at first sight. The left part illustrates the tax income for men, women and total. On the right side, the differences between the projections V2 and V3 as a percent of the values obtained in V1 projection.

Facing the tax income decreasing trend of V1 projection V1 due to the reduction in the number of employed derived from the ageing of the population, the inclusion of the educational factor and of the labour market modernization results in a parabola reaching the maximum with an income around 100.000 millions de Euros about 2025, descending then to a level similar to the one presently obtained. Therefore, in face of a resource reduction obtained with the projections normally used using generational accounting models, the introduction in the model of heterogeneity generates a positive resource contribution all over the period. The percentage differences of the total income reach 40% annual for the men and a value between 100% and 120% for women, according to the version. In total, the annual income shows differences reaching 60% annuals for moment of maximum spread.

Figure 4.3: Tax revenues of labour incomes.
Comparison of projections.



Concerning the differences between V2 and V3 projection, they are produced mainly for women, reaching V3 projection a 13% annual more than V2 in terms of V1, and that imply a difference of a 4% annual in total. This is mainly due to the fact that in V3 scenario women reach a mature labour market with a higher activity rate and consequently a higher number of employed

It must be stressed that the heterogeneity effect, by educational level, is reinforced by the progresividy of the tax income structure. Given that to a higher educated population corresponds a higher salary and higher tax rate, the composition effect generated by the improvement of relative productivity is incremented by that factor.

With these results, the generations paying for the public deficit would change ostensibly and also would change the fiscal policy recommendations.

Conclusions

In spite of all the critics on the limitations of the answers given using generational accounting models, its utilization allows the observation of trends and magnitudes that some economical entities will follow, such as intergenerational fiscal balances, the pension systems and in general all those systems that might be affected by a demographic shock as it might be the case of the ageing of the population.

The results obtained and the conclusions on the economic policy would be very different depending on the assumptions used in the projections into the future. It is therefore necessary to use assumptions that rationally are close to a possible future reality. Some authors such as Banks et al (2000) and Berenguer et al (1999) show that the consideration of the labour market can change the results of the simulations.

In this paper an approach for introducing heterogeneous agents in generational accounting models is proposed. As observed in the market labour projections produced, the active population would increase 13% (8 points in activity rate) if the improvement of the educational level of future generations were considered. The observed trends of the labour market could increase in 23% the number of employed people by a reduction until a 6% level of the unemployment rate. In these simulations, the women's role is determinant for the difference in the results. Both assumptions would increase the contributor's number and would reduce some of the public contributions thus generating significant changes in the intergenerational fiscal balances.

On the other hand, the improvement of the population's qualification level produces an increase of the system's global productivity, as a mere composition effect. This means that the future contributors will have higher contributive capacity respect to past generations, regardless of the macroeconomic scenario used. This higher contributive capacity is augmented with the present progressive tax systems that generate resources to the State more than proportionally when the countries wealth increases.

The simple exercise proposed on the effects that would generate the introduction of the educational level and the market-labour on the labour tax income, shows that those would increase by 58% respect to the tax income generated by the projections not including the improvement of human capital and a 62% if the proposed market labour dynamics was introduced. In our opinion, the countries with similar characteristics to the Spanish case should include these effects in order to obtain a realistic exercise of generational accounting.

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