Generational accounts for Spain 2005

Gemma Abio

Centre d'Anàlisi Econonòmica i de les Polítiques Socials (CAEPS), Universitat de Barcelona

Email: abio@ub.edu

Concepció Patxot

Centre d'Anàlisi Econonòmica i de les Polítiques Socials (CAEPS), Universitat de Barcelona

Email: cio.patxot@ub.edu

Elisenda Renteria

Centre d'Anàlisi Econonòmica i de les Polítiques Socials (CAEPS), Universitat de Barcelona

Email: cio.patxot@ub.edu

Guadalupe Souto

Departament d'Economia Aplicada, Universitat Autònoma de Barcelona

Email: guadalupe.souto@uab.es

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In recent decades Spain has experience a fast economic growth, although it stopped suddenly in 2008 when the economic crisis hit most western countries, specially South-European ones. Spain joined the European Monetary Union (EMU) starting in 2002, being the fourth major economy of the euro area after Germany, France and Italy. At the same time, the country is facing a strong and drastic aging process, probably one of the most important in Europe and even in the world. These economic and demographic changes are expected to have a great impact on evolution of Spanish public finances.

1. Economic Setting

After almost 40 years of a dictatorship, Spain started a rapid economic development in late 70s. The country joined the European Economic Community (at present the European Union EU) in 1986, and it was one of the initial members of the European Monetary Union (EMU) in 2002. In 2007, just before the crisis, per capita GDP reached in Spain the 92.2% of the OECD average, 10 points more than in 1986. The growth rate was also higher than European average. Between 2000 and 2007, Spanish GDP grew more than 50% in real terms, while EU15 grew around 30%.

Spanish economy is mainly based in tertiary sector, which represents more than 60% of total GDP. Construction experienced a huge increase from 1995, although the crisis after 2008 stopped this tendency. On the contrary, the primary sector and industry have been losing participation in the economy during last decades. On the demand side, domestic private consumption represents near 60% of GDP, while public consumption is around 18%. Real total gross capital formation had increased more than 10 points in terms of GDP, until 31%, between 1995 and 2007. Regarding foreign balance, it has been traditionally negative in Spanish case. It reached a maximum of -6.8% in 2007 and nowadays is practically cero. In 2005, when the output gap for Spain is estimated around cero, imports of goods and services were 30.9% of GDP while exports only 25.7%.

Spanish labor market had also experienced deep changes in last decades. Traditionally, Spain has registered high unemployment together with low participation rates. Nevertheless, from

1995 an important increase in both figures took place. By one hand, participation rate rose from 50% in 1995 to 59% in 2007, mainly driven by the women and foreign workers activity, although an important difference subsists between male and female (65% and 46% respectively). On the other hand, unemployment rates fell considerably reaching an historical minimum of 8% in 2007. Nevertheless, last years have been really negative for labor market evolution in Spain, and unemployment rates have returned to the highest levels registered in the first 90s, over the 20%. Self-employment in Spain represented almost a 15% of total employments before the current economic crisis, being over the European average. More than two thirds of self-employed are male, and they are mainly working in the tertiary sector (about 65% of total). Construction had reached a 15% of self-employed, but currently this participation has fallen to 10%. Nevertheless, it should be pointed out that important differences subsist between different regions, because of the specific characteristics of their main economic activities.

Poverty index in Spain have improved slightly over the period. The percentage of people living with 50% or less than the current median income, after taxes and transferences, was 14.1% in 1985 and 13.7% in 2007. In any case, these figures are considerably worse than the OECD average (11.1% in 2007). Looking at the Europe, Spain had the worst poverty index, close but even higher than Greece and Portugal. Nevertheless, Spain had at the same time higher public social expenditure than most other countries. It represented a 21.9% of GDP in 2007, while the OECD average was only 19.2%.

2. Demographic Trends

Spain is undergoing one of the fastest aging processes in Europe, speeded by very low fertility and high life expectancy. In the last decade it has also experienced a huge inflow of immigrants. There is growing concern about how all these demographic changes are going to affect the Spain's welfare system and its policies for supporting the elderly and investing in human capital that would benefit particularly the children.

Spain experienced a late demographic transition in the European context that has brought a relative late and fast aging process. In 1970 Spain had the second highest fertility rate in Europe (only behind Ireland), falling to 1.15 birth per woman in 1998, being one of the world's lowest fertility rates at that time. This indicator has been rising progressively reaching 1.46 in

2008, and being in 2010, 1.38, although it has remained quite low. Moreover, Spain has one of the highest life expectancies in the world—81.95 years for all population and 84.9 years for women in 2010—something that reinforces aging trends.

In the last decade, however, Spain has experienced a great flow of immigration that has slowed the aging process. The stock of immigrants in Spain jumped from fewer than 1 million in 1997 to more than 5 million in 2010, representing now around 10% of total population. In less than a decade Spain received a share of immigrants close to that held by traditional immigrant-receiving European countries such as France or Germany. The demographic consequences are that a high net migration rate reduces the share of elderly individuals because the majority of immigrants are in labor ages and they influence on fertility rates raising them. Therefore, it reduces aging, but if fertility rates reduce again, migration will only postpone the rapid aging to a medium-term future.

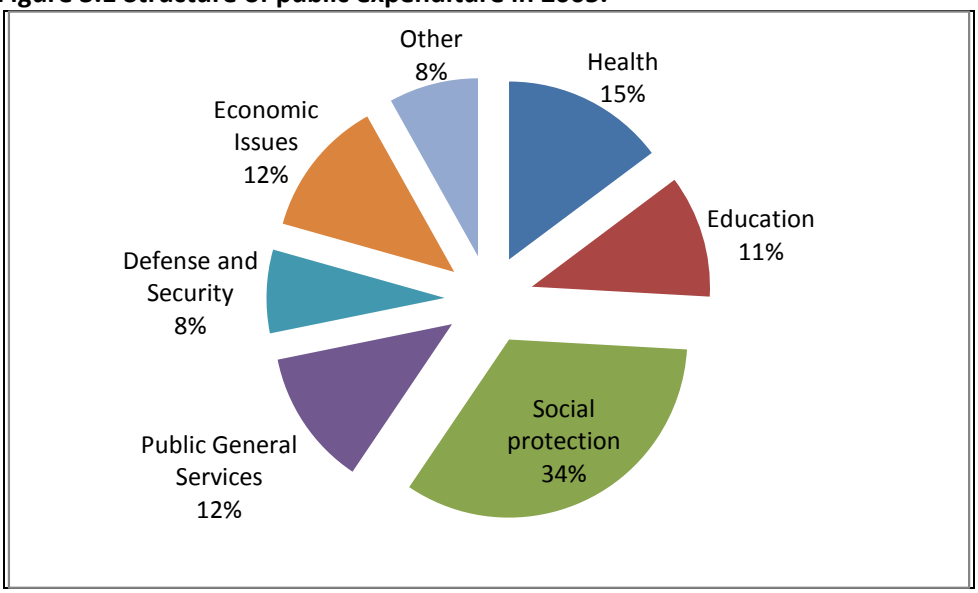
The combination of all this demographic factors has driven to a relative fast aging process among European countries. In Spain it took only 45 years for the proportion of people aged 65 and over to rise from 7 to 14 percent, whereas in France it took 115 years to reach that proportion (Kinsella & Velkoff 2001: 13). By 2000 the proportion of people older than 65 was already greater than the proportion of people younger than 15. Thanks to this late demographic transition and the recent migration trends, the dependency ratio of Spanish population has been decreasing since 2007, bringing a demographic dividend that could have benefit demographically the Spanish economy (Patxot et al., 2011). However, from now on, the perspective is a continuous increase, arriving to 89.66 in 2049, according to INE projections (INE, 2010).

3. Structure of Public Finances

During the 80's most welfare programs were consolidated in Spain simultaneously to important fiscal reforms. Both facts drove a major change of the Spanish public finance structure. By the one hand, public expenditure grew nearly 15 points –from 25% to 40% of GDP– between 1977 and 1985. It reached a maximum of 47% in 1993, when Maastricht Treaty to enter EMU was signed and, as consequence, different measures to control public deficits were implemented. After 2000, Spanish public expenditure remains around 39% of GDP, considerably lower than EU15 average and also below OECD data. On the other hand, public

revenues also raised considerably with the tax reforms. Tax revenues in percentage of GDP grew sharply from 18% in 1975 to 33% in 1985. In 2005 it was around 35%, in line with the OECD average, but much lower than EU15. Finally, regarding the equilibrium of both sides of public activity, Spain had serious public deficits during the 80's and the first 90's which led public debt to a maximum over 60% of GDP in 1996. But good behavior of public finances in the latest 90's and the first years of this century, maintain the relative position to other European countries in a really good place. In 2005 public debt in Spain was 40% while 60% for the EU-15. Nevertheless, the situation has changed dramatically with the present economic crisis.

Figure 3.1 Structure of public expenditure in 2005.



Source: IGAE, Ministry of Economics

Welfare state in Spain is based on a variety of expenditure programs, being the pension system the most important of them. It represents an annual expenditure near a 10% of GDP. The pension scheme is mandatory for all workers (also self-employed), and besides retirement it covers disability, survivors and other risks such a maternity. It is organized on a pay-as-you-go basis under a defined benefit scheme. The benefits depend both on years contributed and the amount of past contributions. The replacement rate of the contributory public pension system is quite high for low wages (nearly a 90%), but not for high wages due to the existence of ceilings in benefits. Although occupational schemes and individual pension plans also exist, their coverage is really low. Another public program provides means-tested pensions for people who are not eligible for the contributory level in case of retirement or disability.

Health care system in Spain is organized as a National Health Service; providing coverage to the whole population and being financed with general revenues. Public health expenditure represents around a 6% of GDP in Spain, and a 15% of the total public expenditure. This figure is practically the same as in the OECD (5.8% of GDP), although lower than in most western European countries. It is important to mention that in Spain the private expenditure in health is less important than in many other countries (only a 30% of total expenditure in health is private financed). As health expenditure is closely related with demographic structure, it should be expected a huge increase in it as a consequence of the aging process. Other factors as technological progress and the increasing demand for a better health care would contribute also to this tendency.

The education system in Spain is also mainly publicly financed –only about a 10% of total expenditure is private. Education is mandatory between ages 6-16, although total schooling practically exists from 3 years of age, when the public financing starts. Spain has reached great achievements in education during the last decades, with huge increases of schooling rates for all ages. Nowadays, a 30% of adult population has a tertiary education degree (over the 26% of Germany, for example). This rate has increased more than 15 points in the last 20 years. On the contrary, the percentage of adults with secondary education is only 22%, one of the lowest in OECD. Public expenditure in education is about 4.5% of GDP, one point below the OECD average. The expenditure on institutional educations per student is also bellow OECD average - about 7000 in equivalent USD in Spain by 8.500 in OECD.

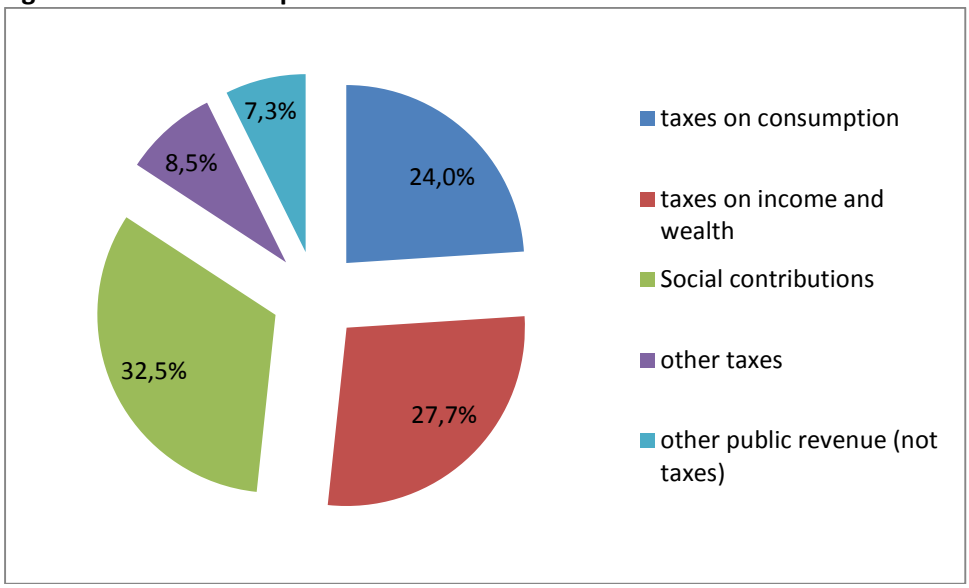
Unemployment protection, subsidies for families and long-term care among others, complete the Spanish welfare system. In the latter Spain suffers the disadvantage of a late process with respect to most EU countries. Long term care protection was only recognized as a universal right very recently, in 2007, and not specific financing was assigned. With respect to family subsidies Spain spends only around 0.5% of GDP –far below the EU average- and the attempts to overcome this limitation have been stopped by the current crisis.[1]

On the side of revenues, the tax system it is clearly the main source for public financing in Spain, as it represents more than 90% of total revenue. The contributions to the Social Security system of workers and employees are the main fiscal source, representing 35% of total in 2000, which is nearly 13% of GDP. They are assigned to finance the contributory pensions as

[1] Patxot et al (2012) show using NTA profiles for Spain that children are mostly financed by private transfers while the elderly mainly rely on public transfers.

well as the unemployment subsidies. The total contribution rate is 28.6% of gross salary, and it has not changed in recent decades. Taxes on consumption represent a 26% of fiscal revenue, and nearly 10% of GDP. Value-added tax (VAT), introduced in 1986 when Spain joined the European Community is the major figure in this category, but special consumption taxes are also important, as tobacco and hydrocarbons excises. Taxes on income and wealth contribute nearly 30% of fiscal revenues and represent about 11% of GDP. Personal income tax is the largest, approximately doubling the corporate income tax.

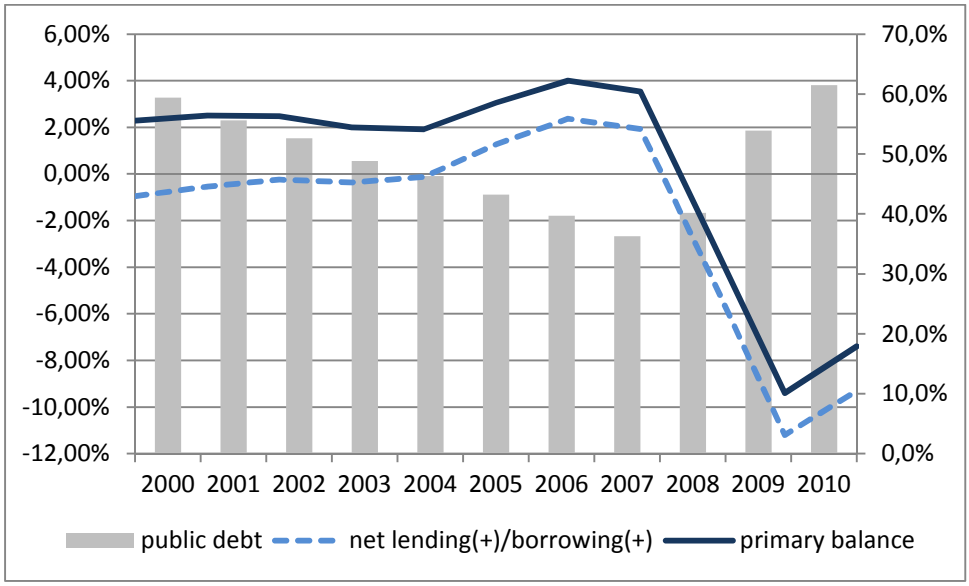
Figure 3.2 Structure of public revenue in 2005.



Source: IGAE, Ministry of Economics

Regarding the equilibrium of public finances, Spain has experienced periods of huge deficit, but also some periods of surplus. At the beginning of the 80's and during the economic crisis at the beginning of the 90's, public deficits moved in high figures near 10% in some cases. But after the Maastricht Treaty in 1993 it started a period of strong control in public expenditures which drove, together with the favorable economic evolution, to significantly lower figures and even surpluses in several years. At the same time, this good performance of the public balances allow for the reduction of the public debt to levels considerably lower than most European countries. In 2005, public debt in Spain was only 43% of GDP, while the EU15 average was over 50%.

Figure 3.3 Past evolution of public deficit and public debt.



Source: Eurostat and IGAE

4. Data and methods applied to the Spanish case

In this section we summarize the data sources employed and the process followed in order to produce the necessary inputs for the estimation of Spanish Generational Accounts. Estimating generational accounts entails, first, disposing of the public accounts informing on the initial situation o the country regarding public taxes and transfers. Second, it is necessary to obtain a set of age profiles catching the incidence of each tax and transfer by age and gender. This age profiles would be preferably directly obtained from official publications from the corresponding Ministry, referring to the total population. If these are not available age profiles can be estimated from micro data surveys and scaled to meet the corresponding aggregates. This usually implies some reclassification of the aggregates obtained from the official public accounts. The methods employed in this context are similar in NTA and GA.[2] In the latter, it is also necessary to make some assumptions on the future evolution of the Economy in order to derive projections to the future.

[2] GA had been previously estimated for Spain for the base year 1996 and updated to 2004 in previous studies (Berenguer et al., 1999; Abío et al. 2003 and 2005, Bonin et al. 2012). The consumption and income profiles were previously estimated in NTA estimations applied to the Spanish case in Patxot et al. 2011).

Profiles can be divided, then, in two parts: Inflows and Outflows. Public inflows in this case transfers refer to all public transfers received by people from the government. They can be divided in in-kind transfers -like Education or Health-, and cash transfers -like pensions or other social transfers. We start explaining the in-kind transfer profiles estimation, derived from public consumption and continue with cash transfers.

To estimate the age allocation of public education expenditures we used the information from the Ministry of Education on average expenditure per student and from the National Statistic Institute on student enrolment by age and sex. This information is disaggregated by type of studies. Hence, the final average consumption of each age group is obtained, by grouping the expenditure of members of the age group in each course. Finally, we divided the total education expenditures of each age group among total population of the same age group to obtain per capita profiles.

Public health transfers needed further disaggregation as they can be divided in four parts: Hospital expenditures, Primary care, Pharmacy and Others. Different data sources are used to estimate the age profile of each one of those services. To obtain the hospital expenditure age profile we followed the methodology presented in Ahn et al. (2003). As the authors suggest, we used diagnosis-related group information (DRG), published by the National Health System and presented by the CMBD (*Conjunto Mínimo Básico de Datos al alta hospitalaria*). These are hospital discharges information registers that include all discharges performed inside Public General Hospitals in Spain, with information of their cost and the age and sex of the patient. Combining this data we can obtain age profiles by sex of hospital costs. To allocate primary care expenditures and pharmacy it was not possible to use direct information on consultation costs and primary care. The 2006 National Health Survey was used to derive a service utilization age and gender profile. The survey gives information on the number of visits on the last year, or last month, (depending on their frequency) to doctors, specialists, nurses, physiotherapists and all kind of health care professionals. As the cost of these professionals can differ greatly, we decided to apply a very simple allocation rule, giving double weight to family doctors and specialists assuming they would imply a higher cost than nurses and other professionals.[3] Medicaments don´t have any distinction in the survey and it is only possible to know if the person is using several kinds of medicaments, but not the quantity or frequency. We had to use this simplified information to estimate the profile to allocate pharmaceutical

[3] According to OECD (2011) the ratio between wages of family doctors and other specialist and nurses and other professionals ranges between 1.7 and 3, being around 2 for most countries.

expenditures. For the rest of health expenditures we assumed a simple flat per capita profile among all population.

Regarding cash transfers, age profiles for pensions and other social transfers were estimated. Most of these age profiles – retirement benefits, survivorship pensions, maternity leave benefits and other marginal social transfers, all of them contributory and non-contributory – were obtained from the annual publications of the Social Security and Employment Ministry. The information published is usually the average benefit of five-years age groups by sex of beneficiaries and the amount of beneficiaries. To estimate the per capita age profile it is necessary to obtain the total value of benefits received by each age group and divide it by the amount of population in each age group. However, there were two benefits, unemployment and temporal disability, that were published using very broad age groups and the benefit amount was not specified. We decided, in these two cases, to use another survey instead. The survey is the European Union Statistics on Income and Living Conditions (EU-SILC) which gives information on all kind of income benefits that the person receives. It is possible to obtain the average benefit received by each person in a single year profile. As the single age profile was not very clean and had a lot of distortion, we applied the super smoothing technique implemented in the R statistical package with a span of 0.01 to estimate the final profile by sex.

Public outflows transfers profiles include all kind of current transfers from the population to the government like taxes on income and wealth, but also social contributions and other current taxes. Each of these transfers needs a different age profile, which can be obtained either directly, or indirectly from the tax base –the latter being consumption and income profiles from labor, assets and property. We will describe here the estimation of each of these profiles, showing later the correspondence between those age profiles and aggregates in the public accounts.

To estimate tax and transfers profiles it was necessary to use several surveys, as not all profiles can be found in a single survey. First, consumption age profiles were needed in order to indirectly estimate age profiles for taxes on consumption - the Value Added Tax (VAT) and separated profiles for special taxes: Alcohol, Tobacco and Oil. Consumption age profiles were retrieved from the Household Budget Survey (Encuesta de Presupuestos Familiares - EPF). This survey carries out a detailed documentation of household expenditures, being its principal objective estimating the total and disaggregated annual household consumption expenditure

at the national and regional level. This was not available for 2005. But, as this information is crucial to estimate outflow age profiles, the 2008 survey was used and afterwards the 2005 aggregates were applied to rescale those profiles.[4]

Consumption is in general collected in the survey EPF at a household level, so it is not possible to know the real consumption of each member. Therefore, to estimate the age profile it is necessary to apply an allocation rule. There are several methods in the international literature that could be used, but we will be using the equivalence scale presented by the NTA methodology, based on an extensive literature review (www.ntaccounts.org). The formula for the scale assumes that adults aged twenty or older are equal to 1, while this number declines linearly from age 20 to 0.4 at age 4, and is constant at 0.4 for those age 4 or younger, following:

$$\alpha(a) = 1 - 0.6 \cdot \left(\frac{20-a}{16}\right) \cdot D(4 < a < 20) - 0.6 \cdot D(a \leq 4)$$

where a is the age, and D is a dummy variable equal to 1 when the condition inside the parenthesis is met, and equal to zero, when it is not met. The parameter α is used to distribute the total consumption of the household among the relative participation of each member, depending on their age. [5] For special goods that are forbidden for children, like alcohol or tobacco, the equivalence scale was only applied to individuals being 18 years old or over, assuming that those under this age do not consume anything.

Second, some other profiles for public outflows were indirectly obtained from income profile – the corresponding tax base.. In particular age profiles are obtained for labor Income, asset Income and property Income. All these profiles can be estimated with EU-SILC data, as it has information on several sources of income for each individual or household.

In the case of labor income, it is important to separate earnings from self-employment, as the aggregate figure applied to each profile comes from different sources. The information of income in the survey is at the individual level but only for people over 16 years-old. It was

[4] The Longitudinal Household Budget Survey was done by the National Institute of Statistics until 2004, but on 2005 there was an interruption of annual publications. From 2006 the survey turned into the Household Budget Survey (Encuesta de Prespuestos Familiares – EPF) and was done yearly (www.ine.es). In order to be consistent with the EPF 2008, we also used the EUSILC 2008 to estimate income profiles.

[5] Consumption of alcohol and tobacco is only imputed to household members aged 18 and more.

assumed that younger people weren't receiving any labor income. Moreover, among those self-employed there were 366 people reporting negative benefits that we changed as receiving no labor income. This information is individualized in the survey, so the age profile is estimated automatically, once labor income is identified. Finally, we estimated age profiles as the mean labor income among people of each age group.

Other income sources (asset and property) are also collected in the EU-SILC survey at the household level. Following NTA methodology, those should be assigned to the household head. Here, the household head is the person with higher individual income in the household, and in case of equal income levels, the oldest one. Being the household head identified, the age profile is estimated directly.

Once outflow profiles are estimated, the next step is to assign them to the correspondent aggregate public transfer outflow. Outflow transfers include taxes on production or on income and wealth, subsidies, social contributions or others. In the case of value added type taxes (VAT), taxes and subsidies that are based in products or import taxes and subsidies, we assigned the general consumption profile. However, separated profiles were done for special taxes like alcohol, tobacco and oil. For export taxes and subsidies or other taxes and subsidies that rely on production, the profile assigned would be a combination of labor income and asset income profiles. Regarding taxes on income, the assignment will depend on the kind of income specified, but the profiles used would be labor income, asset income and property income. Labor income profile is used for aggregate social contributions and for other current taxes, a combination of labor income and assert income profiles is used.

Table 4.1 Aggregate taxes in 2005 (as a percentage of GDP)

Taxes on production and imports	**12,40%**
Value Added Tax	6,34%
Import taxes	0,01%
Tax on special consumptions	3,16%
alcohol	0,14%
tobacco	0,69%
hydrocarbons	1,24%
other	1,10%
Other taxes on production and imports	2,88%
Taxes on income and wealth	**10,25%**
Personal income tax	6,69%
Corporate income tax	3,92%
Taxes on capital	0,47%
Other taxes on income and wealth	0,87%
Social Contributions	**12,92%**
TOTAL TAXES	**35,56%**

Table 4.1 Aggregate public transfers in 2005 (as a percentage of GDP)

Public health	**5,67%**
Public education	**4,28%**
Contributory pension benefits	**9,45%**
Retirement	6,24%
Disability	1,14%
Survivors	2,07%
Non contributory pension benefits	**0,23%**
Retirement	0,12%
Disability	0,10%
Maternity benefits	**0,16%**
Unemployment benefits	**1,62%**
Other social welfare expenditure	**1,35%**
Public family transfers	**0,11%**
Public long-term care benefits	**0,05%**
TOTAL TRANSFERS	**22,90%**

5. Generational Accounting results for the Spanish case

In this section the main results for the baseline situation are presented as well as sensitivity analysis regarding the main assumptions and future macroeconomic evolution and referring to reforms implemented by the government which show potential effects on future sustainability.

Generational accounts and its interpretation

Table 5.1 summarizes the main sustainability indicators for Spain taking 2005 as the base year. This year is chosen to avoid an under or over estimation of the sustainability measures due to the effect of the business cycle on public finances (Bonin et al., 2012). In fact, according to the last updates, Spanish GDP coincided with potential GDP (European Commission, 2012). The first line in Table 5.1 shows the value of the overall sustainability indicator, i. e., the sustainability gap. This figure measures value of intertemporal debt total debt as a share of intertemporal payment capacity. More specifically, it is computed as the present value of explicit base year debt plus the implicit debt accumulated by current fiscal policy implicit debt , expressed as a share of the present value of the sum of future expected GDP. The value obtained implies that it is necessary to raise an annual 3.82% of GDP on average in order to eliminate the sustainability gap. This value is in the range of those obtained in previous generational accounting applications to the Spanish case (Abío et al. 2003 and 2005; Bonin and Patxot, 2012), taking into account the difference in assumptions (Abío et al. 2003 and 2005; Bonin et al., 2012).

Table 5.1. GA sustainability indicators. Base year 2005.

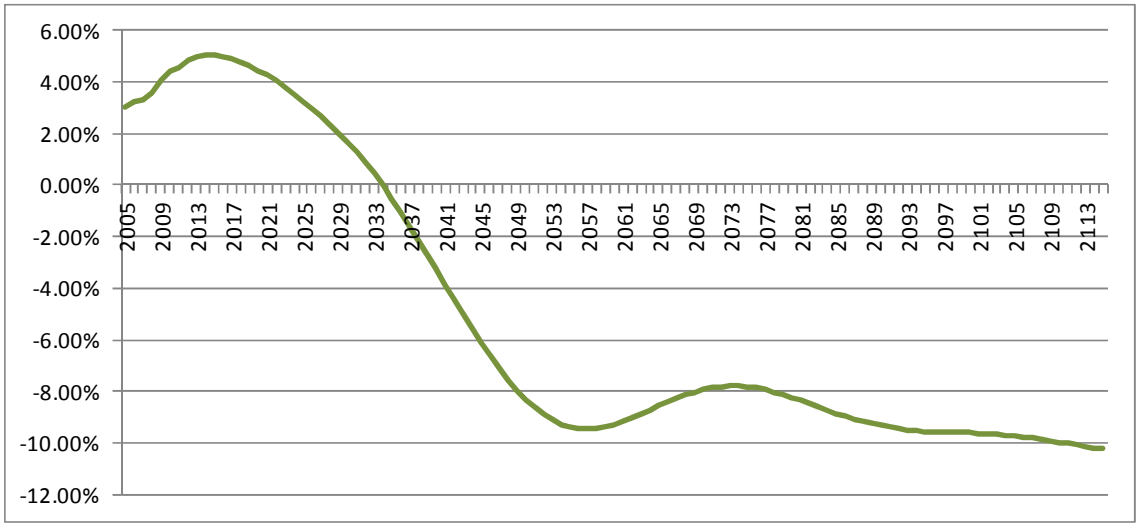
Subtainability gap (%)	3,82
Generational imbalance	
GA male	187.452,10
% of total lifetime income	29,49
GA female	47.122,87
% of total lifetime income	12,36
GA total	119.459,87
% of total lifetime income	23,31
GA future	171.234,39
% of total lifetime income	36,12
tax adjustment (%)	
future gen	18,32
current gen	13,35
all (current + future) 2005–	7,72
2015	9,00
2025	10,70
2035	12,86
tax and transfer adjustment (%)	
future gen	10,82
current gen	7,74
all (current + future) 2005–	4,51
2015	5,12
2025	5,99
2035	7,08

Source: Authors' elaboration.

The sustainability gap can be transformed in an indicator of generational imbalance by comparing the generational account of future generations to the value obtained for the future generations once taxes are adjusted to reach intertemporal sustainability. The result of this comparison is shown in Table 5.1 and in the first two observations in Figure 5.1. The GA of future generations with respect to the newborns is 55% higher.[6] Interestingly, the generational imbalance can also be expressed both in absolute terms and in terms of earnings capacity, by comparing it to the present value of total lifetime income –the latter being derived from the earnings profile. Total lifetime income is used in order to have a fixed benchmark. Current newborns are contributing in net terms a 23.3% of the total lifetime income, being the figure quite different form males (29.5%) and females (12.4%). On the contrary, in order to wipe out the sustainability gap, future newborns would need to contribute up to a 36.1%.

[6] This ratio is usually a good indicator but it is worth noting that it becomes meaningless when the value of GA is near zero as pointed out by Jensen y Raffelhüshen (1997)

Figure 5.1 Evolution of primary surplus as a share of GDP



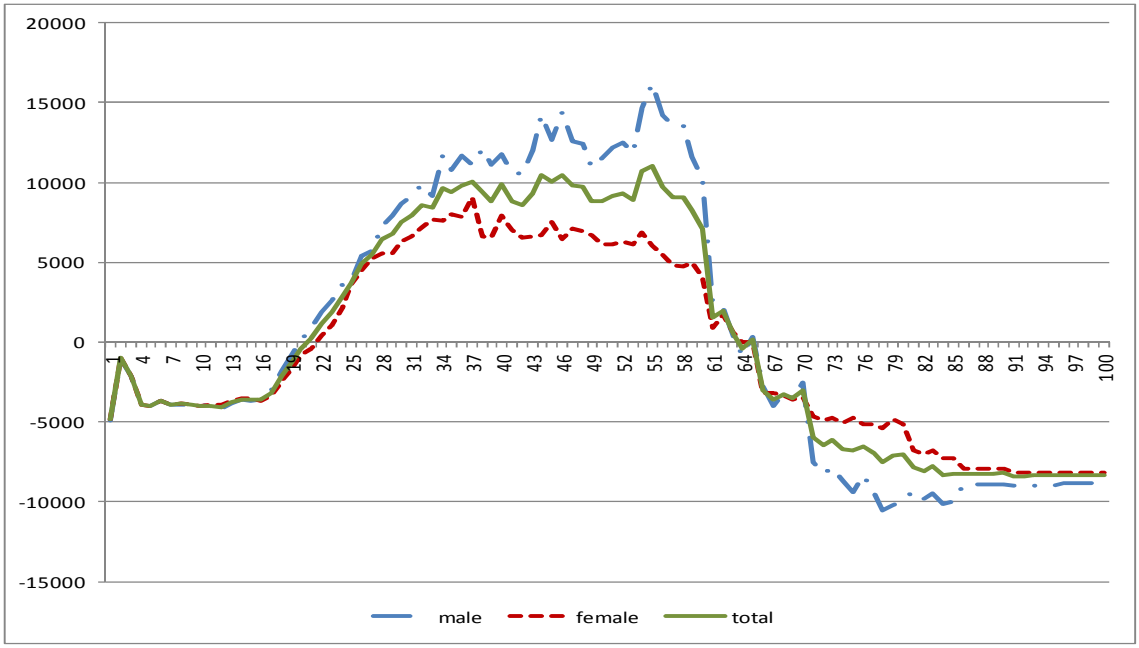
Source: Authors' elaboration.

The columns bellow show the value of the tax and/or transfer adjustments, necessary to wipe out the sustainability gap. First, regarding taxes, an adjustment applied only to future generations gives the stronger adjustment of 18.3%. If only current generations were to suffer the adjustment the size of it would be lower (13.4%), given that the baby boomers would still collaborate. An even smaller adjustment (7.7%) would be needed if it were applied to all –both current and future generations' right in the base year. If tax adjustments are postponed, the necessary adjustment increases to 9.0% (starting in 2015), 10.7% (starting in 2025) and 12.9% (starting in 2035). The last set of figures regarding a downsize of transfers give a similar pattern.

For a correct interpretation of the results it is important to bear in mind the role of discounting in obtaining the GA indicators, both the overall sustainability indicator and the generational imbalance indicators. In fact the indicator obtained depends on the one hand on the time path of the flows. On the other hand the weight given to future flows will depend on the interaction of the growth rate and the discounting rate. Figure 5.1 bellow shows the time path of primary surplus as a share of GDP, starting from the base year. Abstracting for the recent crisis, the initial primary surplus (3.05% of GDP) was expected to rise for more than a decade reaching a maximum value of 5.05% in 2014. From then on, primary surplus would start getting worse becoming zero in 2034, a minimum of -9.46% in 2057. This time path is clearly governed by baby boomers –those born between 1957 and 1977- approaching and reaching retirement age. Once all they are retired the primary surplus improves a bit and tens to stabilize –once some waves due to migration stop- at a value far below the initial one.

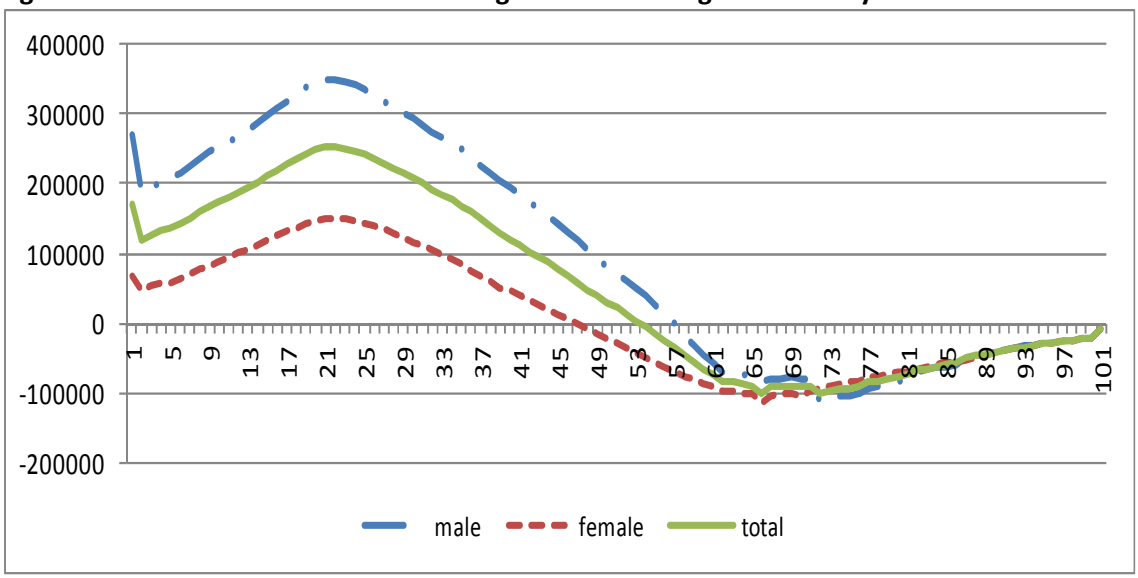
Note that, given that the Spanish economy is under dynamic inefficiency – remember we assumed that g (1.5) < r (3) – the immediate surpluses will be weighted to a greater extent that future deficits. A similar effect occurs when obtaining the generational imbalance indicators. Figure 5.2 shows the total per capita age profiles of net taxes (net of transfers) for Spain in year 2005. The hump shape indicates that individuals are net tax receivers (transfers outweigh taxes) for dependent ages (0-19 and 61-100) while they are net contributors during the working age (20-62). Discounting is again not neutral, as it is the period in which individuals receives more public transfers (61-100), the one that is more strongly discounted. This discounting effect is not a problem when we compare the whole lifetime payments of two cohorts in the same year. A clear example is the comparison of males and females GA born in the same year, which is comparable, provided that the time path of taxes and benefits is similar. Another example is the comparison of current newborns and future newborns. The comparison is correct this time as long as the future GA is discounted one year, given that the time path of payments is exactly the same in this case. In this sense, the comparison of GA of generations born in different years is not always meaningful. Figure 5.3 shows the GA of all generations alive in the base year, 2005, together with the representative of future generations –the one born in 2006. It is important to bear in mind that, except for the case of newborns in 2005 and 2006 the figures are not comparable. For the rest of cohorts alive in 2005 payments are not observed for the whole lifetime. Nevertheless this figure is informative to evaluate the impact of the living generations on the public budget. First it is worth mentioning that net payments are positive for newborns. This implies that along the life cycle Spaniards –both male and females- are net contributors to the public coffers. The net positive contribution increases until age 21, as long as the weight of tax payments increases. This tendency is inverted when the weight of future pension receipts and other transfers approaches enough, so that GA decrease and become negative beyond age 60.

Figure 5.2 Age profile of total net payments in the base year



Source: Authors' elaboration.

Figure 5.3 Generational accounts for the generations living in the base year



Source: Authors' elaboration.

Sensitivity analysis

The results presented for year 2005 are subject to some limitations. First and quite importantly the effect of the current crisis hitting Spain very strongly is not introduced, a sit requires further analysis on the perspectives of recovery. Second reforms introduced since 2005 should

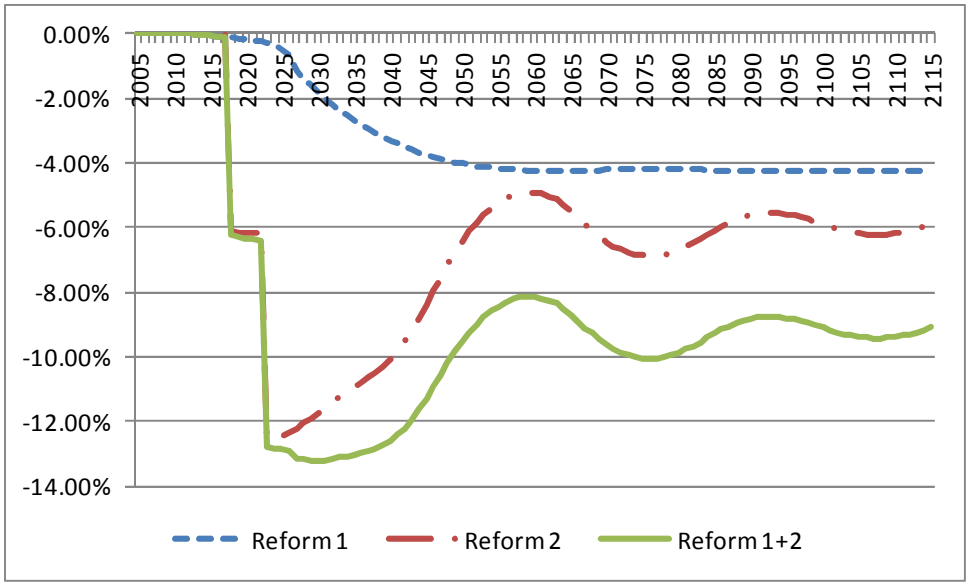
be considered to the extent that if can affect the results. Several reforms have been indeed introduced; many of them due in the context of the austerity measures proposed by the European Commission and will not necessarily have long run effects. Hence, neither the effect of the crisis, neither the effect of the austerity measures is analyzed in the present work.

On the contrary, the pension reform implemented in 2011 by the government has potential effects on the long run expenditure and can be approached in the current setting to some extent. In the following, a stylized simulation of the effect of this reform is presented in a) and sensitivity analysis on the parameters defining the macroeconomic performance is presented in b).

a) The effect of the 2011 reform of the pension system

The 2011 reform of the pension system introduces aims, on the one hand, at fostering the bismarkian nature of the pensions system –the relation between contribution and benefits- and to delay the retirement age. First, the former implies some changes on the initial pension received by pensioners that in general imply a cut in benefits. The government estimated a cut of 3.5% in the initial pension, once the reform is fully implemented, i. e., in 2027. This estimated impact is subject to some limitations as no behavioral responses are considered but the simple implementation of this pension cut can serve as a benchmark. Second, there is a gradual increase in retirement age from 65 to 67. Again, this would be subject to behavioral responses but a stylized version of the reform is implemented by shifting the pension profile by two years. Results of the first (1) and second (2) reform are shown in Figure 5.4. The effect of the reform 1 is very gradual, both because of the implementation process to the new pensioners (2013 to 2027) and because of the time needed for those new pensioners to become old pensioners and, to the complete maturing of the system. The effect of reform in this stylized setting can only be implemented in a discontinuously but have more immediate effects. Overall, the cut in the ratio of pension expenditure to GDP is sizable –it reaches at the most 1.38 percentual points of GDP, but does not solve the situation of the pension system. The sustainability gap is reduced in 1.83 points (0.98) considering (not considering) a corresponding shift in the contributions profile.

Figure 5.4 Effects of the 2011 pension reform



Source: Authors' elaboration.
Note: Reform 1: a 3.5% cut in initial pension. Reform 2: Delayed retirement age. Both measures are introduced gradually from 2013 to 2027.

b) Sensitivity analysis on interest rate and productivity growth rate

Table 5.2 shows the results of the sensitivity analysis on the real discount rate and the rate of productivity growth. Changes in these parameters affect sustainability in different ways. In principle, the pure discounting effect depends on the total size of the adjusted discount factor increased by the rate of productivity growth *g* in the numerator and decrease by the discount rate *r* in the denominator. An increase in this discount factor (lower r and higher g) increases the weight given to future flows and vice versa. In this sense, an increase in growth might have a negative effect on sustainability as it increases the weight given to future payments. This effect can be overcome, nevertheless by the fact –as it happens in Spain- that pension benefits are not increased in line with productivity growth once created. This fact implies a positive effect in sustainability of an increase in productivity. It also implies that increasing *g* is not equivalent to decreasing *r* in terms of sensitivity analysis. Finally it is important to note, as mentioned above, that not only the value of the total adjusted discounting factor matters but also the time path of future flows. Previous evidence for Spain and Germany indicates that the relationship between the SG and the adjusted discount factor shows a U-shape (Bonin, 2001). Note that in our case, primary surplus is positive for the first decades and latter it becomes negative.

Table 5.2 Sensitivity analysis: Changing r and g

		baseline	sensitivity			
		g=1.5%, r=3%	g= 1%	g=2%	r=2%	r=5%
tax adjustment (%)	current gen	13.35	10.31	19.73	46.77	3.14
	future gen	18.32	20.24	16.94	19.32	13.22
	starting 2015	9.00	8.31	10.16	14.53	3.48
	starting 2025	10.70	10.37	11.49	15.55	4.97
	starting 2035	12.86	13.10	13.08	16.70	7.21
	all (current + future) 200	7.72	6.83	9.11	13.67	2.54
tax and transfer adjustment (%)	current gen	7.74	6.03	11.33	26.20	1.91
	future gen	10.82	12.10	9.83	10.84	8.10
	starting 2015	5.12	4.75	5.75	8.04	2.05
	starting 2025	5.99	5.80	6.42	8.53	2.84
	starting 2035	7.08	7.18	7.22	9.10	4.02
	all (current + future) 200	4.51	4.03	5.27	7.67	1.55
Subtainability gap (%)		3.82	3.18	4.85	7.20	1.20

Source: Authors' elaboration.

In this particular application the sustainability gap increases when *g* goes up or *r* goes down – when the adjusted discount factor increases and vice versa. Nevertheless this clear pattern is not applied when referring to generational imbalance. Current and future generations are affected differently when the adjusted discount factor change.

6. Final remarks

This chapter obtains generational accounts for Spain in year 2005, chosen as a base year given that it is neutral in terms of business cycle. By projecting the age structure of taxes and public transfers to the future a sustainability gap of 3.82% of intertemporal GDP is obtained. This implies that in order to wipe out the accumulated debt a 3.82% of GDP should be raised annually on average. This sustainability gap can also be expressed in terms of generational imbalance in different ways. For example, the necessary tax adjustment applied to future generations would amount to 18.32%, while applying both to current and future generations would need an adjustment of a 7.72%.

The results are robust to changes in the assumptions in reasonable ranges. Among the reform measures currently enacted, the effect of the 2011 pension reform is investigated given the expected effect on intertemporal sustainability. In particular, the impact of the 2011 pension

reform has been simulated in a stylized manner starting from existing estimations of the expected effects. After a long implementation process, the effect of this reform measures is sizable but insufficient to ensure sustainability. This is important if one bears in mind that the estimated effects abstract from behavioral responses of the agents, which could limit the extent of the effect.

Further analysis is needed in order to investigate the extent to which the current crisis will worsen the picture shown, once it is clear the time path of recovering and the final level of unemployment reached.

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