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Population Aging and Public Finances: Evidence from El Salvador

Werner Peña

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ABSTRACT

The world's population is aging. The demand for social services from the elderly population is expected to increase. This will exert heavy fiscal pressure on many developing countries. This paper analyzes in detail the fiscal impact of population aging on the demand for social resources from people at the end of the life cycle in El Salvador and discusses the implications in terms of public finances. The empirical contribution of the paper is twofold: first, an estimation of the fiscal dividend is presented to highlight the importance for El Salvador of adopting fiscal policies in the short and medium term; second, a long-term budget projection is produced to assess how population aging will put pressure on government budgets. Both contributions are obtained using the National Transfer Accounts. The results emphasize the need of exploring different fiscal policies to ensure the sustainability of public finances in the medium and long term.

Keywords: Demographic Economics, Population aging, fiscal dividend, budget projection, debt sustainability

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NATIONAL TRANSFER ACCOUNTS
Understanding the generational economy

1. Introduction

The world's population is aging. According to the UN the proportion of the world's population over 65 years will nearly double from 9% to 16% between 2019 and 2050 (United Nations, Department of Economic and Social Affairs, Population Division, 2019). This comes with important challenges, as additional resources will be necessary to meet the needs (in health and social services) of a large elderly population (Seshamani and Gray, 2003). A key aspect of population aging is that it is expected to disproportionately hit developing countries. Indeed, by 2050, 80% of all older people will live in low- and middle-income countries (National Institute on Aging et al., 2018). This will exert heavy pressure on the budget of developing countries and will put at risk a population already vulnerable. Recently an important amount of research has been carried out in the context of developing countries to assess the impact of population aging on fiscal and macroeconomic sustainability as well as the well-being of individuals of all ages[1].

This paper follows this trend by analysing the fiscal impact of population aging on the demand for social resources from people at the end of the life cycle and discusses the implications in terms of public finances. The paper focuses on the case of El Salvador, which is a relevant case study for developing countries in Central America and the Caribbean. El Salvador is currently facing a full demographic transition (ECLAC, 2008). As the pace of population aging is much faster than in the past, this will lead to increasing fiscal pressures (Peña and Rivera, 2018; Unicef, 2018). Therefore, it is important to ensure the sustainability of public finances in the medium and long term. The empirical contribution of the paper is twofold: first, an estimation of the fiscal dividend is presented to highlight the importance for El Salvador of adopting fiscal policies in the short and medium term; second, a long-term budget projection is produced to assess how population aging will put pressure on government budgets.

In order to assess the impact of population aging on public finances in El Salvador, this study uses the National Transfer Accounts (NTA) produced by Peña and Rivera (2016) for 2010. The main advantage of using the NTA is that they allow observing and quantifying the intra and intergenerational support mechanisms, as well as the social effort to finance the consumption needs of different age groups, especially those potentially in dependent ages (Lee and Mason, 2011). The article presents an estimate of the *fiscal dividend,* i.e. the relative growth of taxpayers (contributors) by public transfer receiver (Mejía and Murguía, 2012; Rosero and Robles, 2008; Queiroz and Turra, 2014; Miller and Cruz, 2013). This dividend is currently positive due to the demographic dividend that El Salvador is

[1] For instance, Bloom et al. (2000), Figliuoli, et al. (2018), IMF (2019), Amaglobeli and Wei (2016), Gagnon et al. (2016) and Prettner et al. (2013) have conducted efforts aimed at understanding the fiscal cost of population aging in developing countries.

experiencing. Nonetheless, the fiscal dividend will start to shrink given the evolution of the private demographic dividend estimated in Peña and Rivera (2018).

This paper relies on the methodology proposed by Miller (2006) and applied by Miller et al (2010), Nayarana (2011), Miller and Cruz (2013) for the production of a budget projection for El Salvador for the period 2020-2050 based on the fiscal structure in 2010. This projection (scenario 1) is mainly based on the evolution of El Salvador´s population structure in the coming decades. This paper demonstrates the importance of implementing fiscal policies to anticipate the fiscal pressures that the demographic transition will impose on El Salvador. Moreover, the paper presents how a hypothetical scenario (scenario 2) in which if public revenues are increased progressively, *ceteris paribus*, it can help to cope with the need of additional resources posed by population aging and how this outcome can make the debt sustainable in the long run. Alternatively, the paper discusses another scenario (scenario 3) in which the increase in public revenues is complemented by a reduction in public expenditures in general services. This combination of measures (third scenario) could help to reduce the public debt ratio to levels of 50% of the GDP without reducing social expenditures.

The paper proceeds as follows. Section 2 introduces the NTA and its potential for the analysis of social support structures for the dependent ages. Section 3 discusses the main channels through which population aging exert pressure on public finances. In section 4, the fiscal dividend is estimated while in section 5, the methodology used to carry out the budget projection and the results are presented. Lastly, section 6 concludes and provides policy recommendations.

2. National Transfer Accounts

The National Transfer Accounts (NTA) are useful in order to quantify the reallocations of economic resources among individuals of different age groups (Mason, 2007 and Lee and Mason, 2011). These reallocations occur throughout the life cycle and happen in periods in which labor income is greater than consumption (usually in potentially productive ages) or in periods in which consumption is higher than labor income (usually in potentially unproductive ages) (Lee and Mason, 2011). Both situations generate public and private mechanisms that lead to transfers from people in potentially productive ages to people in potentially unproductive ages (Mason, 2007). These flows that solve these imbalances are generally grouped in transfers -public or private- and assets-based reallocations –public or private. These support mechanisms give rise to intra and intergenerational reallocation of resources between different age groups. The NTA rely on micro and macroeconomic data in order to quantify the flows that shape the social support system. The starting point of the NTA is the basic equation of the generational economy (Uthoff, 2010: 31):

$$C - Y_l = Y_A - S + T_{g,+} - T_{g,-} + T_{f,+} - T_{f,-} \quad (1)$$

Where C is consumption, Y_l is labor income, Y_A is asset income, S represents savings, $T_{g,+}$ represents public transfer inflows[2], $T_{f,+}$ are private transfer inflows, $T_{g,-}$ are public transfer outflows, and $T_{f,-}$ are private transfers outflows. The expression $C - Y_l$ is known as the life cycle deficit. When this is positive, there will be a surplus as consumption is greater than labor income, whereas a negative value will indicate a deficit, which generally occurs in potentially productive ages[3] (Lee y Mason, 2011). The right hand side of expression 1 shows the mechanisms through which the consumption of the population in potentially unproductive ages is financed. The expression $Y_A - S$ shows the reallocations of public or private assets that serve to finance the life cycle deficit. In general, asset incomes are composed of dividends, gains from asset holdings, and public and private dissaving (National Transfer Accounts, 2011). The expression $T_{g,+} - T_{g,-}$ represents the public inflows and outflows. Outflows are normally composed of taxes, while inflows are transfers -in cash or in kind-, which the public sector makes to individuals. The expression $T_{f,+} - T_{f,-}$ shows the inflows and outflows of private transfers –which can be intra and inter-household (Uthoff, 2010).

To demonstrate the potential of the National Transfer Accounts, a summary of the social support mechanisms of El Salvador is represented in figure 1. For younger individuals, the funding of their consumption comes almost entirely from private transfers (89.93% for individuals aged between 0 and 19 years). Public transfers represent 11.88% and asset-based reallocations, 0.18% of this consumption. A similar trend is observed in Mexico, Brazil, Colombia, Costa Rica, Chile and Jamaica, where, on average, private transfers represent 74.5% of the consumption funding for younger individuals (National Transfer Accounts, 2011).

In the case of the elderly, the support mechanisms differ since the asset-based reallocations finance a greater proportion (56.8%) of the consumption of this age group.[4] Private transfers –intra and inter-household- finance 25.8% of the consumption of individuals aged 65 and over. Finally, public transfers represent 17.41%. Besides, the analysis shows that the population in potentially dependent ages (at the beginning and at the end of the lifecycle) in El Salvador relies more on private than on public mechanisms to finance their consumption. A similar pattern is observed in other Latin American countries, with some

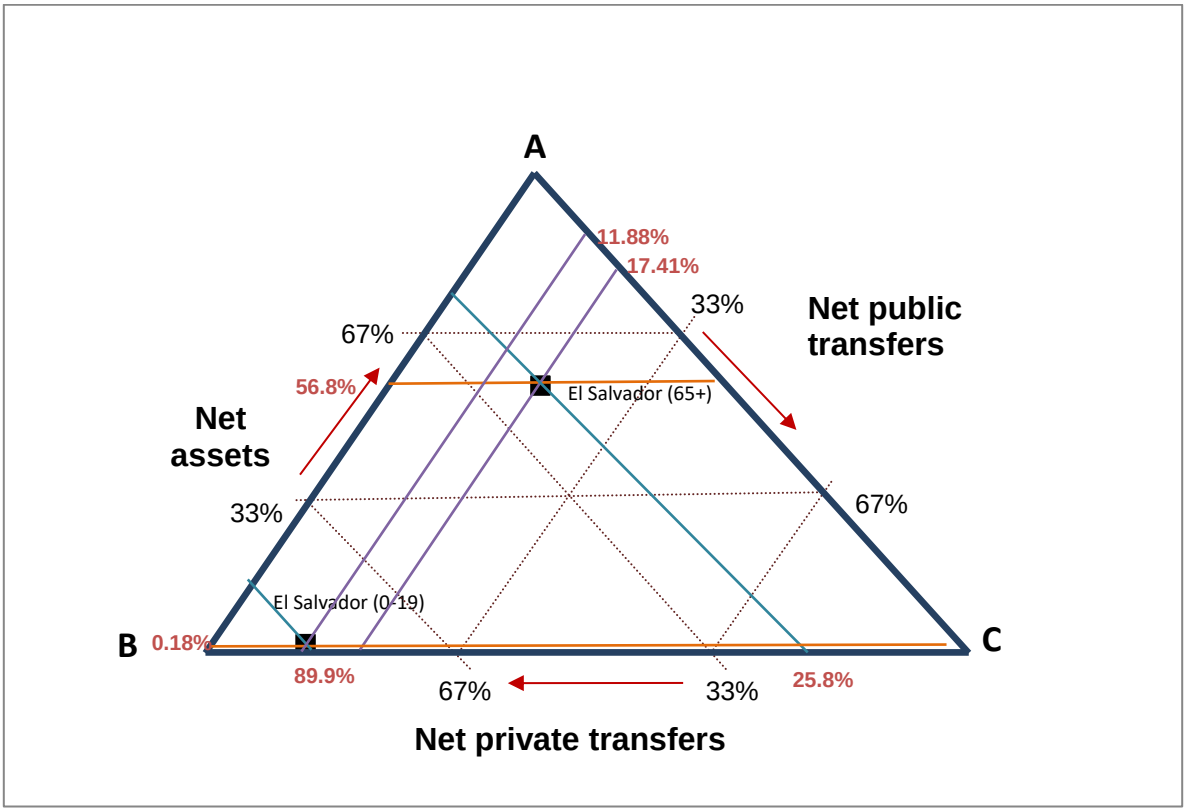
[2] Under the NTA terminology, inflows represent resources that are received by individuals, while outflows are resources given by individuals to other public or private entity.

[3] Following the notation of the generational economy and the NTA, the word "deficit" in this paper denotes an excess of labor income over consumption.

[4] As mentioned, the private asset-based reallocations come largely from capital income, which are not owned by the entire population. In this sense, it is important to keep in mind that these are averages. In National Transfer Accounts (2011: 4), it is pointed out that: "It is unlikely that asset income is an important source of support for the poor in Brazil or Mexico". The same applies for El Salvador (Amarante and Prado, 2017). Thus, the high presence of asset based reallocations as a support mechanism for old people is more related to accumulation of high amount of assets by few people, which in turn affects the average.

exceptions, such as Uruguay and Brazil where public transfers play a major role in financing potentially dependent ages. (National Transfer Accounts, 2011).

Figure 1. Support System for the Youth (0-19 years) and the Elderly (65 and over), 2010



Source: Author's own calculations based on Peña and Rivera (2016). Note: The base of the triangle is the net private transfers (NPT); the left side, the net assets (NA) and the right side, the net public transfers (NPuT). The vertex B represents the NPT, the vertex A represents the NA and the vertex C represents the NPuT. For example, for the ages between 0 and 19 years, NPT represent 89.3%, NA 0.18% and NPuT 11.8%.

As mentioned, public transfers involve two types of flows with respect to individuals: outflows, which are basically represented by the taxes and other public revenues, and inflows that consist of transfers -in kind or in cash- that individuals receive from the public sector. In this way, the public sector has an intermediary role as it reallocates resources among individuals and households (Lee and Mason, 2011). Precisely, expression 2 illustrates this definition by representing public transfer per capita inflows and outflows by simple ages, where N represents the total population and a is the age.

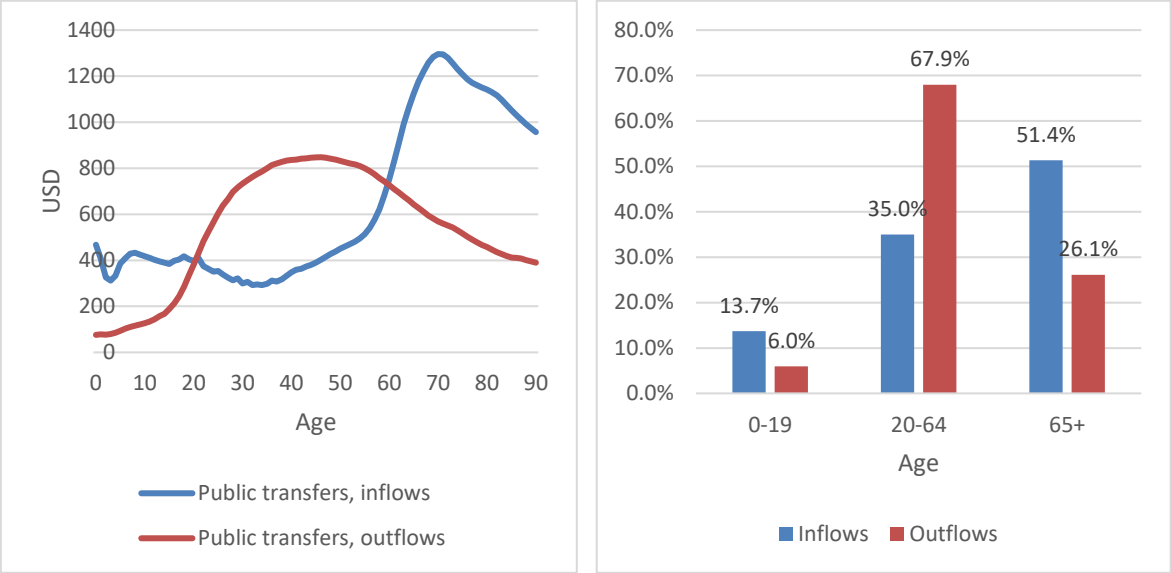
$$\frac{T_g}{N} = \left(\frac{T_{g,+}}{N}\right)_a - \left(\frac{T_{g,-}}{N}\right)_a \quad (2)$$

Figure 2 allows a closer look at the role of public transfers (inflows and outflows) in the social support structure. Public transfers are largely financed by people in potentially productive ages, and are comprised of taxes and social contributions paid by individuals. Individuals in potentially unproductive ages are the ones who receive the most of public

transfers. Panel b of Figure 2 shows that potentially unproductive age groups receive around the double of what they contribute, whereas this relationship is reversed when considering people between 20 and 64 years old.[5] These results highlight the effect of population aging on public finances: as the demographic transition deepens, the proportion of net contributors will decrease, whereas the proportion of receivers will increase due to an increase in the weight for people in the last stage of the lifecycle (Lee and Mason, 2017).

Figure 2. Public Transfers, Inflows and Outflows, 2010

(a) Per Capita Values **(b) Age Distribution**



Source: Author's own calculations based on Peña and Rivera (2016).

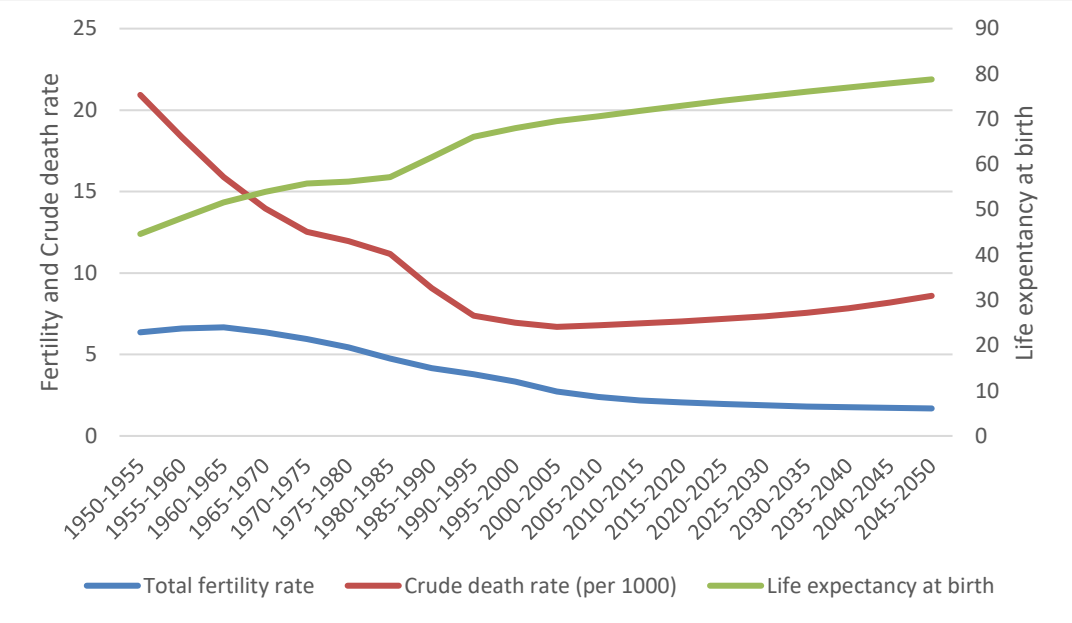
3. Population Aging and Fiscal Pressure

El Salvador is facing a full demographic transition, which is characterized by a moderate mortality and fertility rate and a moderate life expectancy (ECLAC 2008). Its mortality rate for the period 2015-2020 got reduced by 66% compared to the period 1950-1955 (figure 3). This trend will slightly change in the coming years, as the mortality rate will increase, mainly as a consequence of population aging. The current fertility rate (2015-2020 period) is 2.05 children per woman. It considerably decreased since 1950, when the fertility rate was 6.36 children per woman. It is expected that in 2050-2055, the fertility rate will decrease to 1.69 children per woman, even below the replacement rate. Life expectancy at birth has also increased considerably, from 44.6 years in 1950-1955 to 73 years in 2015-2020. The life

[5] This pattern has also been documented for Latin American countries in National Transfer Accounts (2011) and specifically by Rosero and Robles (2008) for Costa Rica and Mejía and Murguía (2012) for Mexico.

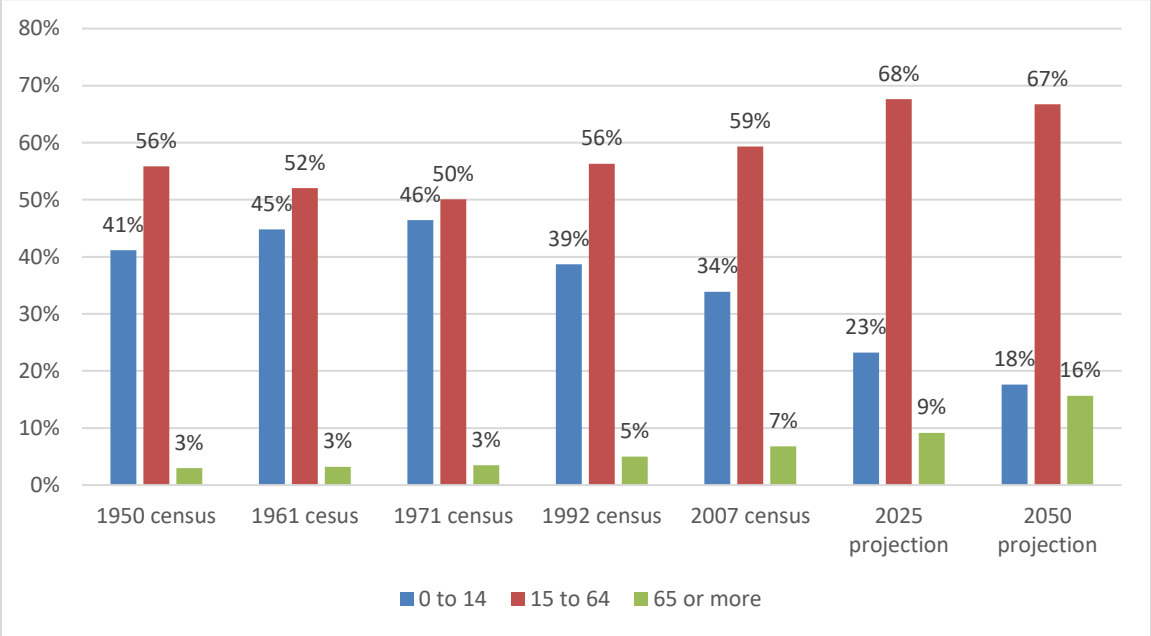
expectancy at birth is expected to be close to 80 in 2050. As a result, the population aged 65 and over will progressively gain more weight in the total population (Figure 4). In fact, according to the projections this population will double its proportion of the total population, from 7% in 2007 to 16% in 2050.

Figure 3. Total Fertility Rate, Mortality Rate and Life Expectancy at Birth, 1950/1955-2045/2050



Source: Author's own calculations based on CELADE (2019).

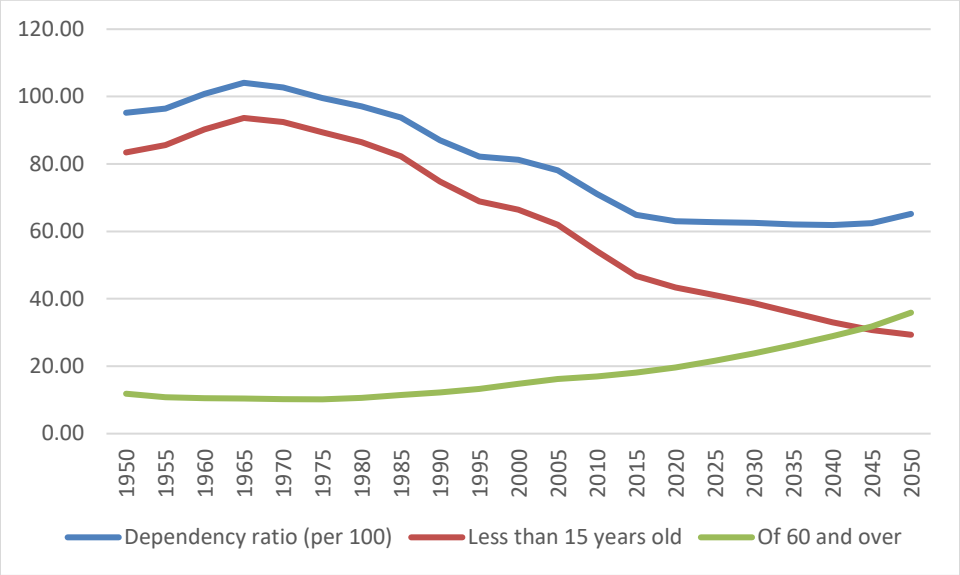
Figure 4. Changes in Population Structure, Censuses and Projections, 1950-2050



Source: Author's own calculations base on DIGESTYC/UNFPA/CELADE (2014) and CELADE (2019).

The changes in the age structure of the population are also reflected in the dependency ratio (figure 5). The total dependency ratio shows a continuous downward trend from the 1960s until 2038, where it will reach its minimum at 61.84%. This is due to the fact that the population in potentially productive ages has increased relatively more compared to potentially inactive ages. This reflects the existence of a demographic dividend in El Salvador (Peña and Rivera, 2018). However, the dividend will begin to close in the middle of 2037-2038. After that period, the total dependency ratio will begin to increase, and it is expected to reach 65.2% in 2050. This is due to the increase in the dependency ratio of the population aged 60 and over. By mid-2045, the dependency ratio of this population will exceed the dependency ratio of those under 15.

Figure 5. Dependency Ratios (in Percentages), 1950-2050



Source: Author's own calculations based on CELADE (2019).

In the last decade, the weight of public debt on the GDP has grown from 63.8% of the GDP in 2013 to 69.8% in 2018 (table 1). According to IMF projections, by 2024, it will even reach 72.2%, registering a 10 percentage point increase in ten years. There are at least three main reasons for this increase. First, a low economic growth has been registered since the beginning of the 2000s (IMF, 2019a). Second, before 2017 (year in which the last pension reform was implemented), the payment of pensions from the old public system exerted an important pressure on public finances, which forced the Government of El Salvador to acquire debt to face these commitments. Third, current expenditures and the payment of interest on debt have increased at a higher rate than public revenues. Despite the country's efforts to reduce the global fiscal deficit, the payments on interest debt is putting pressure on public finances. Interest payments have represented a considerable percentage of the product. For instance, in 2013, it amounted to 2.7% of GDP and it is expected that the payment of interests will represent 4.7% by 2024, offsetting improvements in the primary deficit. According to the IMF (2019a), El Salvador's public finances are stable; however, the relatively high level of public debt may represent a risk in the medium and long term.

Table 1. Fiscal Indicators, 2013-2024 (% GDP)

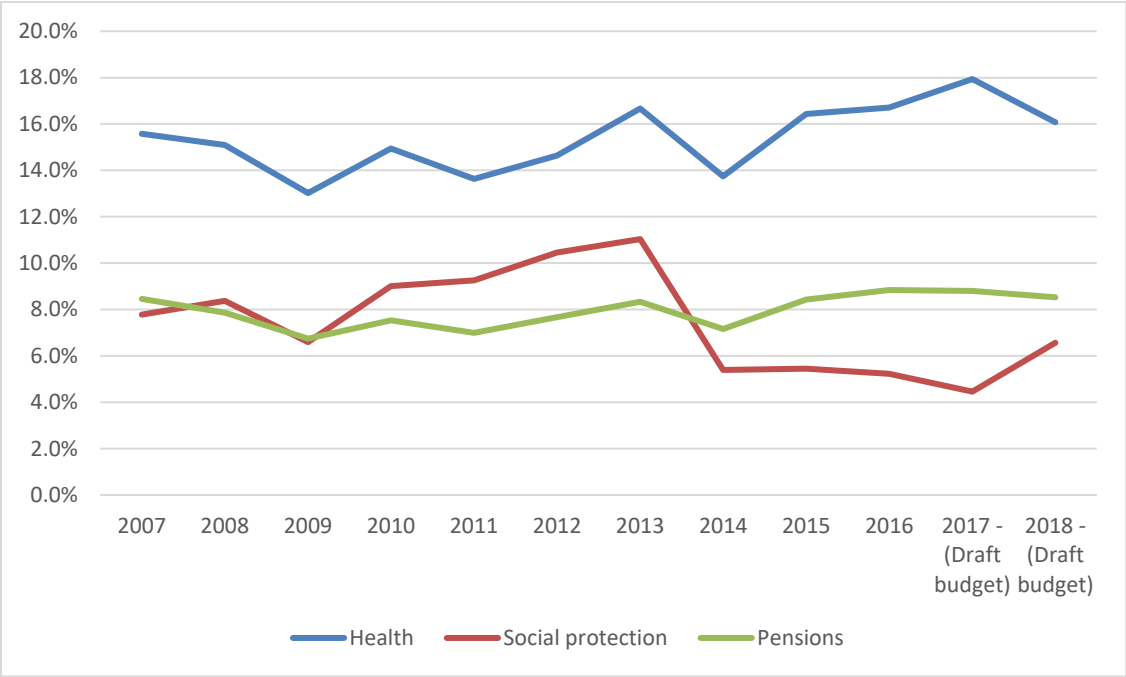
Nonfinancial public sector	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Revenue and Grants	21.3	21.0	21.0	21.8	22.5	22.6	22.1	22.0	22.0	22.1	22.1	22.1
Expenditure	25.7	25.0	24.6	24.9	25.1	25.2	25.5	25.5	24.9	25.1	25.3	25.5
Pension payments (public sector)	2.0	2.1	2.1	2.2	2.2	1.4	1.3	1.6	0.7	0.7	0.6	0.6
Interest payments	2.7	2.7	2.7	2.9	3.2	3.5	4.1	3.9	4.1	4.3	4.5	4.7
Primary balance	-1.8	-1.3	-0.9	-0.2	0.7	0.9	0.7	0.4	1.2	1.3	1.3	1.3
Overall balance	-4.5	-4.0	-3.6	-3.1	-2.5	-2.7	-3.4	-3.5	-2.9	-3.0	-3.2	-3.4
Public sector debt	63.8	65.6	66.8	68.8	70.3	69.8	70.8	71.2	71.2	71.3	71.6	72.2

Source: Author's own calculations based on IMF (2019a). Note: projections from 2019 on.

The demographic and the fiscal contexts combined give a clearer picture of the potential impacts of population aging on El Salvador´s public finances. Figure 6 shows the budget shares of health, social protection and pensions expenditures from 2007 to 2018.[5] The largest share of the budget is allocated to health. An increasing trend has been registered for health throughout the period. However, in 2018, it is predicted to go back to levels registered in 2007 (Icefi, 2017). In recent years, pension expenditures -mainly public pensions that belong to the old pension system- have exceeded the budget allocated to social protection. By adding the shares of these three types of expenditure together, it accounts for around 30% of the public budget in the reference period.

[5] The focus is due to the fact that these three expenditures are the ones that will have a higher impact due to population aging (National Transfer Accounts, 2011).

Figure 6. Budget Shares Allocated to Health, Social Protection and Pensions, as a Proportion of the Total Consolidated Budget. El Salvador 2007-2018



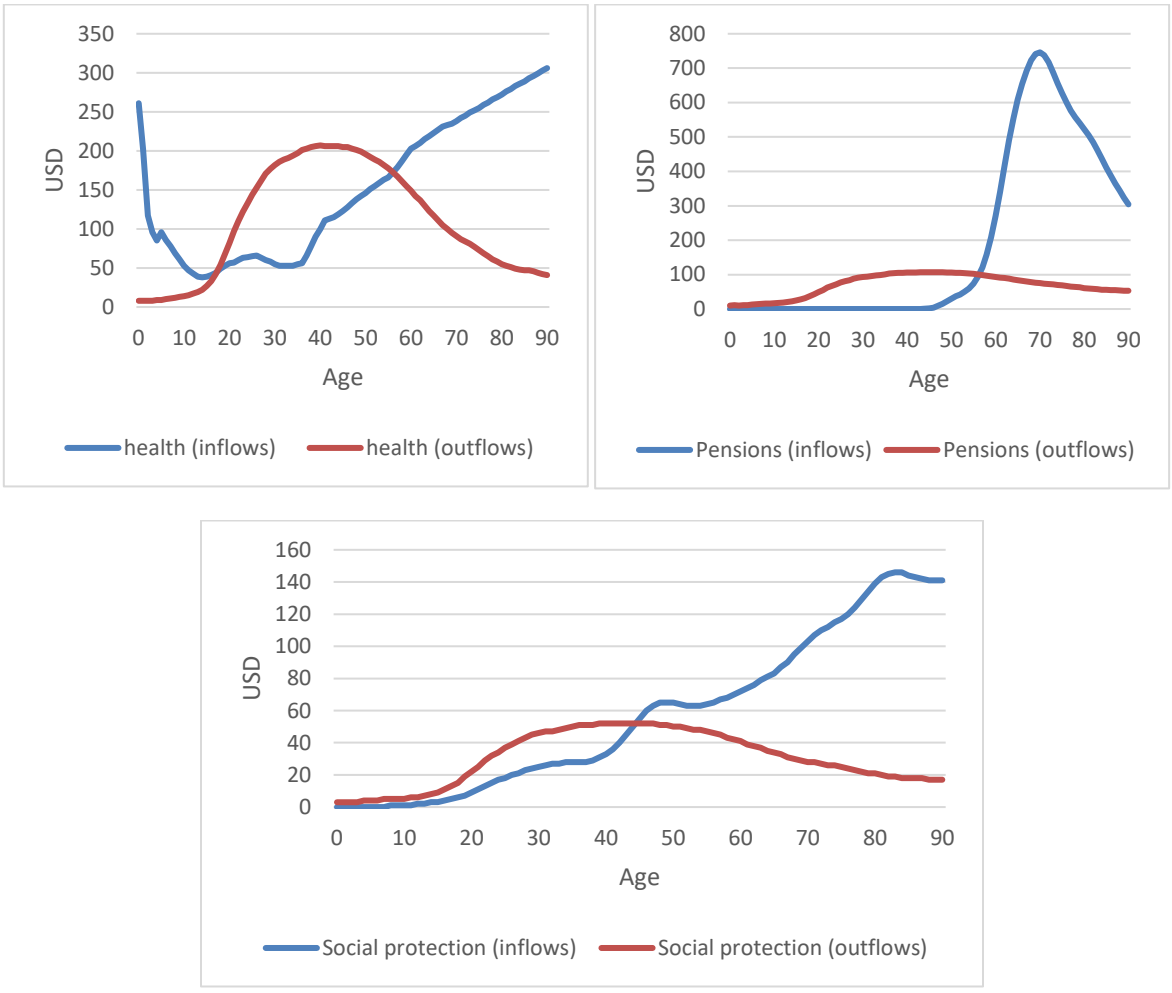
Source: Author's own calculations based on Icefi (2018). Note: The data corresponds to the central government, social security funds, decentralized entities and non-financial public companies. Expenses were classified according to the functional classification of the IMF. The pension data correspond mostly to the payment of pensions from the public system closed for new contributors in 1998. In this sense, it should be kept in mind that in El Salvador the contributing population is in a pension system of individual capitalization with private administration.

The National Transfer Accounts allow understanding why the demand for these services will increase due to population aging. Figure 7 shows the average per capita public consumption in health, pensions and social protection[6] by simple age. The figure shows that, on average, those who receive a greater amount of these three types of public transfers are the people in the last stage of the life cycle. In fact, they receive more than what they contribute, thus becoming net receivers (National Transfer Accounts, 2011). Conversely, people in productive ages are net contributors, since they finance more than what they receive in transfers from the public sector. Figure 7 combined with figure 4 (which shows the changes in the population structure from 1950 to 2050) clearly show why the country's fiscal pressures will be accentuated with population aging: there will be a growing proportion of net recipients, while there will be a decrease in the relative proportion of net contributors. This is in a context of vulnerable public finances with a relatively high public debt. The following two sections present an estimation of the fiscal dividend for El Salvador

[6] This is approximated by the flow of the NTA called "other public transfers in cash".

and a budget projection to assess the impact of the demographic transition on public finances.

Figure 7. Average Per Capita Profiles of Health, Pensions and Social Protection. El Salvador, 2010



Source: Author's own calculations based on Peña and Rivera (2016).

4. Fiscal Dividend

This section presents the estimation of the fiscal dividend, which is similar to the demographic dividend (or private dividend) and comes from the difference between "(...) the growth rates of the effective number of taxpayers and the growth rate of the effective recipients of government public transfers" (Mejía and Murguía, 2012: 87).[7] In practical terms, the dividend allows to observe how the current fiscal structure would change in the context of the demographic transition, maintaining everything else constant. To estimate the fiscal dividend, this paper relies on the methodology used by Mejía and Murguía (2012) and

[7] Author's free translation.

Rosero and Robles (2008). To estimate the fiscal dividend, in the demographic dividend formula (used in Mason, 2007), the weights γ(x) and φ(x) are replaced by the per capita profile by simple age of taxes, and the age profile by simple age of public transfer inflows.[9] The proposed methodology requires i) the historical series of public transfers inflows, ii) historical series on taxes and iii) the historical series of age structure of the population. Due to the fact that in El Salvador, there are no historical series available for the first two components, this paper uses the tax profile and the public transfer inflows calculated by Peña and Rivera (2016). The age structure of taxes and public transfers is assumed to be constant in the period of demographic transition. The fiscal dividend is obtained from equation 3, which represents the fiscal support ratio:

$$FSR = \frac{CO_t}{R_t} \tag{3}$$

CO_t is the effective number of contributors and R_t is the effective number of public transfer receivers. CO_t and R_t can be expressed in the following way:

$$CO_t = \sum_{x=0}^{w} \gamma(x) P_t\,(x) \qquad and \qquad R_t = \sum_{x=0}^{w} \varphi(x) P_t\,(x) \tag{4}$$

In equation 4, it is assumed that $\gamma(x)$ and $\varphi(x)$ are invariant with respect to time. If $\frac{CO_t}{R_t}$ is the ratio of fiscal support, to get its first derivative with respect to time, we have the following expression:

$$\frac{\dot{CO_t}}{CO_t} - \frac{\dot{R}_t}{R_t} \tag{5}$$

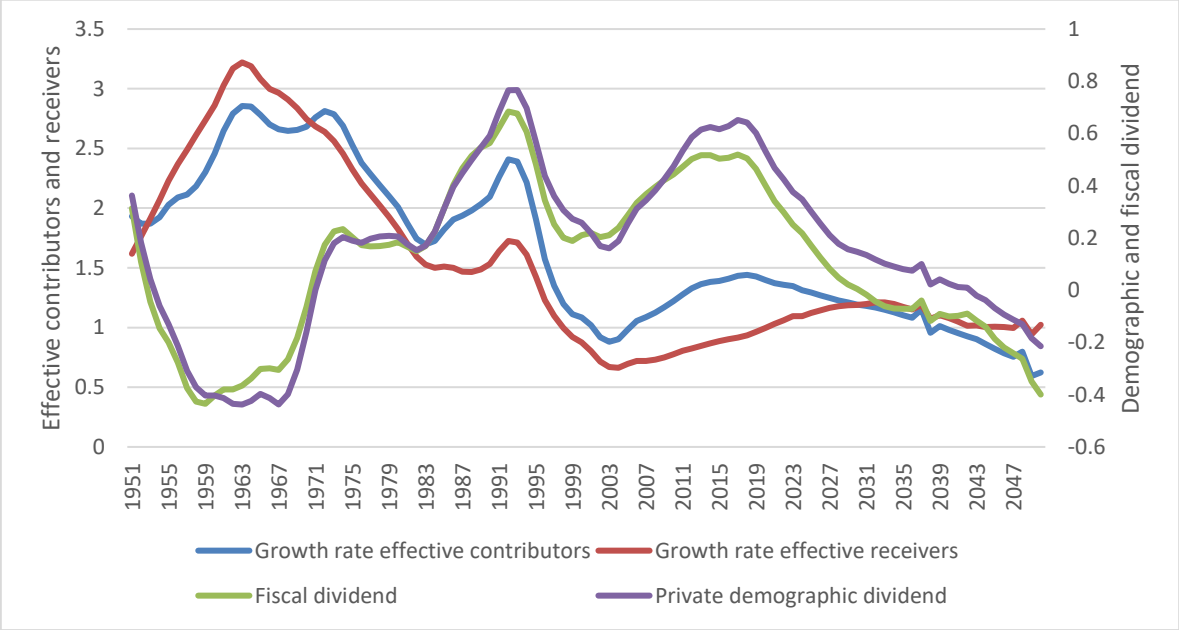
Expression 5 illustrates the fact that when the growth of public revenues or taxes –controlled by the change in the age structure over time– offsets the increase in public transfers inflows –controlled by the change in age structure over time–, a positive fiscal dividend is obtained (Mejía and Murguía, 2012 and Rosero and Robles, 2008). In other words, the fiscal dividend is "the rate at which the [public] revenues would increase by [receiver] if the structure [of public income and expenditure] remained constant and the only thing that changed was the age structure of the population[8]" (Rosero and Robles, 2008: 5). The estimation of the fiscal dividend (alongside with the demographic dividend (private dividend) estimated by Peña and Rivera (2018)) for the period 1951-2050 is shown in figure 8. In addition, this figure represents the growth rate of effective contributors and recipients over time.

[9] It should be kept in mind that these weights are assumed be constant over time and the only thing that varies is the age composition of the country.

[8] Author's free translation.

The fiscal dividend follows almost a similar pattern as the private demographic dividend estimated by Peña y Rivera (2018); however, some differences arise. Between 1950 and the first five years of 1970, the fiscal dividend was negative, which implies that the growth of effective recipients of public transfers was greater than the growth of effective taxpayers or contributors. This is a consequence of the weight of the first ages in the population structure in these years.[10] This is confirmed in Figure 8 when comparing the growth rate of effective contributors with the growth rate of effective recipients of public transfers. For the period 1975-2031, the fiscal dividend is positive, as a consequence of a faster growth of effective contributors relative to effective recipients. This period coincides with a positive private demographic dividend. This means that this demographic window of opportunity is favorable for public finances (Peña and Rivera, 2018), since the effective number of contributors increases in the population.[11] The fiscal dividend becomes negative at the beginning of the 2030s as a consequence of population aging. It becomes negative before the private demographic dividend, so the pressure on public finances derived from the demographic transition will be accentuated in this decade.

Figure 8. Fiscal Dividend (in Percentages), 1951-2050.



Source: Author's calculations based on Peña and Rivera (2016) and DIGESTYC/UNFPA/CELADE (2010).

In order to deepen the analysis, table 2 contains the growth rates of the fiscal dividend (private demographic dividend –defined as the rate of growth of income per effective consumer (Mason, 2007)), GDP per capita and GDP per effective recipient (GDP per effective consumer) for the period 1970-2050. The accumulated fiscal dividend for the period 1970-

[10] A similar pattern is documented by Mejía and Murguía (2012) for the case of Mexico.
[11] Rosero and Robles (2008) have found the same link for Costa Rica and Queiroz and Turra (2014) for Brazil.

2037 is 18.72% (22.70% for the demographic dividend), growing at an annual average rate of 0.275%. When the period 2018-2037 is considered (according to Figure 5, in 2037, the dependency ratio will start to grow), the cumulative fiscal dividend will be 2.560%, with an average annual growth rate of 0.128% (while the demographic dividend will grow at annual average rate of 0.267%). Due to the demographic transition, the fiscal dividend will be negative in the period 2038-2050 (as it can also be seen in Figure 8). It is expected that, due to the greater growth of the effective recipients, the fiscal dividend will decrease at an annual average rate of -0.185%, registering a cumulative decrease of -2.411% at the end of this period (compared to 0.750% for the demographic dividend).

Table 2 also depicts the GDP per effective recipient for the period 1970-2050. For the period 1970-2037, it is estimated that the GDP per effective recipient will be negative in the first scenario in which GDP per capita grows at an average rate of 2%. This is mainly influenced by the growth of the effective number of recipients in the first decades of this period. The GDP per effective receiver becomes positive for this period when other scenarios of higher GDP per capita growth are considered. This shows the importance for El Salvador to boost economic growth in order to cope with the challenges of the demographic transition and improve public finances (Peña and Rivera, 2018). The growth of this indicator becomes positive in the period 2018-2037 and in the period 2038-2050. This is due to the positive effect of the demographic dividend and the higher growth of effective taxpayers compared to effective recipients.

The current fiscal dividend grants the opportunity to implement fiscal policies that can prepare El Salvador to face the future fiscal pressures. By 2040, the population moment will not be favorable to the country, as the effective number of receivers will grow faster than the effective number of contributors. This will have a negative impact on the sustainability of the public finances.

Table 2. Growth Rates of the Fiscal Dividend, GDP Per Capita and GDP Per Effective Recipient (percentage), 1951-2050

	Accumulated fiscal dividend (a)	Accumulated demographic dividend (b)	Fiscal dividend (c)	Demographic dividend (d)	GDP per capita (e)	Effective receivers (f)	Effective consumers (g)	GDP per effective receiver (h)=(e)-(f)	GDP per effective consumer (i)=(e)-(g)
Scenario 1: Avarage annual growth 2% (2020-2050)									
1970-2037	18.72	22.70	0.275	0.334	1.192	1.32	1.34	-0.129	-0.152
2018-2037	2.560	5.344	0.128	0.267	1.959	1.125	1.002	0.834	0.957
2038-2050	-2.411	-0.750	-0.185	-0.058	2.000	1.029	0.760	0.971	1.240
Scenario 2: Average annual growth 2.5% (2020-2050)									
1970-2037	18.72	22.70	0.275	0.334	1.324	1.32	1.34	0.004	-0.019
2018-2037	2.560	5.344	0.128	0.267	2.409	1.125	1.002	1.284	1.407
2038-2050	-2.411	-0.750	-0.185	-0.058	2.500	1.029	0.760	1.471	1.740
Scenario 3: Average annual growth 3% (2020-2050)									
1970-2037	18.72	22.70	0.275	0.334	1.46	1.32	1.34	0.136	0.113
2018-2037	2.560	5.344	0.128	0.267	2.859	1.125	1.002	1.734	1.857
2038-2050	-2.411	-0.750	-0.185	-0.058	3.000	1.029	0.760	1.971	2.240
Scenario 4: Average annual growth 3.5% (2020-2050)									
1970-2037	18.720	22.696	0.275	0.334	1.59	1.32	1.34	0.268	0.245
2018-2037	2.560	5.344	0.128	0.267	3.31	1.125	1.002	2.184	2.307
2038-2050	-2.411	-0.750	-0.185	-0.058	3.50	1.029	0.760	2.471	2.740
Scenario 5: Average annual growth 4% (2020-2050)									
1970-2037	18.720	22.696	0.275	0.334	1.72	1.32	1.34	0.40	0.378
2018-2037	2.560	5.344	0.128	0.267	3.76	1.125	1.002	2.634	2.757
2038-2050	-2.411	-0.750	-0.185	-0.058	4.00	1.029	0.760	2.971	3.240

Source: Author's own calculations based on Peña and Rivera (2016), DIGESTYC/UNFPA/CELADE (2010), ECLAC (2008a), IMF (2019b) and Mejía et al. (2010).

5. Budget Projection

This paper conducts a budget projection to obtain an approximation of the fiscal pressures caused by population aging. The methodology adopted in this exercise has been proposed in Miller (2006) and used by Nayarana (2011), Miller and Cruz (2013), Miller et al (2010), among others.[9] To construct this projection, it was necessary to collect information on the average real interest rate of public debt -an average of the interest rates of the Eurobonds placed by the government of El Salvador between 2002-2017-, the growth of real productivity per worker, inflation rate, aggregate labor income, GDP, total public debt, the overall deficit of the public sector, public spending on education, health, pensions, poverty and other types of social protection, general services and debt service.

To model the impact of the demographic transition, the following average per capita profiles were used: labor income, public consumption in education, public consumption in health, public consumption in poverty and other type of social protection and public consumption in general services. In conjunction with these profiles, population projections from 2018 to 2050 are used (Revision 2010).[10] These were obtained from the General Directorate of Statistics and Censuses of El Salvador (DIGESTYC). The projection method is based on the following formula:

$$\beta(t) = \sum b(a,t) * \exp(g * t) * p(a,t) \tag{6}$$

Where $\beta(t)$ is the budget projection, $b(a,t)$ represents the average transfers -in kind and in cash- received from the government by age a in period t, g is the average growth rate of the correspondent expenditure, and $p(a,t)$ is the total population in age a in period t. This equation is complemented by the following set of equations (Miller, 2006 and Nayarana, 2012):

$$YL(t) = \sum YL(a,t) * \exp(r * t) * p(a,t) \tag{7}$$

$$GDP(t) = YL(t) * (GDP_0/YL_0) \tag{8}$$

$$GR(t) = GR_0 * (1 + gr) \tag{9}$$

$$Debt(t) = Debt(t-1) * (1 + r_n) - PS(t) * \left(1 + \frac{r_n}{2}\right) \tag{10}$$

$YL(t)$ refers to labor income, r is the rate of growth of productivity, $GR(t)$ represents government revenues, gr is the average growth rate for government revenues, r_n is the nominal rate of interest on government debt and $PS(t)$ is the primary surplus. To make this

[9] A more sophisticated methodology, but with the same logic behind, is used by the European Comission to produce its Ageing Report for the EU members (see European Commission, 2017) and the Department of Finance-Government of Canada (2018).

[10] These projections are used since they are available by simple age and cover the period 1950-2050.

projection, the database of the 2018 budget draft presented by the Ministry of Finance is used.[11] This database has been codified by the Central American Institute for Fiscal Studies (Icefi, 2018) according to the functional classification of the International Monetary Fund. Based on this classification, the expenses were grouped into the following categories: education, health, pensions, poverty and other types of social protection, general government services and debt service.[12] With respect to pension expenditure, the projection of the amounts to be paid in the future was obtained from the actuarial estimates published by the Superintendencia del Sistema Financiero (2018) under the context of the recent pension reform.[13] Therefore, they do not vary with respect to the demographic transition nor with the growth of previous periods, as the other expenditure groups which are considered do.[14]

To obtain the debt growth based on the needs imposed by demographic transition, the interest rate paid on public debt, the debt of the previous period and the primary deficit of the public sector are taken into account (See equation 10). To obtain the GDP growth, a fixed proportion is used between GDP and the aggregate of labor income -which grows based on labor productivity- (See equation 7 and 8). The growth of expenditure components is

[11] Normally, the budget approved by the Legislative Assembly differs from budget draft. However, at the time at which this analysis was produced, only the budget draft was available with the IMF classification (Icefi, 2018). Even though, the data should be taken as indicative of a trend.

[12] This grouping was carried out arbitrarily, using the 10 general categories of the expenditure classification by functions of the IMF. Likewise, the data correspond to the aggregation: central government, social protection funds, decentralized entities and non-financial public companies.

[13] In September 2017, the Legislative Assembly approved a structural pension reform, which aimed at releasing the fiscal pressure derived from the pension debt accumulated with the old pay-as-you-go system. The decree of the reform (in Spanish) is available at the following link: http://www7.mh.gob.sv/downloads/pdf/700-UC-CM-2017-013.pdf

[14] In El Salvador, after the structural pension reform approved in 1996 and implemented in 1998, the public pay-as-you-go system was closed for new contributors. An individual capitalization system of private administration came into operation. The technical reserves of the public pension system were exhausted in 2001 (Mesa-Lago, 2010). Therefore, it was necessary to issue public debt to finance the payment of pensions for this system. Subsequently, other reforms were made that increased the fiscal pressure of the pension financing (See legislative decrees 1217 and 100). In 2006, the Pension Obligations Trust was created as a mechanism to obtain resources through the issuance of public debt without having to go through the approval of the Legislative Assembly. Given the fiscal pressure of the payment of public pensions, in 2017 a reform was implemented to the individual capitalization pension system. Among the most visible changes was the creation of the Solidarity Guarantee Account. It is privately managed and in practice it works as a solidarity fund. To finance this account, part of the global contribution per worker goes to it, while the other goes to the individual account. As part of the actuarial evaluation of the 2017 reform, the financial flows of the system were constructed with the proposed changes (Mielinsky, 2017) and after the reform the Superintendencia del Sistema Financiero (2018) made an actuarial report of the future commitments in charge of the public sector. Given that the estimates of these flows are available, they were used instead of making the projection based on the simple age profile and population projections, since to do so would be assuming that the growth of the pension payment of the public system would be guided by population aging, which is not entirely correct.

assumed, as expressed in equation 6, guided by age groups growth and by the growth of the correspondent expenditure in the previous periods[15]. In this respect, the growth of expenditure components can be taken as a natural growth influenced by production growth and inflation, whereas the growth of population groups represents the increase/reduction in demand for services given the population aging.

Table 3 presents a summary of the main parameters used to run the projection. Three scenarios are constructed: Scenario 1 in which the government issues debt to pay for the public costs of population aging. Scenario 2 in which the government raises government revenues in order to cope with the fiscal effects of population aging. The government will automatically issue debt to cover any budget deficits. Scenario 3 in which the government raise taxes and lower benefits in order to cope with the fiscal effects of population aging. The government will automatically issue debt to cover any budget deficits.

Table 3. Parameters Used for the Fiscal Projection

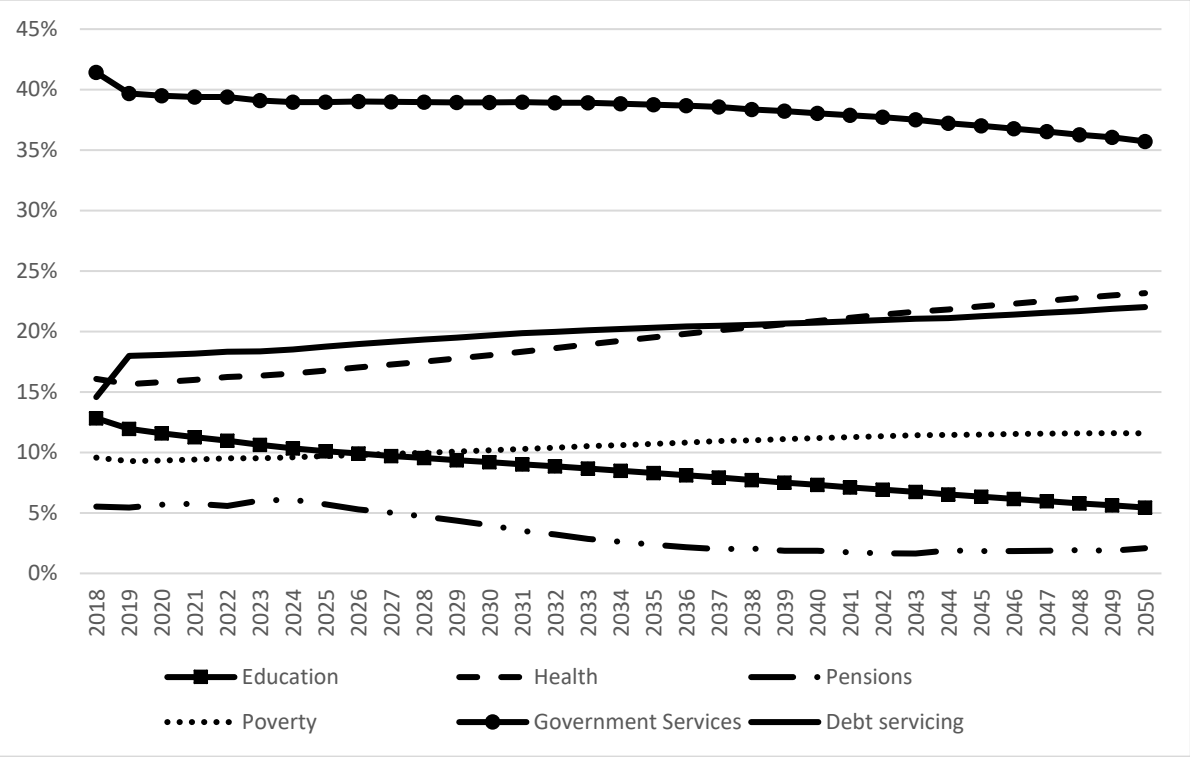
Parameters used (percentages or millions USD)	2017-2018
The Economy	
1. Real interest rate on government debt	5.5%
2. Real growth rate of labor productivity per worker	1.2%
3. Inflation rate	2.0%
4. Aggregate Labor Income	$11,971.33
5. GDP	$26,056.94
The Government	
6. Total Outstanding Government Debt	$18,974.68
7. Annual Government Deficit	$781.09
8. Total Government Revenue	$6,882.73
9. Total Government Spending	$7,663.82
10. Education	$983.10
11. Health	$1,232.43
12. Pensions	$423.64
13. Poverty and other social protection	$733.65
14. Government Services	$3,173.93
15. Debt Servicing	$1,117.07
16. Education (Growth of expenditure-average 2013-2018)	2.7%
17. Health (Growth of expenditure-average 2013-2018)	5.2%
18. Poverty and other social protection (Growth of expenditure-average 2013-2018)	4.0%
19. Government Services (Growth of expenditure-average 2013-2018)	4.0%
20. Total Government Revenue (Growth of expenditure-average 2013-2018)	4.9%

Source: Author's own calculations based on the information provided by the Central Bank, Ministry of Finance, Peña and Rivera (2016), Icefi (2017).

[15] This is a modification compared to the original methodology proposed by Miller (2006), in which expenditures growth according to labor productivity.

Figures 9 and 10 present the results of the projection base scenario (scenario 1) in percentages of the total budget and GDP. The components that increase the most in proportion in the budget and in the GDP are debt servicing, health, and poverty and another type of social protection. Indeed, health expenditure increases from 16.08% of the budget (and 4.73% of the GDP) in 2018 to 23.2% of the budget (and 9.02% of the GDP) in 2050. The category of poverty and other type of social protection goes from 2.82% to 4.51% of the GDP (9.57% to 11.57% of the budget) in the same period. In the case of pensions, the share tends to decrease, although the absolute value tends to increase over time.[16] A result that is worth to note is that the share of spending on education decreases along the period. This is largely explained by population aging and the inversion of the population pyramid.

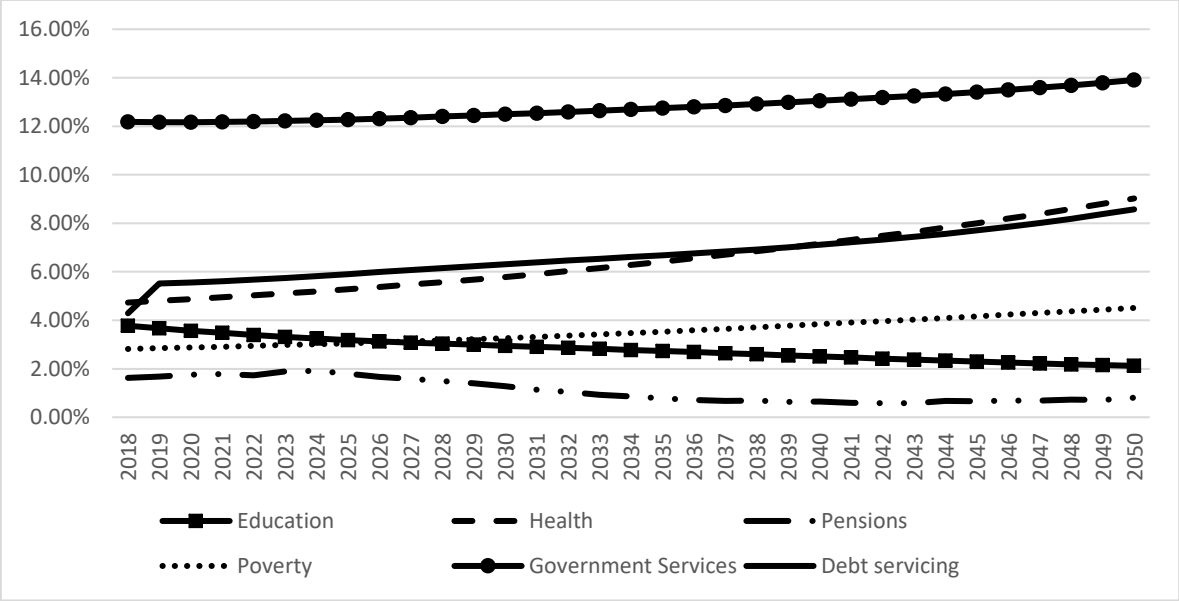
Figure 9. Budget Projection by Expenditure Components (in Percentages of the Total Budget), 2018-2050



Source: Author's own calculations based on the information provided by the Central Bank, Ministry of Finance, Peña and Rivera (2016), Icefi (2017).

[16] As indicated by the Superintendencia del Sistema Financiero (2018: 9), from 2044 onwards, the fiscal pressure of pensions increases "because at that moment most of the contributors of the currently younger generations will begin to receive compensation for contributions to the CGS [Solidarity Guarantee Account]" (Author's free translation).

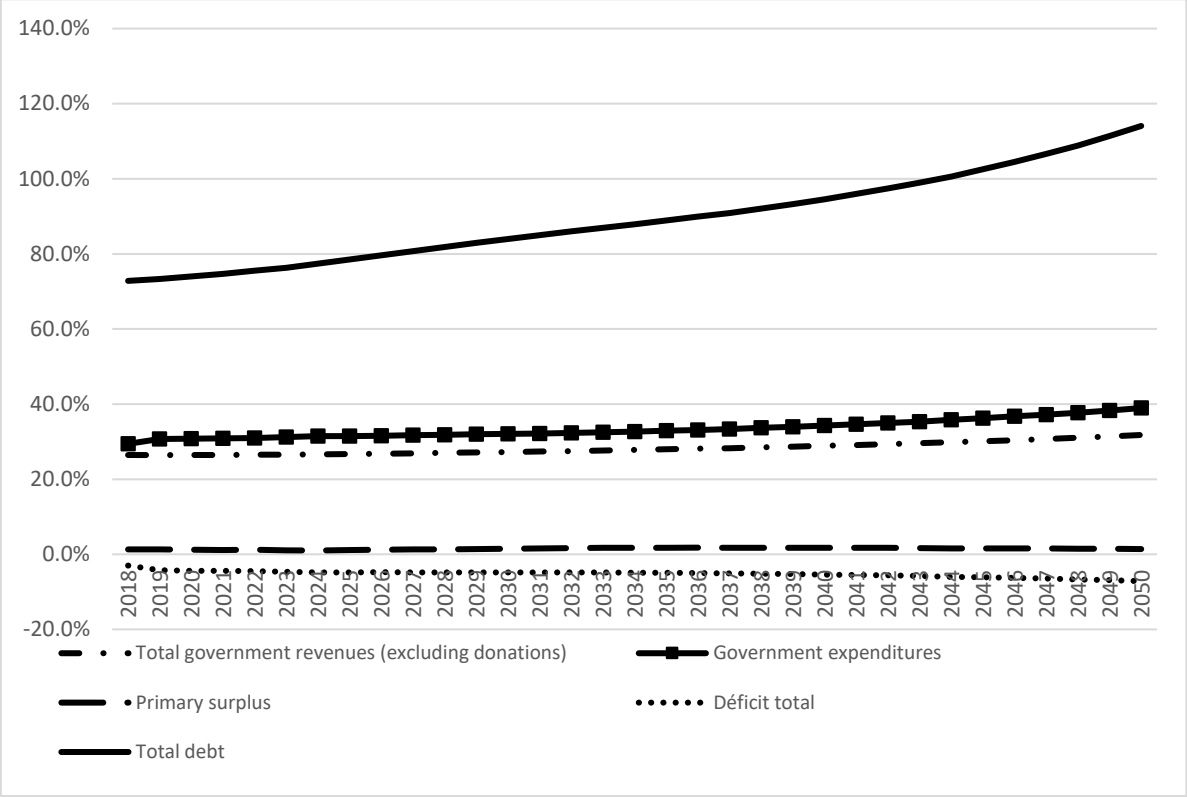
Figure 10. Budget Projection by Expenditure Components (in Percentages of GDP), 2018-2050



Source: Author's own calculations based on the information provided by the Central Bank, Ministry of Finance, Peña and Rivera (2016), Icefi (2017).

Figure 11 presents some fiscal indicators for the base scenario (scenario 1). A striking result is the growth of public debt, which would even exceed the limit of 80% as of 2027 and would almost represents 114% of GDP by 2050. This is as the main consequence of demographic change and assuming that the average rate of growth of the expenditures and revenues considered in Table 3 remain constant along the period considered. In addition, the primary surplus reaches 1.4% of the GDP as of 2050. With the increase in public debt and with no austerity measure on incomes and/or expenditures the payment of interest will increasingly affect the total deficit and at the end of the period it might represent -7.2% of the GDP. The results show that the demographic transition and the consequent increase in the demand for health services and poverty and another type of social protection - leaving everything else constant - will impose important fiscal pressures on the country. It can lead to unstainable levels of debt and total deficit.

Figure 11. Budget Projection by Fiscal Indicators (in Percentages of GDP), 2018-2050



Source: Author's own calculations based on the information provided by the Central Bank, Ministry of Finance, Peña and Rivera (2016), Icefi (2017).

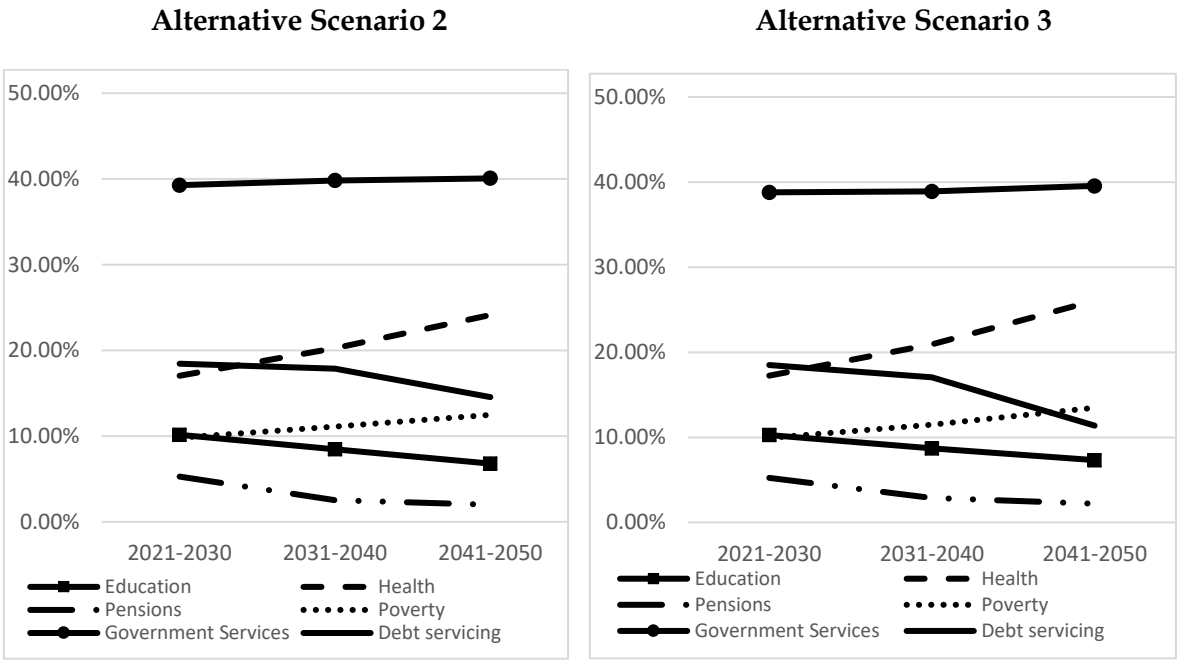
An important advantage of the budget projection is that different scenarios can be evaluated. This paper considers two alternative scenarios: one in which public revenues are increased progressively (scenario 2); and the other in which the increase in public revenues is complemented by a reduction in public expenditures in general services (scenario 3). These two alternative scenarios lead to an increase in the annual growth rate of government revenues by 0.3 percentage points[17] (from 4.9% to 5.2%) and for the third scenario to a decrease in the annual growth rate of the general government services by 0.3 percentage points (from 4% to 3.7%)[18]. The fiscal indicators resulting from the projection undergo important changes. This is presented in Figures 12, 13 and 14 and Table 4. Figures 12 and 13 and Table 4 show a more pronounced growth in the share of GDP and the total budget of expenditures in health and poverty and another type of social protection. This is as a consequence of a reduction in the service of the debt which is derived from an increase of the revenues of the public sector and a reduction in the growth rate of government services

[17] It is assumed that this increase it is not due to inflation.

[18] This mean having an accumulated growth of around 9% in revenues and a reduction of around 9% in general government services at the end of the period. In addition, general government services expenditures represent around 41% of the total expenditures, thus, a change in its long run trend can have a significant on El Salvador's public finances.

expenditures. The payment of interests is reduced in both scenarios. At the end of the 2040-decade, the debt servicing represents 2.33% of the GDP in Scenario 3, compared to 4.30% in Scenario 2 and 8.57% in the base scenario.

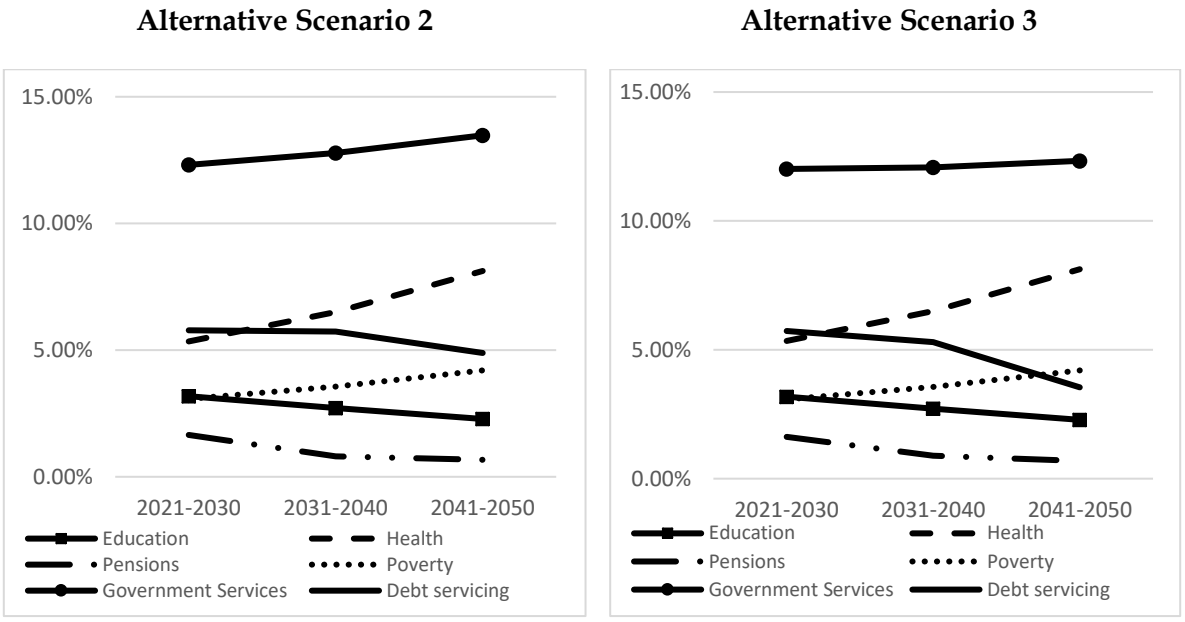
Figure 12. Budgetary Projection by Expenditure Components - Increment in Revenues- (in Percentages of the Total Budget), 2018-2050



Source: Author's own calculations based on the information provided by the Central Bank, Ministry of Finance, Peña and Rivera (2016), Icefi (2017).

On the other hand, figure 14 shows the projection of the fiscal indicators in the alternative scenarios. Public sector revenues grow at an annual average rate of 5.2% each year, going from 26.4% of the GDP in 2018 to 34.7% in 2050. This increase in revenues (and in Scenario 3, the reduction of government services expenditure) makes the debt sustainable over time. It even reduces its proportion in the product to levels close to 57% in 2050 in Scenario 2 and 31% in Scenario 3. This is far from 114%, the level reached in the base scenario (Scenario 1). Finally, Table 1 presents a summary of the budget projections (presenting the averages per decade), considering the three scenarios.

Figure 13. Budget Projection by Expenditure Components - Increment in Revenues- (in Percentages of GDP). El Salvador 2018-2050

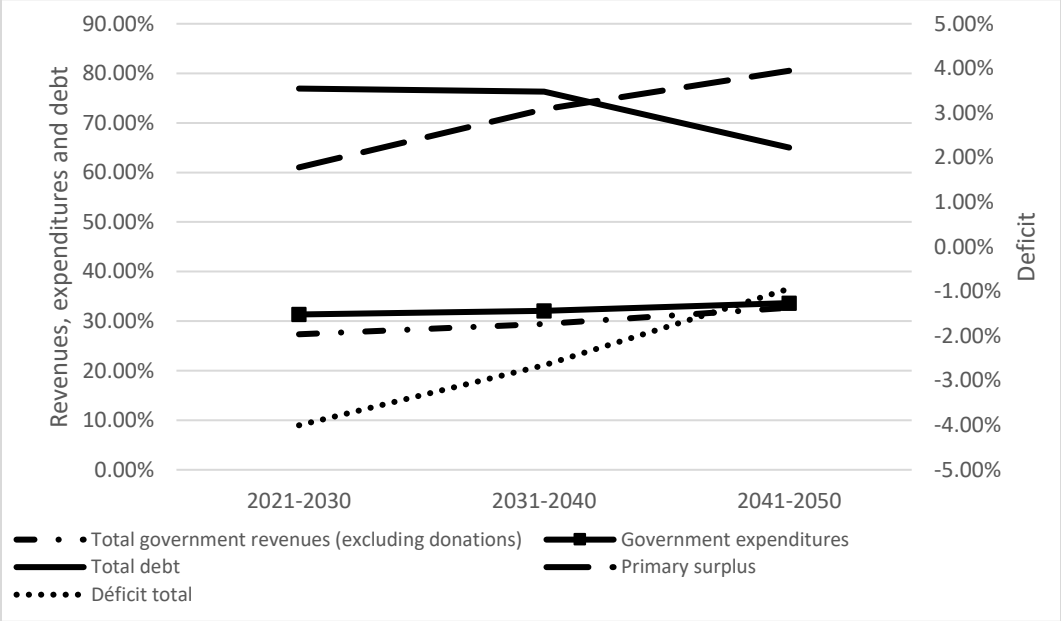


Source: Author's own calculations based on the information provided by the Central Bank, Ministry of Finance, Peña and Rivera (2016), Icefi (2017).

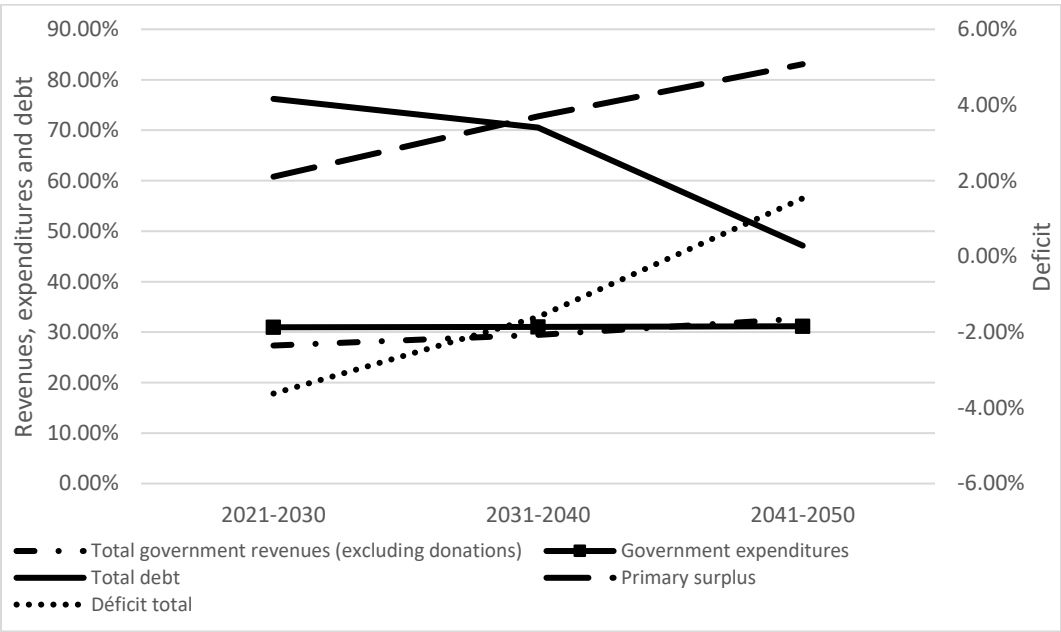
This projection exercise shows that the public sector must take fiscal measures -either increasing revenues, decreasing expenditures, or a combination of both- to tackle down the fiscal pressures derived from the demographic transition. This exercise shows that, without taking fiscal policy measures, population aging and the increasing demand for resources and services that it entails could cause the public debt to take an unsustainable path in the long term. On the opposite, an increase in public revenues and a reduction in government expenditures can help to reduce the fiscal pressures derived from population aging.

Figure 14. Budget Projection by Fiscal Indicators –Increment in Revenues- (in Percentages of GDP). El Salvador 2018-2050

Alternative Scenario 2



Alternative Scenario 3



Source: Author's own calculations based on the information provided by the Central Bank, Ministry of Finance, Peña and Rivera (2016), Icefi (2017).

Table 4. Budgetary Projection Baseline Scenario and Alternative Scenarios (Increase in Public Revenues) (Averages in Percentages of GDP). El Salvador 2020-2050

	Scenario 1-base scenario- (% GDP)			Scenario 2 (% GDP)			Scenario 3 (% GDP)		
	2021-2030	2031-2040	2041-2050	2020-2030	2031-2040	2041-2050	2020-2030	2031-2040	2041-2050
Education	3.18%	2.71%	2.28%	3.18%	2.71%	2.28%	3.18%	2.71%	2.28%
Health	5.34%	6.50%	8.12%	5.34%	6.50%	8.12%	5.34%	6.50%	8.12%
Pensions	1.65%	0.81%	0.67%	1.65%	0.81%	0.67%	1.62%	0.89%	0.69%
Poverty	3.08%	3.56%	4.20%	3.08%	3.56%	4.20%	3.08%	3.56%	4.20%
Government Services	12.31%	12.78%	13.48%	12.31%	12.78%	13.48%	12.02%	12.08%	12.33%
Debt servicing	5.95%	6.73%	7.82%	5.78%	5.74%	4.89%	5.73%	5.30%	3.54%
Total government revenues (excluding donations)	26.79%	28.07%	30.33%	27.35%	29.45%	32.70%	27.35%	29.45%	32.70%
Government expenditures	31.52%	33.10%	36.58%	31.35%	32.11%	33.64%	30.97%	31.05%	31.17%
Primary surplus	1.22%	1.70%	1.57%	1.78%	3.08%	3.95%	2.11%	3.70%	5.08%
Total Deficit	-4.73%	-5.03%	-6.25%	-4.00%	-2.65%	-0.94%	-3.62%	-1.60%	1.53%
Total debt	79.16%	89.55%	104.10%	76.93%	76.30%	65.02%	76.22%	70.55%	47.14%

Source: Author's own calculations based on the information provided by the Central Bank, Ministry of Finance, Peña and Rivera (2016), Icefi (2017).

6. Conclusion

This paper analyses the fiscal impact of population aging in developing countries by analyzing the case of El Salvador, a country located in Central America, which is currently going through a full demographic transition. This demographic transition is leading to the ageing of the population structure, a phenomenon that will increase the weight of older people in the overall population. In fact, it is expected that by 2050 the weight of the population older than 65 years old will double. The National Transfer Accounts show that this demographic change will increase the demand of resources, in health and social protection, needed to satisfy the necessities of the population group at the end of the life cycle. Precisely, the demographic transition will impose an important pressure on El Salvador's public finances. According to the IMF, El Salvador's public finances are currently stable; however, the relatively high level of public debt may represent a risk in the medium and long term. Therefore, the study of the fiscal implications of population aging are of a critical importance for El Salvador. In order to assess these impacts, this paper presented the estimation of El Salvador's fiscal dividend and a budget projection with different scenarios.

First, this study presented an estimate of the private and fiscal dividend for El Salvador, in order to identify the demographic window of opportunity that the country has in terms of public finances. The results show that the fiscal dividend has been positive since the 70s and it will remain so until the beginning of the 2030s, almost coinciding with the growth of the dependency ratio. It becomes negative before the private demographic dividend, which starts to be negative around 2037. The results also show that a greater growth of GDP per capita leads to the increase in the growth of the GDP per effective receiver. This means that the more the production growths, the more resources are available to finance the consumption of the dependent ages (especially those at the end of the life cycle). The fiscal dividend show that the current population moment of El Salvador is favorable to take fiscal policy measures (income, spending and debt) to prepare the country for the population aging. At the same time, it shows that the country needs to implement these policy measures in the short and medium term; otherwise, the window of opportunity given by the fiscal dividend will disappear in the next decade.

Second, this document presented a budget projection based on the growth of labour productivity, past values of public expenditures, inflation and the change in the population structure. The results show that the increase in demand for health services and social protection would increase the budgetary pressures if the fiscal structure as of 2018 does not change. This fiscal pressure would result in an increase in public debt used to finance expenditures on health and social protection and other general expenses. In this scenario, the increase in public debt could exceed the level of 80% of GDP in 2027 and might even reach 114% of GDP by 2050, thus, making El Salvador's public finances unsustainable in the medium and long term. Two alternative scenarios were examined: a scenario (Scenario 2) in which the average annual rate of government revenues increases by 0.3 percentage points (from 4.9% to 5.2%) and another scenario in which this increase in government revenues is combined with a decrease in the annual growth rate of the general

government services by 0.3 percentage points (from 4% to 3.7%) (Scenario 3). Both scenarios lead to the stabilization of the public debt around 31% to 50% of the GDP at the beginning of 2050. In the third scenario, this means that El Salvador could cut by a half the weight of its public debt on the GDP, by implementing measures to increase the public revenues and reducing the public expenditure in a scenario of population aging and a positive fiscal dividend.

As shown, the fiscal policy can be an effective tool to address the challenges of the demographic transition that El Salvador is facing, provided it is implemented accordingly. The country must set fiscal measures to face the demand for additional resources that will be created by the progressive aging of the population. The increase in public revenues, as well as a more efficient and effective use of public spending, are fundamental for achieving this objective. Furthermore, the sustainability of the debt in the long term cannot be ignored. By taking greater advantage of the demographic dividend, public finances can be strengthened. However, any fiscal policy measure should have a progressive nature, avoiding undermining efforts to reduce inequality. The results obtained provide us a unique basis of knowledge for informed policy-making and help identify effective policies to deal with the fiscal impact of population aging, not only in El Salvador but likely in other developing countries facing a full demographic transition as well.

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