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The CEQ logo is a stylized graphical representation of a Lorenz curve for a fairly unequal distribution of income (the bottom part of the C, below the diagonal) and a concentration curve for a very progressive transfer (the top part of the C).

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ABSTRACT

The paper investigates empirically the links between the fiscal space, fiscal redistributions, and distributional outcomes for the case of Latin America. It focus on two factors; first, the role of intertemporal restrictions and debt sustainability and, second, the demographic transition's influence on the fiscal redistribution structure. The paper identifies some stylized facts that matter in designing distribution-friendly fiscal consolidation policies. Two findings deserve highlighting. First, the way in which a given fiscal adjustment is implemented matters to income distribution. As a general rule, the downward adjustment of expenditures is regressive, although the importance of the impact varies substantially according to the expenditure item and from one economy to another. Second, the Demographic Window of Opportunity (DWO) is the key stage of the demographic transition regarding the fiscal space in Latin America. Younger countries are entering the DWO and the older ones have to prepare to abandon it and enter the aging stage. The exercises suggest that the DWO will create the fiscal space required to implement progressive policies in younger countries while the opposite will occur in the countries that will age. The simulations indicate that the demographic transition-driven effects on the items of fiscal redistributions are potentially very large and have substantial consequences for income distribution and debt sustainability.

JEL Codes: E62; J11

Keywords: Fiscal policy, Demographics

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1. Introduction

When discussing fiscal redistributions, that is, changes in income distribution caused by taxes and expenditures, policy makers tend to focus on two main factors: redistribution effects considering a cross-section of the current population's income levels, and the short-run impact on the public budget. In contrast, more often than not, the intertemporal implications have not been systematically evaluated. Two dimensions are particularly relevant with regard to fiscal redistributions: the sustainability of public debt and the consequences for the distribution of wealth among present and future generations.

The literature that considers the intertemporal dimension argues that policy makers need sufficient budget "flexibility" to implement their policies and, in recent years, the concept of "fiscal space" has become increasingly popular to assess the degree of flexibility a government enjoys. Peter Heller (2005) defined fiscal space as "room in a government's budget that allows it to provide resources for a desired purpose without jeopardizing the sustainability of its financial position or the stability of the economy." The United Nations' approach to the notion of fiscal space, in turn, explicitly considers the link between flexibility and fiscal redistribution (Roy et al., 2007). According to this approach, fiscal space is needed in the first place to evaluate the extent to which a government can mobilize resources to combat poverty and achieve the Sustainable Development Goals. Ostry et al. (2010) focus on the financial side and define the fiscal space as the difference between an estimated upper limit of public debt (beyond which action would have to be taken to avoid default) and actual public debt, expressed as a percentage of GDP. The upper limit is estimated econometrically. The fiscal space so defined is routinely measured by Moody's analytics (2011) for a set of developed economies, which are classified into three categories according to the availability of fiscal space.

The notion of fiscal space is useful to evaluate the financial dimension of flexibility but it leaves aside two factors that are essential to measure the degree of flexibility that a government has to sustain a given fiscal redistribution structure in the face of a shock or to introduce changes in such structure.

The first factor is the combination of taxes and expenditures, that is, the fiscal redistribution structure, associated with the primary surplus required to ensure debt sustainability. This is crucial when evaluating the degree of flexibility to achieve the required primary surplus without jeopardizing the results sought concerning poverty or distribution. Under certain conditions, the intertemporal financial stability restrictions and fiscal redistributions can interact perversely. On the one hand, when a negative shock occurs, say, a fall in the terms of trade, and debt sustainability is under scrutiny, the authorities may have to implement "adjustments" in taxes and expenditures to increase the primary fiscal balance and thus strengthen its creditworthiness. The adjustments

often have a negative distributional impact that weakens the progressivity of the existing fiscal redistribution structure. This is why, in evaluating different options to ensure sustainability, it is crucial to include an assessment of the distributional effects of changes in the level and composition of the taxes and expenditures that make up the structure of fiscal redistributions. On the other hand, when launching an initiative to improve income distribution and/or combat poverty that changes the structure of fiscal redistribution permanently, the fiscal authorities should routinely check for debt-sustainability. In the special case of natural resource-rich countries, it is important to consider the extent to which fiscal revenues depend on such resources. Marked budgetary imbalances may appear as a consequence of shocks in natural resource prices that provide funds to finance the existing structure of fiscal redistributions. This is particularly so when symptoms of the natural resource curse are present. Furthermore, it goes without saying that the flexibility concerning the choice of the tax/expenditure mix has a bearing on the political economy equilibrium and, consequently, it matters to determine the maximum primary fiscal balance that is politically feasible.

The demographic transition is the second factor that matters to the link between intertemporal constraints and the fiscal redistribution structure. Unexpected, undesired redistributions of wealth across generations may occur when fiscal redistributions – especially those implemented through the social security system – do not properly consider the constraints posed by the demographic transition. One main reason explaining this is that, as the demographic transition evolves and the weight of each cohort in the population changes, the overall tax/expenditure mix also changes because such mix differs from one cohort to another. This induces endogenous changes over time, first, in the fiscal redistribution structure and, second, in the size of the primary fiscal balance, modifying the available fiscal space.

When the fiscal redistribution structure does not take demographic changes into account and, as a consequence, has a bias in favor of the current cohorts, market participants may foresee potential debt-sustainability problems because of the difficulty of garnering political support for reforms that favor future generations to the detriment of the current ones. Consequently, the observed primary fiscal balance may tend to fall systematically lower than the one that is consistent with a sustainable public debt. This means that the fiscal space becomes partially determined by the stages of the demographic transition. Although that issue goes beyond this paper, it is important to consider that demography can also change the upper debt limit and change the availability of fiscal space because of endogenous changes in the size and composition of private portfolios. For example, as aging approaches, the demand for financial instruments to allocate savings tends to increase.

In sum, we can say that a government has sufficient flexibility – or fiscal space – if it is able to run a primary surplus that is higher than the one required to ensure debt sustainability while maintaining a structure of fiscal redistributions that is consistent with its distributional goals. In assessing the degree of flexibility, it is crucial to take into

account the endogenous changes in fiscal redistributions induced by the demographic transition.

The main purpose of this paper is to investigate empirically the links between fiscal space, fiscal redistributions, and distributional outcomes for the case of Latin America. We highlight two factors. The first is the intertemporal dimension. It plays an essential role because, on the one hand, the definition of fiscal space introduces debt sustainability into the analysis. On the other, we take into consideration the demographic transition's influence on the fiscal redistribution structure. The second factor is the structure of fiscal redistributions, which is essential to evaluate the distributional effects of the intertemporal dimension of fiscal policies.

In the empirical work, we define fiscal flexibility following the fiscal space approach. To this end we state an exogenous debt to GDP limit and define the fiscal space as the difference between the primary fiscal balance/GDP ratio that is intertemporally consistent with such limit and the "observed" primary fiscal balance/GDP ratio. By "observed" we mean either the actual balance or the one that results from a simulation exercise. We will explore how the changes in the primary fiscal balance, the structure of fiscal redistributions, and the demographic transition influence government flexibility and impinge on income distribution as measured by the Gini coefficient.

To establish the links between the primary fiscal balance, the mix of taxes and expenditures that make up the fiscal distribution structure, and the effects of the demographic transition we will use the methodology presented in Fanelli (2018), which is designed to take advantage of the information provided by two relatively new sources of data developed by the CEQ Institute on fiscal redistributions and the NTA Project on the economic effects of the demographic transition. For fiscal data we use the IMF and ECLAC databases. We will work with a sample of 16 Latin American countries, which were chosen for the availability of the data.

The rest of the paper is as follows. Section 2 defines the structure of fiscal redistributions and explores their relationship with income distribution in a set of Latin American countries. The main objective is to study the data provided by the CEQ database from a macroeconomic perspective that seeks to assess the empirical relevance of the issues that we raised previously and identify a set of stylized facts. Section 3 analyzes fiscal flexibility, discusses its linkages with the fiscal redistribution structure and performs simulations to evaluate the impact of shocks and adjustment patterns on the fiscal space and the Gini coefficient. Section 4 examines long-term fiscal pressures via the changes in the population structure and its effects on the fiscal primary balance, fiscal sustainability, and income distribution. Section 5 concludes.

2. Fiscal policy and redistribution outcomes

In this section, we first present a framework showing the relationship between the taxes and expenditures that make up the fiscal redistribution structure and the primary fiscal balance and, then, apply the framework to the case of 16 Latin American countries. We study the composition of the fiscal redistribution structures and the relevance in terms of the GDP and of the Gini coefficient.

Fiscal redistribution, primary balance, and fiscal space

In what follows all variables are defined as ratios to GDP. We represent such ratios with Greek letters. The indicator of *aggregate fiscal redistributions* (η_t^d) that is presented in Fanelli (2018) is based on the CEQ approach (see Lustig, 2017; Lustig et al., 2014) and, consequently, it is defined as the difference between aggregate market income (γ_t^M) and aggregate final income (γ_t^F) in period "t".

$$\eta_t^D = \gamma_t^F - \gamma_t^M \tag{1}$$

Market income is the sum of market labor income (γ_t^L) and the market income stemming from previously accumulated assets (γ_t^A) before taxes. Income from assets includes private transfers such as private pensions and remittances. Hence, market income can be written as:

$$\gamma_t^M = \gamma_t^L + \gamma_t^A \tag{2}$$

Final income is calculated by adding the set of fiscal redistribution items as defined by Lustig (2017) to γ_t^M. Concerning the expenditure items, we add contributory pension transfers (ψ_t^A), other monetary transfers (ψ_t^O), indirect subsidies (ψ_t^I) to energy, food and other general targeted subsidies, and expenditures in kind related to education (ψ_t^E) and health (ψ_t^H). For presentation purposes and owing to data limitations, in some cases we will define $\psi_t^{OT} = \psi_t^O + \psi_t^I$. On the tax side, we subtract employee contributions to social security (τ_t^A), personal taxes (τ_t^Y), fees (τ_t^F), and indirect taxes (τ_t^I). We thus obtain:

$$\gamma_t^F = \gamma_t^L + \gamma_t^A + \psi_t^A + \psi_t^O + \psi_t^I + \psi_t^E + \psi_t^H - \tau_t^A - \tau_t^Y - \tau_t^F - \tau_t^I \tag{3}$$

The *fiscal redistribution structure* can therefore be expressed as:

$$\eta_t^D = \psi_t^O + \psi_t^A + \psi_t^I + \psi_t^E + \psi_t^H - \tau_t^A - \tau_t^Y - \tau_t^I - \tau_t^F \tag{4}$$

If $\eta^D < 0$, it means that fiscal interventions contribute to easing the budgetary constraint and, to the contrary, a positive figure indicates that the financing of the redistribution structure requires funds that will be obtained by running a surplus in the remaining budget items and/or increasing indebtedness. The rest of the elements that make up the

primary fiscal balance are government investment (ι_t^G), the revenues from government-owned non-financial assets (ε_t^G), and a variety of miscellaneous items related with government revenues (τ_t^R) and the provision of public goods (ψ_t^R). For the sake of convenience, we define: $\eta_t^R = \psi_t^R - \tau_t^R$. The primary fiscal deficit (θ_t^{GP}) can, then, be defined as:

$$\theta_t^{GP} = \eta_t^D + \eta_t^R + \iota_t^G - \varepsilon_t^G \tag{5}$$

Note that the decisions concerning η_t^D directly influence the primary deficit. This deficit is a central determinant of debt sustainability to the extent that it equals the government's net borrowing, excluding interest payments on consolidated government liabilities. But, of course, to determine the impact on distribution it is necessary to identify the value of η_t^D corresponding to each relevant stratum. If *d* stands for the stratum under consideration and the total number of strata is $\bar{d}$, we can write:

$$\eta_t^D = \sum_{d=1}^{\bar{d}} \eta_{d,t}^D = \theta_t^{GP} - \eta_t^R - \iota_t^G + \varepsilon_t^G \tag{6}$$

For fiscal redistributions to have a significant impact on distribution, the tax burden and the portion of government expenditures that make up the $\eta_{d,t}^D$ corresponding to each stratum must differ substantially. With regard to $\eta_{d,t}^D$, the CEQ presents country-specific data for a base year. If we use a tilde for the ratio between government expenditures received by the stratum and total expenditures in the base year, *t=b* and do the same with taxes, we can write:

$$\eta_{d,t}^D = \tilde{\psi}_d^O\, \psi_t^O + \tilde{\psi}_d^A\, \psi_t^A + \tilde{\psi}_d^I\, \psi_t^I + \tilde{\psi}_d^E\, \psi_t^E + \tilde{\psi}_d^H\, \psi_t^H - \tilde{\tau}_d^A\, \tau_t^A - \tilde{\tau}_d^Y\, \tau_t^Y - \tilde{\tau}_d^I\, \tau_t^I - \tilde{\tau}_d^F\, \tau_t^F \tag{7}$$

We will use this equation to evaluate the distributional impact of the fiscal redistribution structure. To distribute among the strata the amounts corresponding to each of the tax and expenditure items observed in the period under consideration, we will use the base-year coefficients corresponding to the *d* strata. Based on this, we can estimate approximately the simultaneous effects of shocks – for example, terms of trade shocks – on the fiscal space and income distribution.

As in Lustig (2017), we will also use an alternative definition of fiscal redistributions according to which the contributions to social security are forced savings rather than a tax and, consequently, pension payments are considered to be the perception of deferred income rather than government transfers. In this case equation (4) becomes:

$$n_t^{D\prime} = \psi_t^O + \psi_t^I + \psi_t^E + \psi_t^H - \tau_t^Y - \tau_t^I - \tau_t^F = \eta_t^D + \tau_t^A - \psi_t^A \tag{8}$$

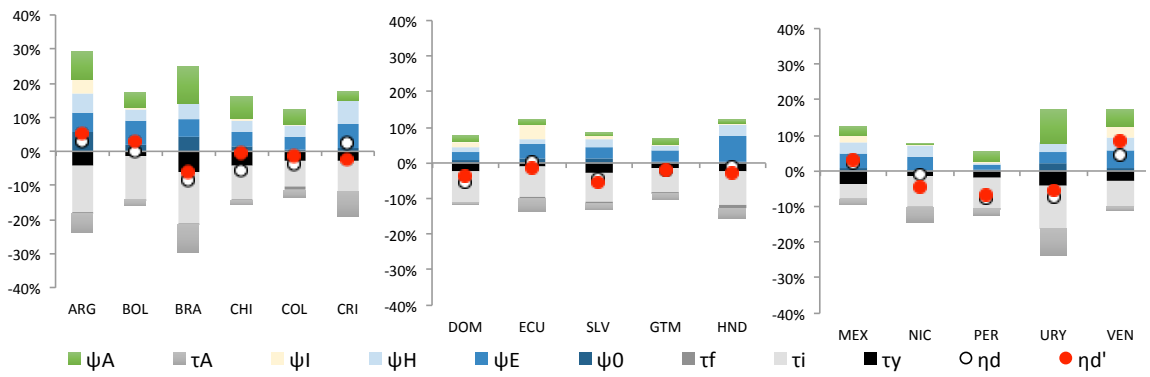
The size of fiscal redistributions under the assumption of deferred income may greatly differ from the effects under standard assumptions. The difference depends on the value

of $\tau_t^A - \psi_t^A$, but the redistributive impact, nonetheless, also depends on the distribution of ψ_t^A and τ_t^A among income strata (see Fanelli, 2018).

The structure of fiscal redistribution in 16 Latin American Countries

We will now use the framework to analyze the data on the structure of fiscal redistributions provided by the CEQ database.[4] Figure 1 presents the level and composition of fiscal redistributions as a percentage of GDP (that is, the right-hand side items of equations 4 and 7) for the countries under analysis.

Figure 1
Fiscal redistributions in Latin America, c. 2010(1)
(% GDP)



Source: Own elaboration based on data
Note: (1) ARG: 2012, BOL: 2009, BRA: 2009, CHI: 2013, COL: 2010, CRI: 2012, DOM: 2013, ECU: 2011, SLV: 2011, GTM: 2011, HND: 2011, MEX: 2010, NIC. 2009, PER: 2009, URY: 2009, VEN: 2013.

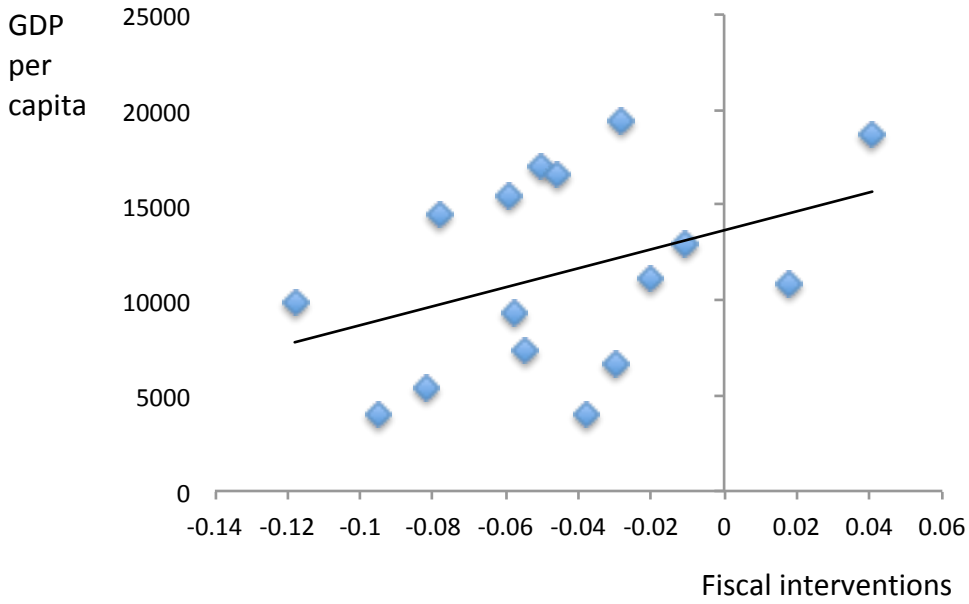
From the figure it follows that n^D is negative, as a rule. Only Argentina and Colombia show a positive value. This means that the structure of fiscal redistributions tends to make a positive contribution to the primary balance according to the SEQ sample.[5] The distributional impact, nonetheless, is largely independent of the value of η_t^D because a given value of this variable is compatible with different structures of taxes and expenditures. Poorer countries tend to show a negative n^D, as we can see in Figure 2 below, although the correlation is low. This probably reflects the fact that expanding the fiscal space is more difficult for poorer countries not only because of the obstacles to increase the tax burden but also for the difficulties to access credit markets, which limit

[4] Note that the CEQ data concerning the structure of fiscal interventions do not coincide with the aggregate data provided by the IMF and ECLAC databases on taxes and expenditures. The difference occurs because CEQ data are based on household surveys. In light of this, we have checked the stylized facts that we discuss in this section using the FMI and ECLAC data and find no substantial differences. We comment on any relevant difference. Consider that the main goal of this part of the paper is to examine the characteristics of the CEQ data. When we perform macroeconomic simulations using CEQ base-year coefficients to distribute taxes and expenditures among strata –deciles – we utilize IMF and ECLAC aggregate fiscal data.

[5] If we used FMI and ECLAC data, in 10 out of 16 economies, the structure of fiscal redistribution would make a positive contribution to the primary balance, although the contribution is small in some cases.

their ability to run a primary deficit and sustain a larger negative n^D. This suggests that poorer countries will have less ability to implement redistributive policies and to soften the effects of negative shocks while simultaneously sustaining the existing structure of fiscal redistribution. In the case of the set of natural resource-rich countries, which are the richer ones in the sample, the revenues originating in such resources make it easier to finance fiscal redistributions.

Figure 2
Fiscal Redistributions and Per Capita GDP (PPP), c. 2010
(% GDP)



Source: Own elaboration based on CEQ and World Bank data.

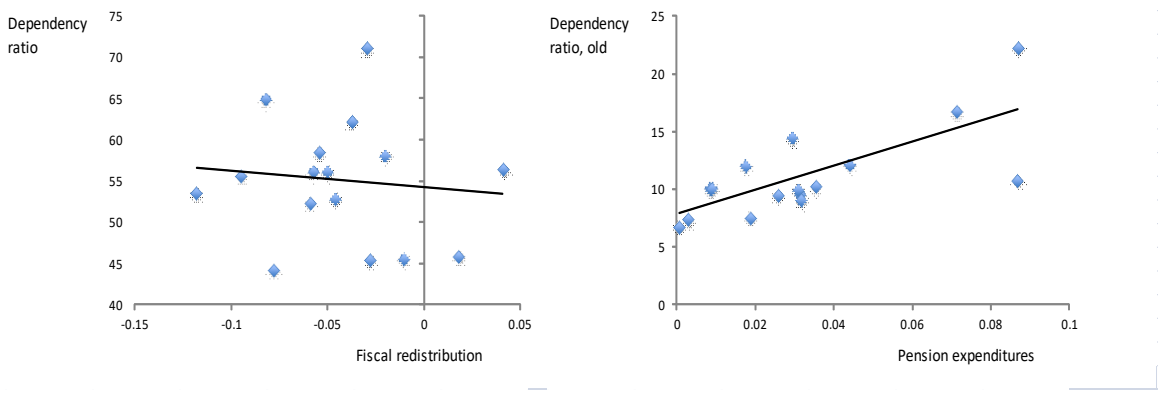
In the economies of the sample indirect taxes account for the largest part of fiscal revenues and, therefore, they finance a good portion of government expenditures. In some countries, increases in indirect taxes have small, and even progressive, regressive effects but the negative consequences for the poor may still be damaging (see Lustig, 2017). Direct taxes, on the other hand, are generally less significant and in all cases much more progressive. On average, indirect tax revenues more than double the revenues from direct taxes.

What about the fiscal redistribution structure from the perspective of the demographic transition in Latin America? A first point to highlight in the CEQ sample is the absence of sizable differences between fiscal redistributions measured in terms of n^D and $n^{D\prime}$ (see Figure 1). Nevertheless, in those societies that are undergoing the "bonus" stage of the demographic transition and must prepare for the aging stage – the case of all richer and larger Latin American economies – it is important to monitor closely the future evolution of the social security system deficit $(\psi^A - \tau^A)$. According to the data, 9 out of 16

countries show a deficit in the social security system ($t^A - g^A < 0$). In addition, some countries, for example, Argentina and Uruguay, spend a significant amount on non-contributory pensions (see Lustig and Pessino, 2013). The consequences can be highly undesirable if the deficit of the social security system is financed by indirect taxes that may have a marked incidence on the poor's budget. In addition, as we will see in the next section, the redistributive effects of the social security system – in terms of the Gini coefficient – can differ substantially from one country to another, depending on the joint incidence of ψ_t^A and τ_t^A on each stratum.

A point that is highly relevant to our analysis of the role of demography in Section 4 is that contributory pensions are an important part of government transfers in various countries, particularly in the cases of Argentina, Brazil, and Uruguay.[6] The next two figures show the relationship between the dependency ratio, fiscal redistribution, and expenditures on contributory pensions.

Figure 3
Fiscal redistributions and dependency ratios (total and old) in Latin America, c. 2010



Source: Own elaboration based on CEQ and World Bank data.

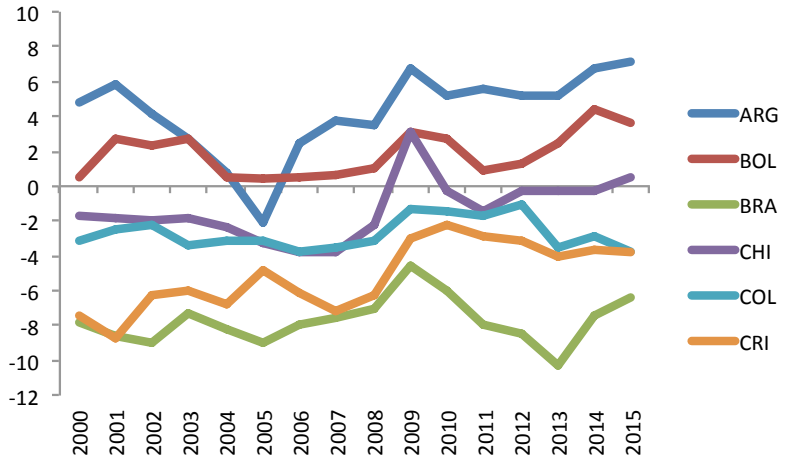
As can be seen, the relationship between fiscal redistribution and the dependency ratio shows no defined pattern, but the relationship between aging and pension expenditures is much clearer: the higher the old dependency ratio is, the higher pension expenditures are. One point should be highlighted – the countries that show a high level of expenditures on pensions are still undergoing the "bonus" stage of the demographic transition, which precedes the aging period. Therefore, the CEQ sample suggests that a problem of "premature" spending on social security may be present in Latin America. Pension transfers can displace other social expenditures that are of critical importance at the "bonus" stage when the economy has to invest in human capital. Furthermore, we will see that the social security system can have deleterious effects on income distribution

[6] This is not surprising because these countries' per capita GDP is high in terms of our sample. We found a high correlation between development and pension expenditures (0.74) in the case of the IMF-ECLAC data.

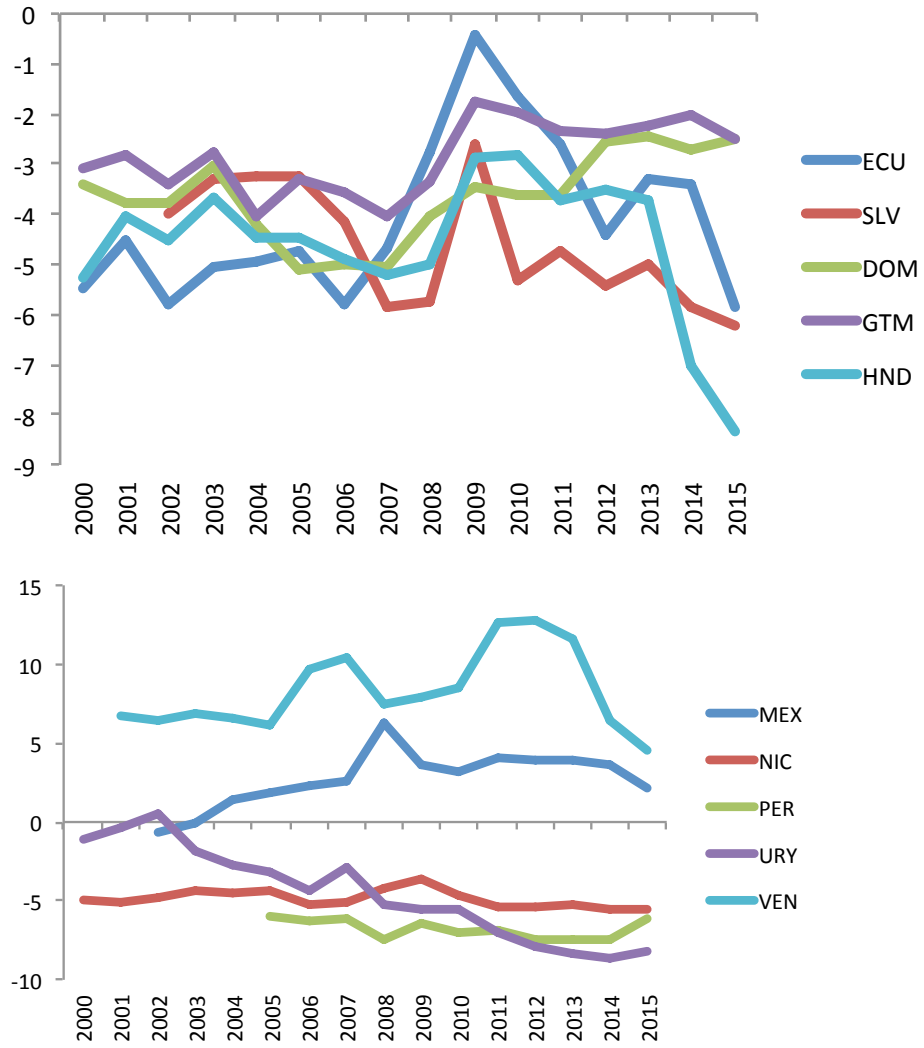
if pension transfers tend to favor the richer strata and the social security system runs a deficit, as seems to be the case in Brazil (as is explained in Higgins and Pereira, 2013). In fact, a bad combination will occur if fiscal redistributions and expenditures are low – as is the case in poorer countries – and the dependency ratio is high because the country is demographically young. Low government expenditures usually mean low investment in the younger generations' human capital, as well as low investment in infrastructure, which weakens productivity growth.

The CEQ database only provides the base year observation of η_t^D. Consequently, in what follows we will use data from the IMF's Government Finance Statistics database and the ECLAC database to examine the evolution of η_t^D over time. Since the ability to sustain a given fiscal redistribution structure is not independent of the macroeconomic situation and, additionally, the mix of taxes and expenditures that make up such structure is influenced by political economy factors, it is natural to expect the macroeconomic relevance of η_t^D to vary across time. The following figure shows the year-on-year evolution of η_t^D from 2000 to 2015[7].

Figure 4
Evolution of fiscal redistribution (% of GDP): 2000-2015



[7] Note that the CEQ estimates for aggregate fiscal redistribution as a share of GDP may differ from those estimated by the IMF and national account.



Source: Own elaboration based on IMF and ECLAC data

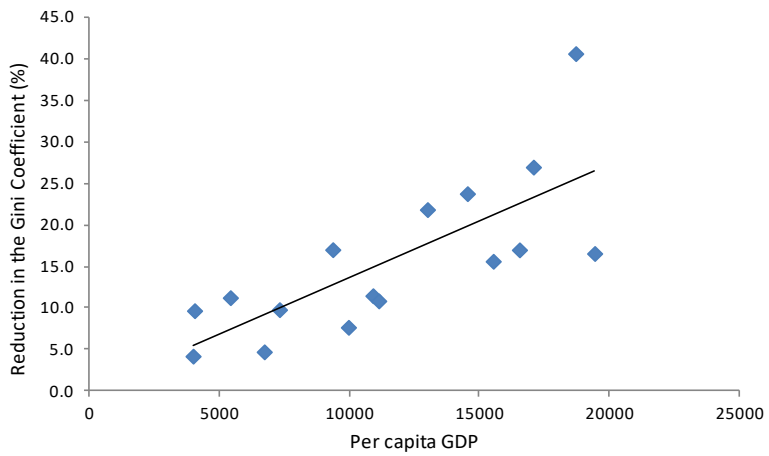
From the figure it follows that, in fact, the value of n_t^D is rather volatile in many of the countries under analysis and that the range of variation can be of various percentage points of GDP. A better understanding of why n_t^D is volatile or why it is more stable in some countries than in others could greatly help to improve the sustainability of distribution policies. One aspect that complicates the matter, nonetheless, is that n_t^D may change for different reasons. For example, as we will discuss later, n_t^D can change endogenously because of the demographic transition. Likewise, a change in the n_t^D ratio might be the result of initiatives that are not motivated by redistribution goals, such as expenditure cuts or tax increases aimed at reducing the deficit after the occurrence of a negative shock. But, beyond this, n_t^D can also change as a consequence of the implementation of new redistribution initiatives. And, indeed, in the case of Latin America, a positive shock often induces the implementation of redistributive policies, as was the case in the resource-rich countries during the commodity super-cycle. If the change in the fiscal redistribution structure is permanent and the shock is transitory, the

authorities will probably have to launch a fiscal adjustment. Our approach, which assesses debt sustainability and fiscal redistributions simultaneously, may help to avoid or to manage this kind of dynamics. Nevertheless, in any case, in-depth knowledge of the sources of shocks and the determinants of fiscal redistribution initiatives calls for detailed case studies that go beyond the goals of this study.

Fiscal redistribution and distributive impact

We can evaluate the distributional impact of the structure of fiscal redistribution in greater detail using the CEQ data. In all the countries under analysis, the existing structure of redistribution improves the Gini coefficient, which is good news given the inequality that is observed in terms of the market income. However, the magnitude of the reduction differs substantially among the economies in the sample. The maximum impact of the structure of redistribution is observed in Argentina and the minimum in Honduras. The effect observed in the first case is ten times higher. More generally, there is an association between the per capita GDP and the size of the redistribution (see Figure 5). The correlation coefficient in our sample is 0.7.

Figure 5
Fiscal Redistribution and GDP Per Capita (PPP), c. 2010
(Contributory pensions as current transfers)

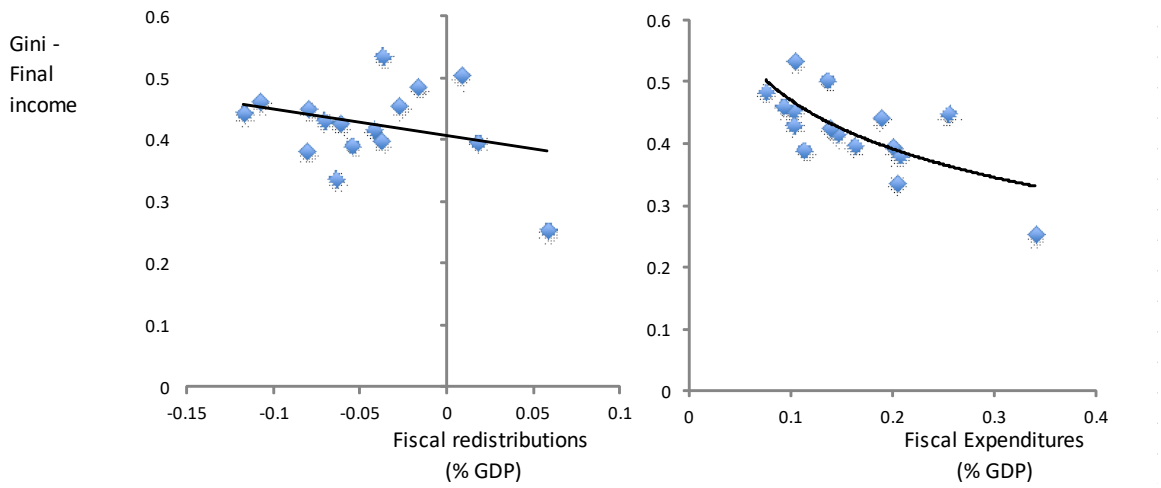


Source: Own elaboration based on CEQ and World Bank data.

The relationship between η^D and the improvement in the Gini coefficient is much weaker than the relationship between this last variable and expenditures. In the sample under consideration, the correlation coefficient is 0.25 in the first case and 0.88 in the second. Something similar can be found in the special case of contributory pensions as deferred income (0.20 and 0.82, respectively). In line with these facts, Figure 6b indicates that those countries that spend more as a percentage of GDP obtain better income

distribution results as measured by the Gini coefficient corresponding to the final income. The association is weaker in the case of fiscal redistributions, as Figure 6a shows.

Figure 6
Income inequality and fiscal redistributions



Source: Own elaboration based on CEQ and World Bank data.

The evidence, then, reveals two facts. First, those countries that have a higher per capita income and that can spend more are in a better position to improve equity and combat poverty. Second, many of the countries that managed to increase the expenditure component of fiscal redistributions have also managed to increase tax collection. This follows from the fact that there is no high correlation between η^D and the redistributive impact. Of course, if the ability to match expenditures and tax collection were largely a consequence of the beneficial effects of the commodity super-cycle, we would observe a reduction in the fiscal space as the boom faded and/or a weakening in the positive distribution outcomes that have been observed in the region. In any case, we have shown that η_t^D has a degree of volatility that is macroeconomically significant.

Table 1 shows the results of simulating the relationship between the fiscal balance and n_t^D under different periods. For the simulations we draw on the observed changes in fiscal redistributions and the fiscal primary balance over two periods – 2005-2010 and 2010-2015 – using the results shown in Figure 4 and the corresponding data on the taxes and expenditures. We employ the CEQ base-year coefficients (the set of $\tilde{\psi}$ and $\tilde{\tau}$ in equation 7) to allocate taxes and expenditures to the different strata. Based on this we calculated the final income of each strata (deciles) and the distributive impact as measured by the Gini coefficient. To isolate the effects of fiscal redistributions we kept market income inequality constant in the simulations. It goes without saying that the main purpose of these exercises is not to make a precise assessment of the actual evolution of income distribution but to illustrate the empirical relevance of one of the points that we

have raised: fiscal flexibility, debt sustainability, and distributional impacts should be analyzed jointly.

Table 1
Fiscal Redistributions, Primary Fiscal Surplus and Simulated Gini Coefficient

	2005-2010 Change (% of GDP, except Gini) in…				2010-2015 Change (% of GDP, except Gini) in…			
	Gini	Nd	Primary balance	Expenditures	Gini	Nd	Primary balance	Expenditures
ARG	-0.037	2.6	-3.0	7.4	-0.051	1.5	-4.1	6.5
BOL	-0.006	2.0	1.1	0.4	-0.009	-0.8	-5.0	2.5
BRA	-0.007	2.4	-1.1	1.9	-0.004	-0.2	-4.2	2.2
CHI	-0.010	2.7	-5.4	2.4	-0.005	0.7	-1.6	1.1
COL	0.003	0.0	-1.5	-0.2	-0.001	-3.2	0.9	-1.1
CRI	-0.017	2.3	-4.9	3.7	-0.001	-1.5	0.0	0.3
DOM	-0.005	1.7	-1.7	0.7	-0.017	1.3	3.3	2.1
ECU	-0.026	2.4	-2.4	5.9	-0.006	-4.0	-3.1	0.4
SLV	0.001	-1.6	-1.5	-0.4	-0.008	-0.9	1.7	0.8
GTM	-0.006	2.1	-1.5	1.2	0.004	-0.4	1.9	-0.8
HND	-0.005	1.3	-2.9	1.5	0.015	-5.5	4.1	-2.7
MEX	-0.008	1.4	-1.9	1.5	-0.005	-1.0	0.3	0.9
NIC	0.003	-0.7	0.3	0.3	-0.001	-1.4	-1.3	0.7
PER	0.006	-1.4	0.0	-1.2	-0.002	0.5	-2.5	0.8
URY	-0.013	-2.4	-1.1	1.7	0.010	-2.6	-1.5	-1.1
VEN	-0.006	4.0	-14.5	2.9	-0.021	-4.9	-8.6	3.8

Source: Own elaboration based on CEQ and IMF data

Beyond the particularities of the relationship between the tax and expenditure components of fiscal redistributions in each of the economies under study, Table 1 reveals a key stylized fact – changes in fiscal redistributions are quantitatively important. The changes in the components of the structure of fiscal redistribution and in the level of n^D may be of various percentage points of GDP and, therefore, can potentially affect the fiscal space. Nonetheless, empirically, the relationship is not simple. During the first period under consideration, five countries achieved a reduction of more than one point in the Gini coefficient and all of them experienced a significant worsening in the primary balance and an increment in n^D (with one exception in this latter case). In the second period, three countries experienced more than one-point improvement in the Gini coefficient and while two showed a worsening in the fiscal balance and an increase in n^D, one experienced a substantial improvement. For the sample as a whole, there is a low correlation between changes in the Gini Coefficient and the fiscal balance while the correlation with n^D is higher (0.58). In this regard, we should add that those countries in which the Gini coefficient worsened registered $\Delta n^D < 0$, suggesting that progressive distributional policies tended to be crowded out by other fiscal needs, especially in the cases in which expenditures fell.

The evidence in Table 1 confirms the importance of public expenditures in accounting for changes in the Gini coefficient. With the exception of one country, expenditures fell in all of the countries showing regressive redistributions, according to our simulations. On the

other hand, in the two periods without exception, expenditures augmented, and substantially in some cases, in all those countries where the Gini coefficient fell. The case of Argentina is striking. Together with a sizable improvement in the Gini coefficient over the period 2005-2015, there was an increase in expenditures of almost 15 percentage points of GDP, which in this case certainly affected the primary balance, although the degree of flexibility was favored by the fact that the debt/GDP ratio was low. There is a high correlation between changes in government expenditures and changes in income distribution. In this sample it is more than 0.9 in both periods.

The upward movements in the tax component of n^D are also important. These movements are especially marked in the period 2010-15. In both periods, all the economies showing more than a one-point improvement in the Gini coefficient experienced an increment in taxes (with the exception of Chile in 2005-10, when they remained constant). This suggests that the redistribution initiatives are bolder when the authorities perceive that it is possible to expand the fiscal space by increasing the tax burden. In those cases in which the change in the Gini coefficient was more modest, the picture is more diffuse.

3. Fiscal redistributions and debt sustainability

In this section we introduce an upper limit for the public debt/income ratio to define an indicator of fiscal flexibility and evaluate empirically its links to the fiscal redistribution structure and distributional outcomes.

An indicator of fiscal space

If *g* and *r*, respectively, stand for the constant rates of growth of *GDP* and the interest rate on public debt and we define $\frac{1+r}{1+g} = 1 + \lambda$, we can express the recursive equation governing the dynamics of the public debt to market income ratio as:

$$b_t = (1+\lambda)b_{t-1} + \eta_t^D + \eta_t^R + \iota_t^G - \varepsilon_t^g \tag{9}$$

The solution to this equation in present value terms is:

$$(1+\lambda)^{-N} b_N = b_0 + \sum_{t=1}^{N} (1+\lambda)^{-t} (\eta_t^D + \eta_t^R + \iota_t^G - \varepsilon_t^G) \tag{10}$$

This is the intertemporal version of the government's budget constraint. This expression shows that future policies that impinge on the allocation of resources between n_t^D, n_t^R, and ι_t^G over time, together with the returns from state-owned assets, ε_t^G, will have a bearing on the trajectory of the debt/market income ratio. It also shows that the interest-rate-growth differential λ, which we call the "effective" interest rate, helps determine the path of the public debt. In the simulations we assume that these two

variables are either constant at 2% and 4%, respectively, for all the countries in the sample, or that they equal the average country-specific values, depending on the purpose of the exercise (on effective interest rates see Escolano, 2010).

For the level of public indebtedness to be sustainable, it is necessary to impose the No-Ponzi-Game condition ($\lim_{N\to\infty}(1+\lambda)^{-N}\, b_N = 0$); under this condition, the present value of the surpluses that the government plans to run in the future must be equal to the value of the current stock of debt:

$$b_0 \;= \sum_{t=1}^{\infty}(1+\lambda)^{-t}\,(\varepsilon_t^G - \eta_t^R - \iota_t^G - \eta_t^D) \qquad (11)$$

In order to meet this constraint, if the government were to implement a fiscal rule to maintain the ratio between the primary deficit and market income constant, the primary deficit would have to be:

$$\theta^{PG^*} = -\lambda b_0 \qquad (12)$$

because $\sum_{t=1}^{\infty}(1+\lambda)^{-t} = \frac{1}{\lambda}$. Under these conditions, at each point in time, the structure of fiscal redistributions that is consistent with the intertemporal budget constraint is:

$$\eta_t^{D^*} = \varepsilon_t^G - \eta_t^R - \iota_t^G - \lambda\, b_0 \qquad (13)$$

At each point in time θ^{PG^*} can differ from θ^{PG}. Therefore, we can define the available fiscal space (χ_t) as:

$$\chi_t = \theta^{PG^*} - \theta_t^{PG} \qquad (14)$$

This means that the maximum flexibility to modify the fiscal redistribution structure is:

$$\chi_t = \eta_t^{D^*} - \eta_t^D$$

Of course, the authorities could set $b_t = b^*$ instead of $b_0 = b^*$ as the politically feasible ceiling for the debt/GDP ratio. In the simulations we assume a 60% debt/GDP ratio, which is common in the literature (see Fatás 2010) and matches the Maastricht Criteria for the European Monetary Union. For an emerging economy, nonetheless, the World Bank (2017) suggests a limit at 45% of GDP.

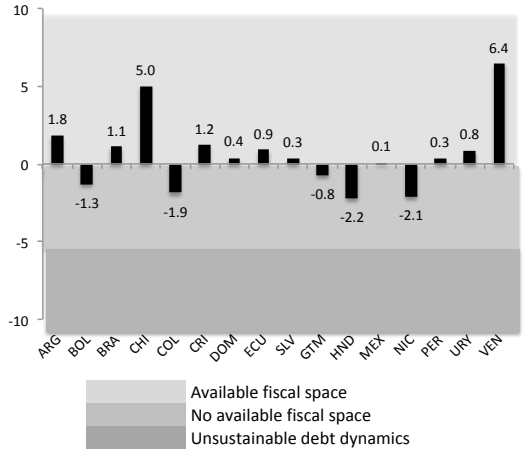
If $\chi_t < 0$, it means that either the cost of the existing structure of fiscal redistributions or some of the other items in the budget must be reduced because otherwise the government would violate the restriction of keeping the debt/GDP ratio at the desired level. Following IMF (2011), which uses an adjustment threshold of 5% of GDP, we distinguish three cases:

- *Fiscal space available:* $\chi_t \geq 0$, (high flexibility to implement η_t^D);
- *No available fiscal space:* $-5\% \leq \chi_t < 0$ (required adjustment below 5% of GDP);
- *Unsustainable debt burden:* $-5\% < \chi_t$ (required adjustment above 5% of GDP).

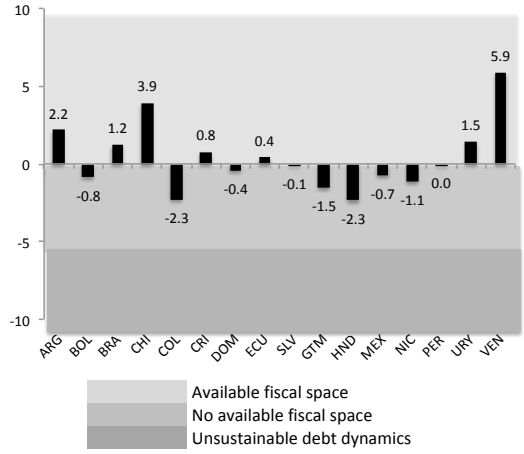
Figure 7 presents estimates of the available fiscal space for the countries in the sample for three points in time: 2005, 2010 and 2015. We begin by assuming an effective interest rate of 2% – similar to that observed in France, Germany, Italy and other countries in recent decades – and two debt ceilings: $b^* = b_0$ (figure a) and $b^* = 60\%$ of GDP (figure b).

Figure 7
Available Fiscal Space (% GDP)
2005

(a) With constant public debt, $b^* = b_0$

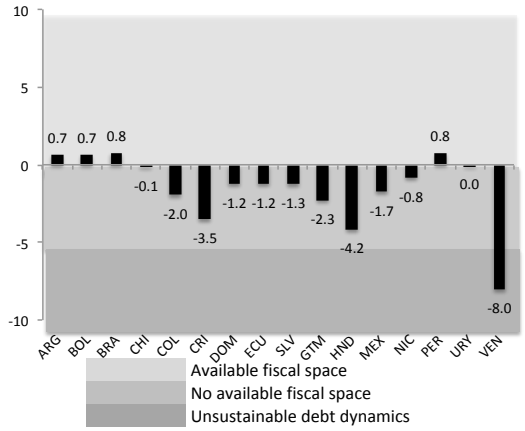


(b) With a public debt ceiling of 60% of GDP

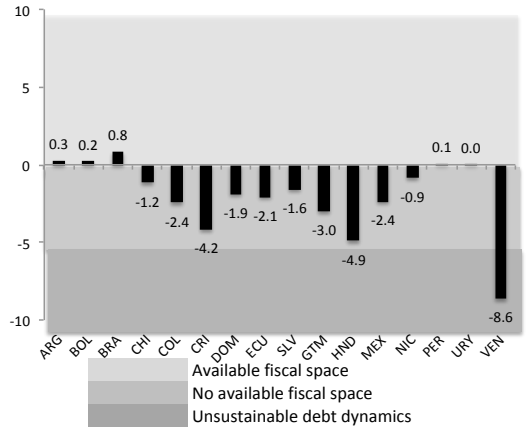


2010

(a) With constant public debt, $b^* = b_0$

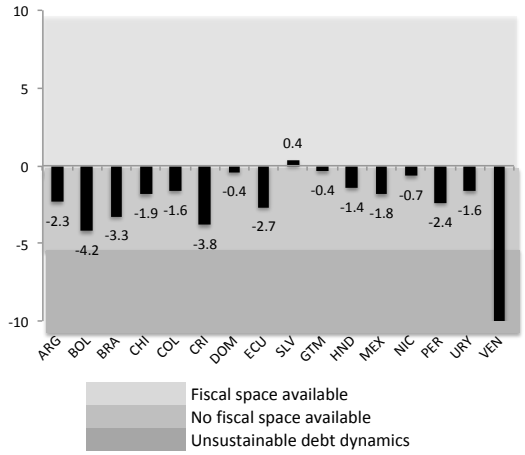


(b) With a public debt ceiling of 60% of GDP

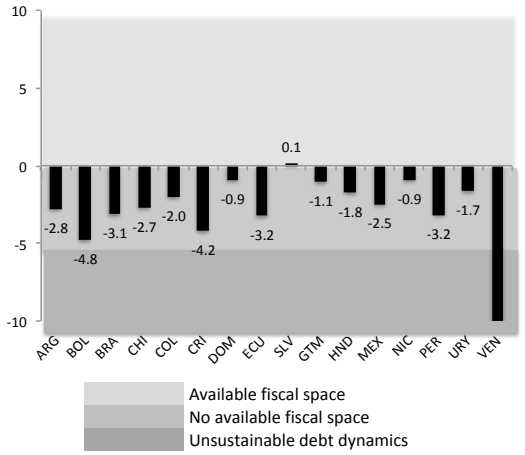


2015

(a) With constant public debt, $b^* = b_0$



(b) With a public debt ceiling of 60% of GDP

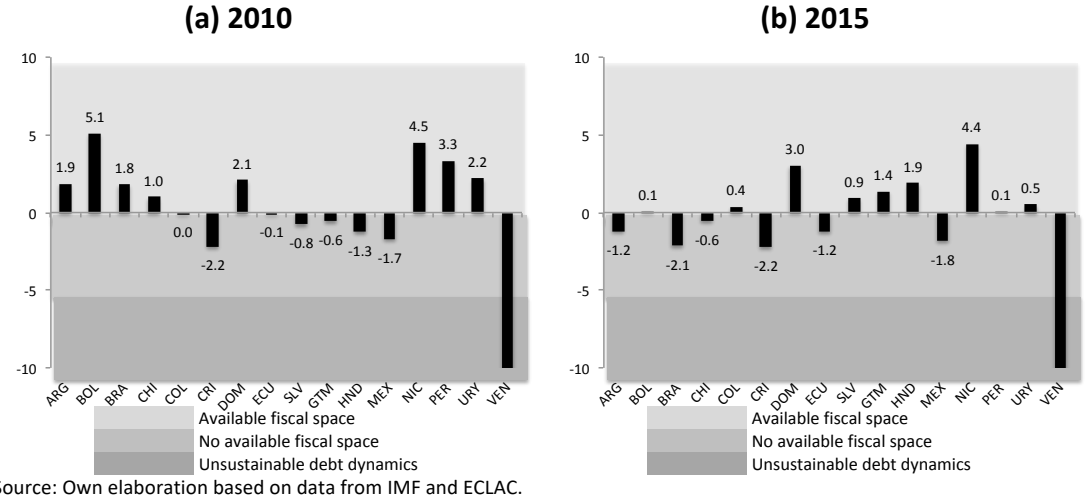


Source: Own elaboration based on data from IMF and ECLAC.

By 2015, the only indicator in the unsustainable region corresponds to Venezuela. The rest of the countries are in a better position although, on average, we can see a worsening in the degree of fiscal flexibility. The available fiscal space in 2005 was, on average, substantially higher than in 2015. Indeed, in 2015, only El Salvador shows some degree of flexibility. The result is basically the same independently of whether the fiscal balance required is calculated on the basis of a debt ceiling that equals the existing debt/GDP ratio or a 60% maximum.

How would these results change if we used country-specific effective interest rates in the simulations? In Figure 8 we address this question. We set *g* at the country-specific average for 2010-2015. For the interest rate, in turn, we calculate the 2010-2015 average of the ratio between the interests paid and the stock of public debt of the previous period. Figure 8 shows the evolution of the fiscal space between 2010 and 2015. We used *b*= 60%* of GDP.

Figure 8
Available Fiscal Space with country-specific r-g (% GDP)
(Public debt ceiling of 60% of GDP)



Source: Own elaboration based on data from IMF and ECLAC.

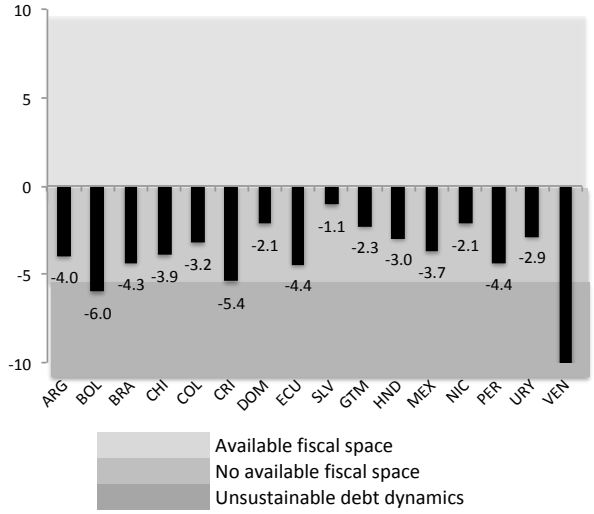
If we consider the average degree of fiscal flexibility in the region in 2010, the situation concerning flexibility is much better under such metric, as can be seen in Figure 8a. The fiscal space is much larger in 2010. However, the economies that show better debt-sustainability indicators are mostly those that are natural resource rich – with the striking exception of Venezuela. This may explain why important fiscal redistribution initiatives were launched in the first decade of the new century in many resource rich countries in the region. By 2015, nonetheless, the fiscal space shrank in a context of lower commodity prices. But, on the other hand, fiscal flexibility has improved in some Central American economies.

An important conclusion that follows from these simulations is that we should not take fiscal flexibility for granted. When macroeconomic or financial conditions vary as a consequence of a shock, the size of the fiscal space may also vary substantially, making it necessary to adjust taxes and/or expenditures that are probably associated with fiscal redistributions. Since the adjustment could be of several percentage points of GDP, it is reasonable to conjecture that the distributional impact of fiscal adjustments can be significant.

For an idea of the empirical relevance of the distributional impact of shocks, we will proceed as follows. First, we allocate prevailing taxes and expenditures corresponding to 2015 to each of the strata using the CEQ base-year coefficients (the set of $\tilde{\psi}$ and $\tilde{\tau}$ coefficients in equation 7) and, then, calculate the Gini coefficient. Second, we simulate three shocks to evaluate the changes in the available fiscal space: a deceleration in the growth rate of 2% (Figure 9); an increase in the interest rate of 1% (Figure 10); and a fall in natural resource rents to its minimum in the period 2000-2015 (Figure 11). Third, we

calculate the adjustment required in the primary balance to meet $\chi_t = 0$ and compare this to the maximum adjustment limit of 5% of GDP.

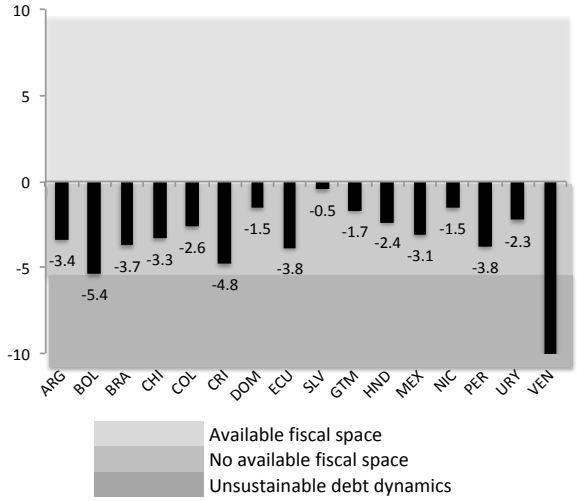
Figure 9
Lower growth rates: impact on the available fiscal space (% GDP), 2015 (1)



Source: Own elaboration based on data from IMF and ECLAC.
Note: growth deceleration of 2% and public debt ceiling of 60% of GDP

Low economic growth implies, ceteris paribus, a higher λ and therefore, it is necessary to increase the primary fiscal balance. In the absence of an adjustment, several countries in the region have no available fiscal space and at least two face unsustainable debt dynamics. The results in Figure 9 indicate that growth is a powerful tool to diminish fiscal risks.

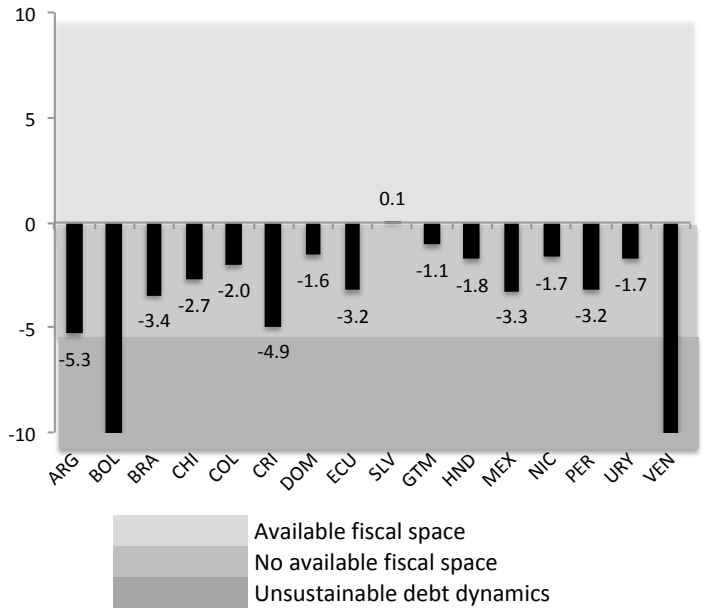
Figure 10
Higher interest rates: impact on the available fiscal space (% GDP), 2015



Source: Own elaboration based on data from IMF and ECLAC.
Note: a 1% increase in interest rates and public debt ceiling of 60% of GDP

A higher interest rate operates similarly to low growth, that is, through a higher λ. The outcome shown in Figure 10 is similar to the one observed in Figure 9 and indicates that financial conditions matter significantly to the availability of fiscal space. Venezuela, Bolivia and to a lesser extent Costa Rica are the most vulnerable cases. In the former two, a mild increase in the international interest rate may trigger a problem of debt sustainability

Figure 11
Lower rents scenario: impact on the fiscal space (% GDP)
2015 (Public debt ceiling of 60% of GDP)



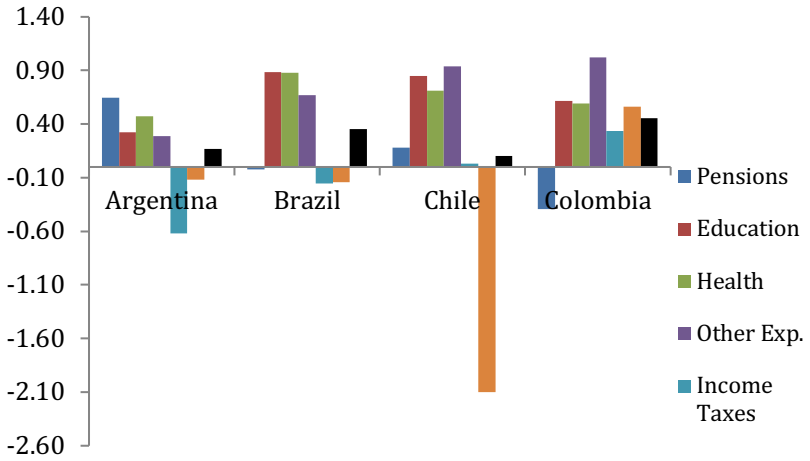
Source: Own elaboration based on data from IMF and ECLAC.

The volatility of commodity revenues is represented here by substituting the observed value of ε_t^G with its minimum value for the period 2000-2015. Although the outcome is similar in the sense that the fiscal space shrinks, Bolivia and Ecuador are much more affected, while Honduras and Nicaragua are less sensitive under these metrics (see Figure 11).

Bear in mind that the main purpose of these simulations is to show that shocks may significantly restrict fiscal flexibility and, hence, impact the government's ability to sustain a given fiscal redistribution structure. Looking at history, this seemed to be the case for Latin American countries. However, the exercise should not be interpreted as a description of the actual situation of the countries involved. For one thing, we have shown that the available fiscal space is larger when we take the actual rates of growth and interest into account. We use λ=2% for all countries in order to facilitate within sample comparisons.

How does a post-shock adjustment impact on distribution? Does the way in which the adjustment is implemented matter to the Gini coefficient? To evaluate these questions, we simulate how much the Gini coefficient would change were the bulk of the adjustment to fall on a single item of the fiscal redistribution structure, leaving the rest constant. Figure 12 shows the change in the Gini coefficient (multiplied by 100) per each one percentage point of GDP of fiscal adjustment. We only present the case of four countries from the sample that, given the standards of the region, present a developed fiscal redistribution structure.

Figure 12
Impact on the Gini coefficient of 1% of GDP adjustment
2015



Source: Own elaboration based on data from CEQ,

The figure indicates that there are marked cross-country differences concerning the impact on the Gini coefficient. Reducing expenditures on health and education always has a regressive effect, but it is higher in some countries than in others. There are some rather surprising results. In Argentina, the most regressive type of adjustment has to do with pension transfers and health expenditures. But in Brazil and Colombia, the effect of reducing pension transfers is progressive. The consequence of increasing taxes is, in general, progressive, but the results differ substantially from one country to another. In light of these differences, there is no one-size-fits-all when it comes to designing a fiscal adjustment.

4. Looking at the future: the sustainability of fiscal policy in aging societies

In this section we explore the role of the demographic transition in the evolution of the fiscal redistribution structure and its impacts on the aggregate fiscal redistribution. We first briefly discuss a number of stylized facts that have to do with the stage of the demographic transition that Latin America is going through. Second, we examine the

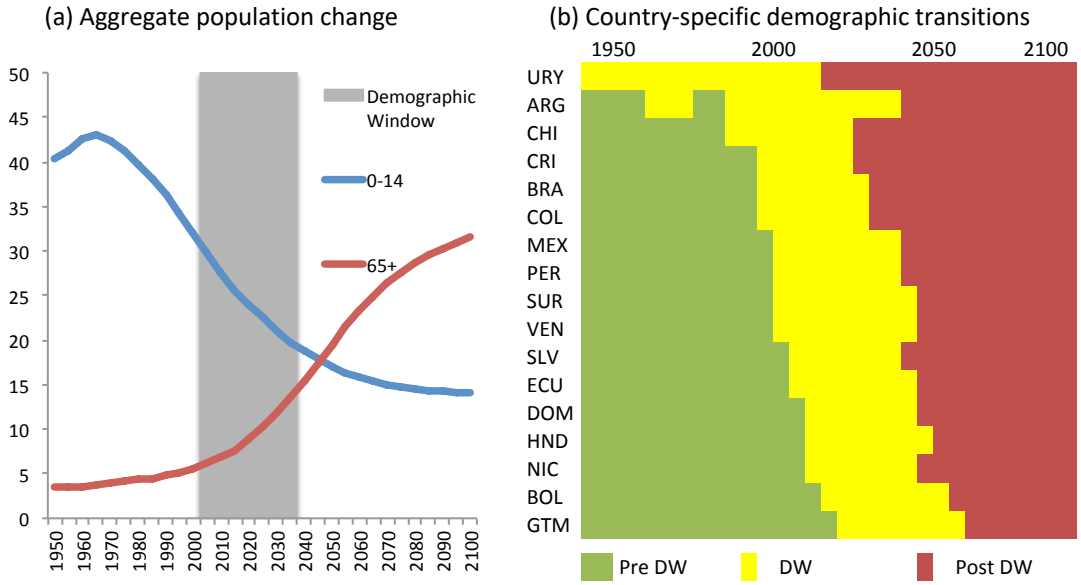
channels through which a changing population structure impacts on the size and components of the fiscal redistribution structures of a set of Latin American countries using information from the NTA and CEQ databases. Third, we analyze the way in which the demographic-driven changes in η_t^D affect the primary deficit and the availability of fiscal space. Finally, we examine the changes in the Gini coefficient that may occur as the demographic transition modifies the fiscal redistribution structure.

On the demographic transition in Latin America

According to the UN Population Division, in 2010 two out of three Latin Americans were adults aged 15 to 64 (United Nations, 2017). Latin America as a whole can be considered an "adult" region, younger than “old” Europe and older than “young” Africa. Thanks to their demographic structure, the richer and larger economies in the region – and in our sample – are enjoying the so-called "demographic window of opportunity" (DWO) stage of the demographic transition and will abandon the DWO mostly during the 2030s.[8] This is not only the case of Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela, but also of smaller Costa Rica and Uruguay. The poorer and smaller economies, on the other hand, are entering or preparing to enter the DWO (El Salvador and Ecuador are examples of the former, Bolivia and Guatemala of the latter). In any case, this means that in the next four decades the Latin American population structure will experience substantial shifts as the population gets older. As Figure 13a shows, the proportion of the elderly will increase substantially, accompanied by a continuous fall in the participation of the young. By 2050 the share of middle-aged adults is expected to remain roughly invariant but there will be one older adult for every child. The aging stage will come earlier in the older countries of the region (such as Uruguay, Chile or Costa Rica) while younger countries (like Honduras, El Salvador or Nicaragua) will still be experiencing the demographic dividend (Figure 13b).

[8] The UN Population Division has defined the DWO as the period in which the proportion of children and youths under 15 years falls below 30 percent and the proportion of people 65 years and older is still below 15 percent. Typically, the demographic window of opportunity lasts for 30–40 years depending upon the country. In our simulations we use the UN medium-variant projection of population growth and population structure.

Figure 13
Population structure in Latin America



Source: Own elaboration based on data from the UN Population Division

The literature on the effects of demography on growth has shown that the DWO is a crucial period because the proportion of prime workers (aged 25-54 years) in the population reaches a maximum and, as a consequence, it would be possible to increase per capita income even if productivity per worker remained the same (Lee and Mason 2006 and 2012; Bloom et al., 2015; Mason et al., 2017). This is the so-called "first growth dividend" that takes place during the DWO. There is also a "second growth dividend" originating in the fact that there is a rise in the proportion of "prime savers" to the extent that the prime workers exhibit the highest savings capacity hand-in-hand with the increase in the proportion of prime workers. This opens the way for faster capital accumulation and growth acceleration. The first dividend, nonetheless, will reverse as the DWO declines and the aging process deepens. This will be a more difficult period from the standpoint of growth because of the shrinking proportion of prime workers and the increasing number of retirees. However, the aging impact will be lower if real wages increase as a consequence of capital accumulation during the second dividend. In addition, as longevity steps up, workers may save more in anticipation of a longer retirement period and this can help capital accumulation. Note, nonetheless, that the literature on the "demographic dividends" associated with the DWO (Mason et al. (2017), emphasizes that such benefits are not automatic; the DWO merely expands the opportunities for growth acceleration-.

As Fanelli (2018) explains, the lifecycle deficit varies across cohorts and, as a consequence, the transformations that accompany the demographic transition induce changes at the aggregate level in the relationship between labor income and consumption, as well as in the propensity to save and the labor and asset-income shares in market income. These

changes, in turn, modify the structure of the demand for public transfers and public goods and the tax base.

These developments may change the value of η^D markedly as well as the fiscal redistribution structure. In effect, first, the increase in the proportion of prime workers, prime savers and, hence, growth opportunities during the DWO induces an expansion in the fiscal space. This is the consequence of the expansion in the tax base and in the demand for financial assets, which usually includes government securities. Second, the size and structure of the demand for transfers and public goods changes throughout the DWO. It is particularly important that the number of children in school peaks just before entering the DWO. The requirements of human capital accumulation during the DWO should be easier to finance given the parallel increase in government revenues associated with the first dividend. Afterwards, nonetheless, the importance of investing in human capital does not decrease, as it is essential to enhance labor productivity for the post-DWO aging period, when the proportion of prime workers in the population begins to fall and the dependency ratio begins to increase, reversing the first dividend. Third, during the aging period, after the closing of the DWO, Latin American economies will experience a continuous growth in the elderly demanding health services and pensions and the demands might be difficult to finance because of the weaker dynamics of tax collection. The costs of fiscal redistributions might exert a continuous pressure on the primary deficit. Under these circumstances, the fiscal space would be much more difficult to manage. The situation would be particularly complicated if the second growth dividend were not too large, employment rates were low, or informality were pervasive, as is the case in many Latin American economies. The intensity of the effects, nonetheless, will depend on institutional factors, such as the generosity and the coverage of the social security system.

In sum, these facts indicate that the fiscal authorities should take into account demographic factors in evaluating the probable evolution of the cost of financing the structure of redistributions and of the impact on income distribution of changes in that structure. In what follows, we will use the NTA, CEQ and IMF data to evaluate empirically the significance of these changes.

The impact of the demographic transition on the fiscal redistribution structure

In order to analyze empirically the channels through which the demographic transition influences the fiscal redistribution structure, it is necessary to introduce the concepts utilized by NTA. The NTA database presents data on "age profiles" for the "tax burden" (T_a) and for the "benefits received" (G_a); where a stands for cohort. The parameter τ_a is defined as the ratio of the per capita taxes paid by cohort a normalized by per capita income and ψ_a are the benefits (public goods and transfers) received by each cohort from the government normalized in the same way. We use the superscripts *A, Y, I, F,* and *R* with the same meaning as above. Hence, if $X_{a,t}$ is the total population of cohort a in year t, and y_t is the per capita income, for the base year b we can write:

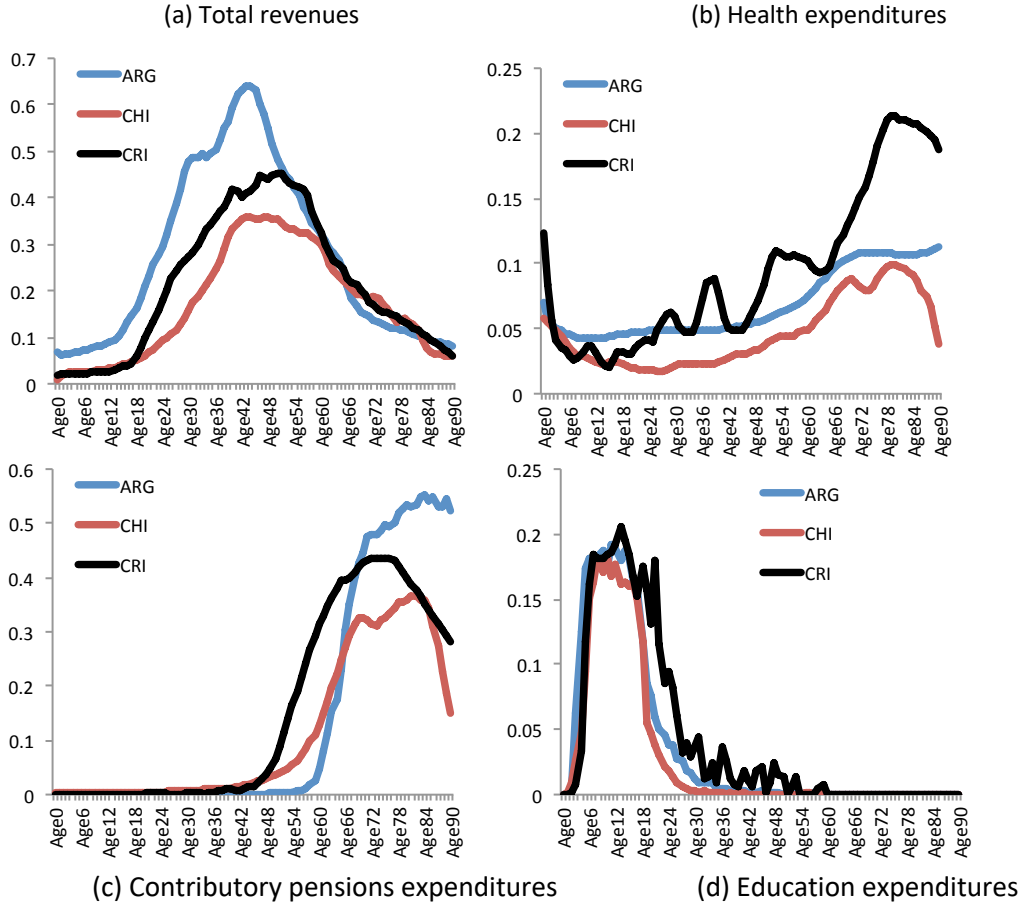
$$\tau_a = \frac{T^A_{a,b}+T^Y_{a,b}+T^I_{a,b}+T^F_{a,b}+T^R_{a,b}}{X_{a,b}y_b} \tag{15}$$

And, for the benefits received:

$$\psi_a = \frac{G^O_{a,b}+G^A_{a,b}+G^I_{a,b}+G^E_{a,b}+G^H_{a,b}+G^R_{a,b}}{X_{a,b}y_b} \tag{16}$$

Expressions (15) and (16) imply that demographic changes matter to the fiscal redistribution structure because each of the items that make up such structure is influenced by a specific per capita age profile and, thus, the fiscal redistribution structure changes endogenously as the population structure changes. Figure 15 shows the tax and benefit profiles for the cases of Argentina, Chile, and Costa Rica, using the NTA profiles.

Figure 14
Age profiles of the components of the fiscal redistribution structure(1)
(as a share of per capita income)



Source: Own elaboration based on data from NTA
Note: (1): ARG: 2012, CHI: 1997, CRI: 2004.

In light of our analytical goals, the following facts deserve mention. First, the top left-hand figure shows the tax profile. Fiscal revenues have a similar shape across countries in the sense that they have a bias towards middle-aged adults, who comprise the prime workers. Age-specific tax burdens across countries differ in levels, nonetheless, as a quick comparison between Argentina and Costa Rica reveals. In addition, the bias towards middle-aged adults as taxpayers is stronger in some countries (like Chile) than in others (like Argentina). Second, the age profiles corresponding to different types of public consumption show very different shapes. In particular, Figure 14c exhibits per capita fiscal expenditures in contributory pensions. As expected, this item of the fiscal redistributions has a bias towards the elderly. Yet again, there are important cross-country variations. Argentina shows the higher level of expenditures. Health expenditures, in turn, also present a pronounced bias in favor of the elderly. Finally, education benefits are concentrated in the younger cohorts, as was expected.

Simulations with fixed age profiles

From these facts it follows that the allocation of total expenditures will vary when the demographic structure changes and that the same will happen with the allocation of the tax burden. As a consequence, the value and sign of η_t^D are likely to vary. Likewise, if the allocation among deciles of different types of taxes and expenditures vary significantly – say, education vs. pension transfers – there will be modifications in the Gini coefficient calculated on the basis of final income.

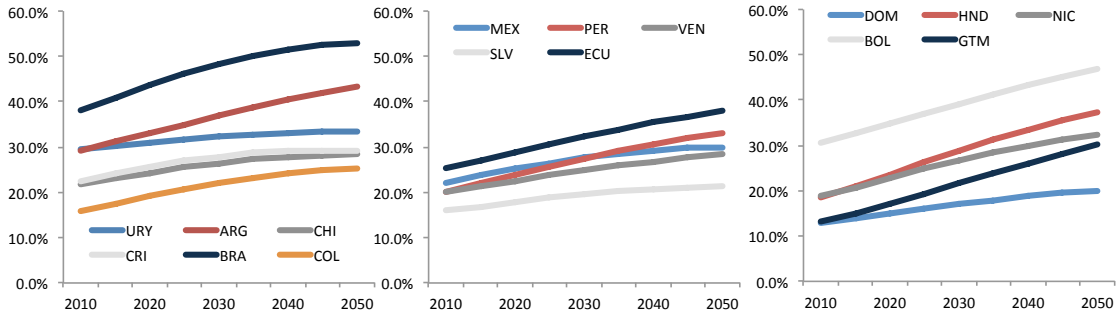
If the older cohort is $\bar{a}$ and the participation of cohort a in total population is $\mu_{a,t}$, the aggregate tax burden and benefits expressed as ratios of market income at time *t* will be:

$$\tau_t = \sum_a^{\bar{a}} \tau_a \, \mu_{a,t} \tag{17}$$

$$\psi_t = \sum_a^{\bar{a}} \psi_a \, \mu_{a,t} \tag{18}$$

Note that in these simulations we are fixing the values of the age profiles, that is, we assume that behavior, rules, and institutions do not change in the future. Using estimated population dynamics from the medium-variant projection of the UN Population Division, Figure 15 shows the demographic driven evolution of τ_t until 2050. As we see, after the closing of the DWO in the older Latin American economies – such as Costa Rica and Uruguay – there is a flattening in the curve representing the tax revenues/income ratio, reflecting the reduction in the proportion of prime-age taxpayers. This is not the case of the younger and poorer countries, such as Bolivia or Nicaragua. This suggests that these two groups of countries will face very different fiscal challenges in coming decades: in the post-DWO countries the fiscal space will shrink and the opposite will happen in the economies enjoying the first dividend, opening an opportunity to take advantage of the larger fiscal flexibility to implement more aggressive poverty reduction initiatives.

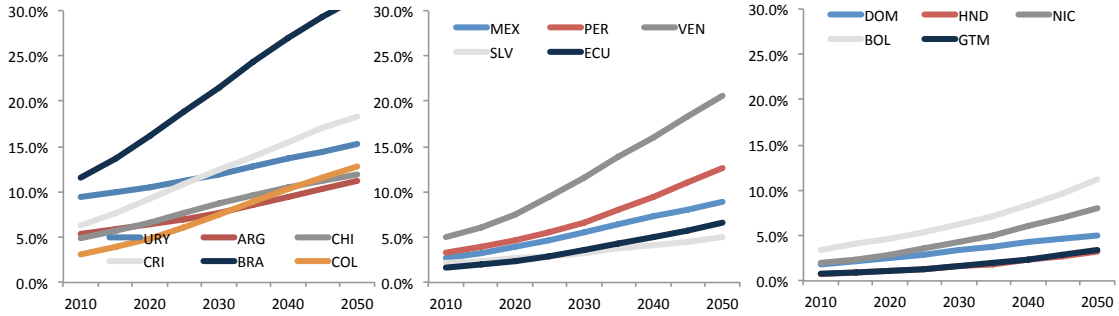
Figure 15
Demographic-driven evolution of fiscal redistributions (i): Total revenues
(% GDP)



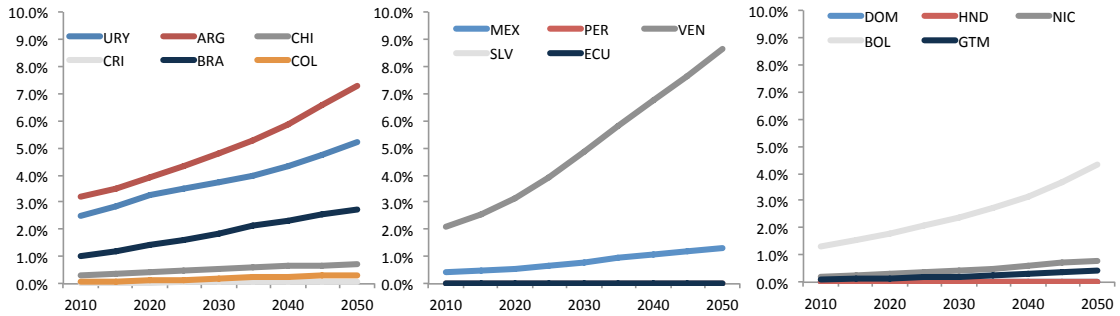
Source: Own elaboration based on data from NTA, CEQ and UN

The demographic driven changes in pension expenditures ($G_{a,t}^{A}$) for the period until 2050 are presented in Figure 16a. These types of transfers will increase in all countries. However, those that are more advanced in the aging process will face increased difficulties to keep the primary deficit under control because of the combination of a less dynamic evolution of the tax revenues/income ratio with rising pension transfers/income ratio. The financial gap will grow as the initial level of transfers widens and the social security system is more generous – i.e., coverage, retirement age, and the level of the pension benefits. With respect to contributory pensions (Figure 16a), the case of Brazil is striking and prone to generate sustainability problems. The evolution of contributory pension transfers also appears to be complex in Venezuela, Costa Rica, and Uruguay. Non-contributory pensions (Figure 16b) can also trigger imbalances of great magnitude. The evolution of these kinds of pension transfers is clearly unsustainable in Argentina and Venezuela and to a lesser extent in Uruguay. The fast increase in non-contributory pensions in Bolivia is surprising, given that the country is undergoing an early stage of the demographic transition.

Figure 16
Demographic-driven evolution of fiscal redistributions (i): Pensions
(% GDP)
(a) Contributory pensions



(b) Non-contributory pensions

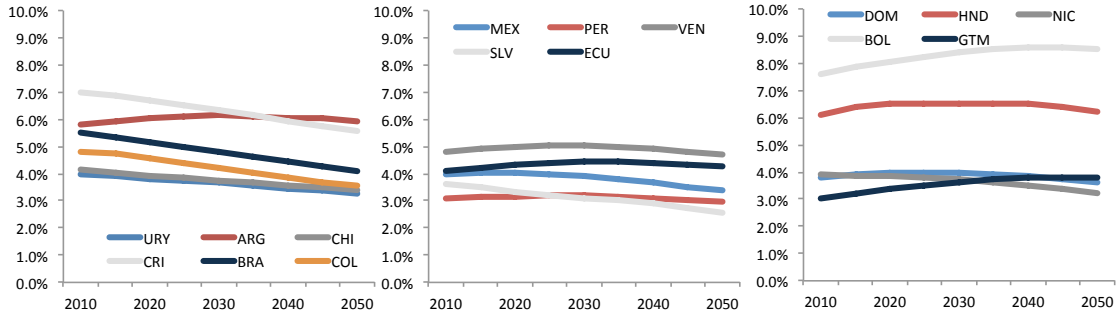


Source: Own elaboration based on data from NTA, CEQ and UN

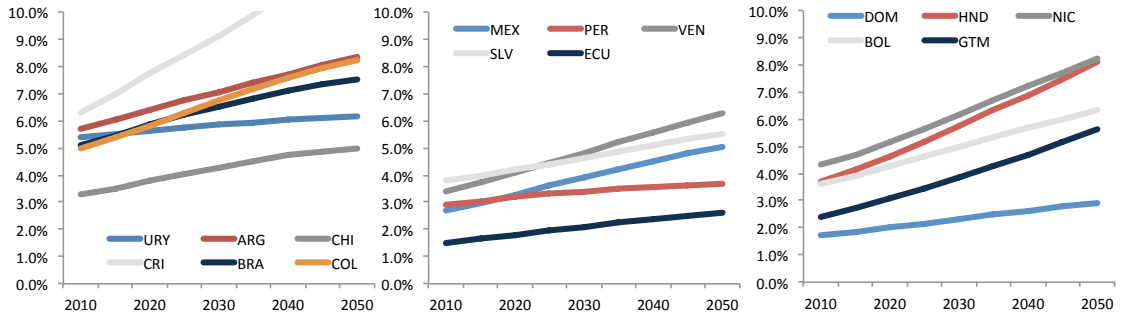
The path simulated for the demographic-driven educational expenditures that Figure 17 shows differs markedly from the path of pension transfers. More advanced countries in the demographic transition will experience some financial relief stemming from the reduction in the demand for educational benefits, while such demand will move in the opposite direction in younger economies. This is not, of course, the case of Bolivia or Nicaragua, where demographics will push total education expenditures upwards. The lower panel in the same figure registers the paths simulated for health expenditures. It is interesting that expenditures in this case tend to increase in practically all countries, although the causes differ in young and adult countries. In particular, health expenditures in the latter countries are expected to increase because of the aging process. In some Central American countries, such as Costa Rica and Honduras, health expenditures will also be hard to finance in the not-so-distant future.

Figure 17
Demographic-driven evolution of fiscal redistributions (iii): In-kind transfers (% GDP)

(a) Education



(b) Health

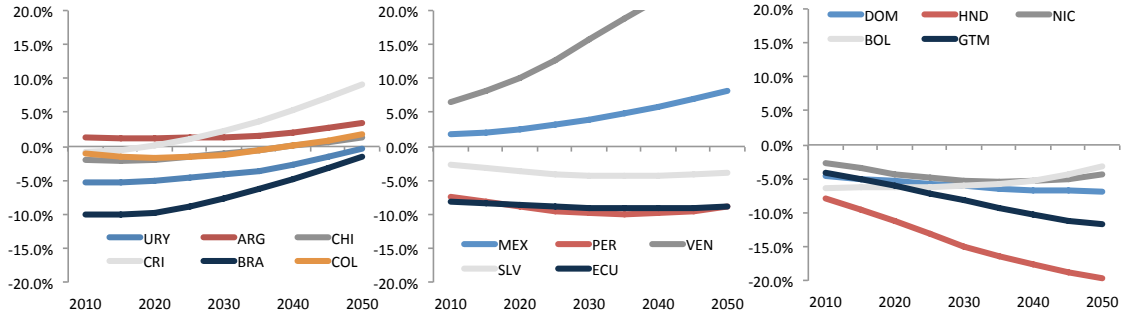


Source: Own elaboration based on data from NTA, CEQ and UN

In sum, Figures 15, 16 and 17 suggest that the demographic transition has long-lasting consequences not only for the size of the fiscal space but also for the allocation of the available fiscal resources.

Finally, Figure 18 registers the demographic-driven changes in fiscal redistributions ($\psi_t - \tau_t = \eta_t^D$) that result from the diverging paths of taxes and expenditures. In the group of younger countries, the forces unleashed by the increase in the tax-paying proportion of prime workers dominate and, as a consequence, fiscal redistributions are negative and decreasing. This suggests that it is reasonable to expect an expansion in the fiscal space, and, thus, more flexibility to implement redistribution policies. In these cases demography favors sustainability. The opposite is true in the case of the countries that will abandon the DWO around the 2030s. The simulations show that demographic-driven changes in the costs of redistributions tend to grow and become positive, creating a net demand for funds from the budget.

Figure 18
Demographic-driven evolution of aggregate fiscal redistributions
(% GDP)



Source: Own elaboration based on data from NTA, CEQ and UN

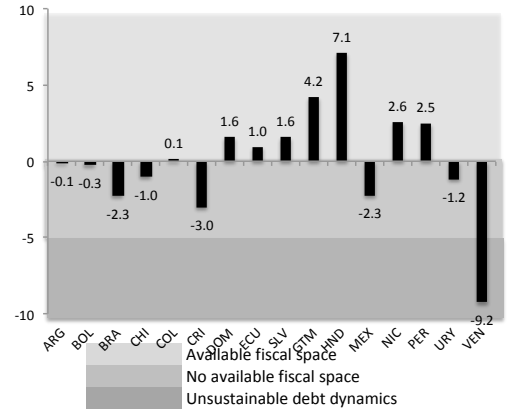
The impact of demographic-driven changes on the fiscal space and distribution

Figure 19 below exhibits the effects of the demographic-driven changes in fiscal redistributions on the fiscal space. To isolate these effects, the primary fiscal deficit (that is, $\theta_t^{GP} = \eta_t^D + \eta_t^R + \iota_t^G - \varepsilon_t^G$) for each period was calculated assuming fixed ratios with respect to market income in the case of public investment, non-tax fiscal revenues, and other taxes and expenditures.

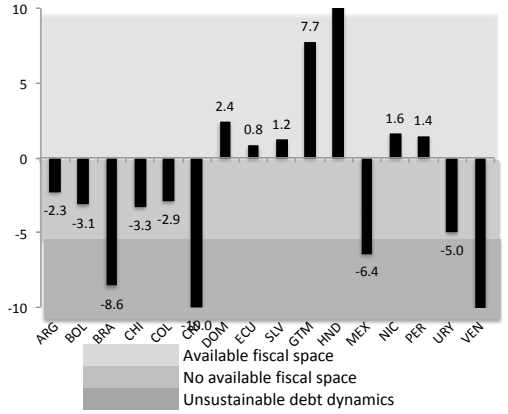
The figure suggests that significant changes in behavior, institutions, and policies will probably be necessary to preserve the availability of fiscal space at the end of the bonus and the aging stage in the countries in the CEQ database. As can be seen, in line with the simulations in Figure 18, there are basically two groups. Those that are more advanced in the demographic transition will enjoy much less availability of fiscal space as the transition evolves. The aging process is largely responsible for this: the fall in the proportion of prime workers reduces the tax base and, simultaneously, the increase in the number of retirees augments the pension transfers. In this context, there will be a trade-off between equity-improving expenditures and policies aimed at ensuring public debt-sustainability. The younger countries, in turn, will experience an expansion in the availability of fiscal space. These countries will be enjoying an increase in the tax base associated with the higher proportion of prime workers in the population. In this case, the most important challenge will be to achieve an allocation of the fiscal space that is both efficient and equitable. Undoubtedly, expenditures to accelerate human capital accumulation so as to improve the poor's endowment should play a key role.

Figure 19
Demographic-driven changes in the fiscal space
(% GDP)

a) With constant public debt, $b^* = b_0$



(b) With a public debt ceiling of 60% of GDP



Source: Own elaboration based on data from NTA, CEQ and UN

To illustrate the effects of the demographic transition on income distribution, which operates through changes in the fiscal redistribution structure, we need to identify the

groups in the population by cohort (a) and income stratum (d). The structure of fiscal redistributions can then be expressed as:

$$N^D_{a,d,t} = G^O_{a,d,t} + G^A_{a,d,t} + G^I_{a,d,t} + G^E_{a,d,t} + G^H_{a,d,t} - T^A_{a,d,t} - T^Y_{a,d,t} - T^I_{a,d,t} - T^F_{a,d,t} \quad (19)$$

Following Fanelli (2018) we define: $\eta^D_{a,d,t} = \frac{n^D_{a,d,t}}{y_t}$, where $n^D_{a,d,t}$ is the per capita fiscal redistribution corresponding to the members of cohort a pertaining to stratum d. In this case, assuming time-invariant parameters for the distribution among cohorts and income strata, we can rewrite $\tau_t$and ψ_t as:

$$\tau_t = \sum_d^{\bar{d}} \sum_a^{\bar{a}} \tau_{a,d}\, \mu_{a,d,t} \quad (20)$$

$$\psi_t = \sum_d^{\bar{d}} \sum_a^{\bar{a}} \psi_{a,d}\, \mu_{a,d,t} \quad (21)$$

and,

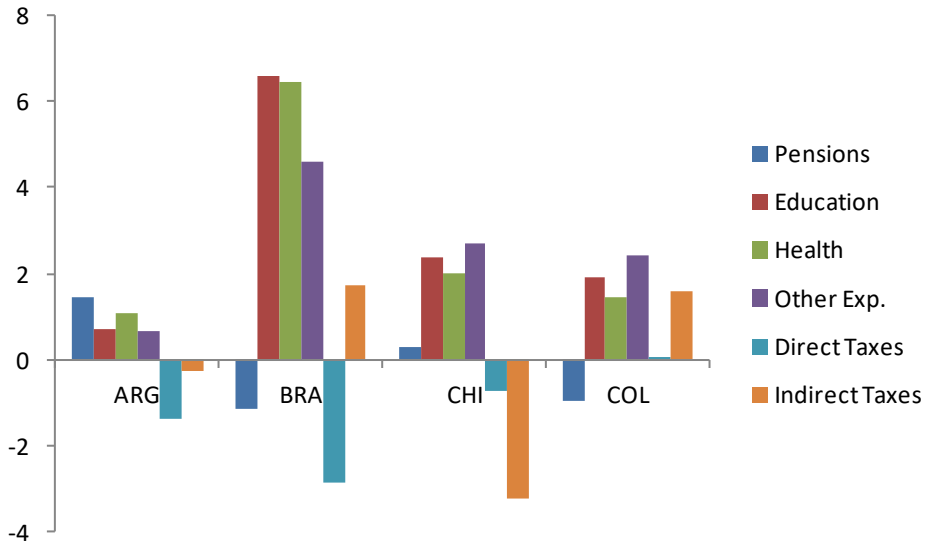
$$\eta^D_t = \sum_d^{\bar{d}} \sum_a^{\bar{a}} (\psi_{a,d} - \tau_{a,d}) \mu_{a,d,t} \quad (22)$$

Regrettably, there is no information available on the parameters $\tau_{a,d}$ and $\psi_{a,d}$. Therefore, to simulate the evolution of the final income, we followed a strategy that is similar to the one utilized in Section 3. First, we project each of the components of η^D_t as the demographic transition evolves. Second, assuming that the parameters for the distribution of taxes and benefits among income strata remain invariant and equal to the ones provided by CEQ for the "base year", we distribute the demographic-driven taxes and expenditures corresponding to each year among the income strata. Third, we calculate the final income corresponding to each income strata and obtain the Gini coefficient for each projected year. That is, the estimated share of expenditures allocated to stratum d at time t $\psi^*_{d,t}$ will be:

$$\psi^*_{d,t} = \tilde{\psi}_d \psi_t = \tilde{\psi}_d \sum_{a=0}^{\bar{a}} \psi_a\, \mu_{a,t} = \tilde{\psi}_d \sum_{a=0}^{\bar{a}} (\psi^A_a + \psi^Y_a + \psi^I_a + \psi^F_a + \psi^R_a) \mu_{a,t} \quad (23)$$

The following figure plots the impact on the Gini coefficient (multiplied by 100) that would have the fiscal adjustment necessary to compensate for the endogenous changes induced by demography between 2010 and 2050 and achieve $\Delta\chi_t = 0$. As in Figure 12, the graph shows what the impact would be if the bulk of the adjustment were to fall on only one of the components of the fiscal redistribution structure. We show four countries that will be affected by the aging process.

Figure 20
Demographic-driven changes in the fiscal redistribution structure and changes in the Gini coefficient (multiplied by 100)



Source: Own elaboration based on data from NTA, CEQ and UN

The figure suggests that the worsening in the Gini coefficient as a consequence of aging could be important. The case of Brazil, where the aging process has been particularly rapid, can be very difficult to manage from a fiscal point of view.

5. Conclusion

In this paper we have explored empirically the linkages between the fiscal redistribution structure, the fiscal space, and income distribution in a set of Latin American countries. The main purpose was to take advantage of the new data provided by the CEQ and NTA databases from an intertemporal perspective, which includes demographic factors. To perform the simulations presented we have had to make assumptions concerning the allocation of taxes and public expenditures to income strata and the behavior of the different cohorts; in particular, we have had to assume that the allocation and behavioral parameters will remain constant over an extended period, which are not uncommon in the literature on demography.

What is the value of the exercises? Three reasons justify them. First, we hope that this work will contribute to highlighting how essential it is to produce the data that are necessary to fully-evaluate the intertemporal consequences of fiscal redistributions. Second, we also hope that despite the data limitations, we have succeeded to a certain extent at showing that a unified methodology has the potential to reveal new aspects of

the interactions between the fiscal redistribution structure, debt-sustainability, demography, and income distribution. Third, we identified some stylized facts that, beyond the limitations of our data, may suggest future lines of research and restrictions that should be respected in designing fiscal and distribution policies. The following points deserve highlighting.

First, the notion of structure of fiscal redistribution can be fruitfully used as a pivot to articulate the fiscal items of the budget that impinge on income distribution. We found that in the CEQ sample analyzed, those countries that show higher government expenditures/GDP ratios achieve better distributional outcomes. We also found a positive relationship between the expenditure ratio and the per capita GDP, which indicates that it will be more difficult for poorer countries to implement policies to improve income distribution, although demography may be an opportunity because of the expected increase in fiscal revenues in younger countries.

Second, an important point that follows from our analysis is that the way in which a given fiscal adjustment is implemented matters to income distribution. As a general rule, the downward adjustment of expenditures is regressive, although the importance of the impact varies from one economy to another. The reduction in pension transfers can be regressive (Argentina) or progressive (Colombia) but the cutback in education or health expenditures is always regressive. On the other hand, the increase in income taxes is basically progressive while the results concerning indirect taxes are mixed.

Third, we observed that, although fiscal expenditures in our sample are more correlated with distribution outcomes than fiscal redistributions, the latter are a better synthetic indicator of the "net budgetary costs" of achieving a given difference between market income and final income and, consequently, is a good indicator of the way in which the distributional dimension of the budget impacts on the primary surplus and, hence, on public debt sustainability. Our exercises suggest that the modifications in the level and composition of fiscal ions required to achieve a given change in the Gini coefficient may amount to various percentage points of GDP and, under certain circumstances, may negatively impact on either the required tax burden or debt sustainability.

Fourth, we believe that the methodological framework and the exercises were instrumental in showing that demography matters to the size and the allocation of the fiscal space because it impinges on the composition and the level of fiscal redistributions and the primary surplus, which is a key determinant of debt sustainability.

Fifth, in the special case of Latin America the DWO is the key stage of the demographic transition. For younger countries it matters because they are entering the DWO and for the older ones because they have to prepare to abandon it and enter the aging stage. Using the NTA age-profiles, the exercises suggest that the DWO will probably help to create the fiscal space required to implement progressive policies in younger countries while the opposite will occur in the countries that will age. The simulations indicated that

the demographic transition-driven effects on the items of fiscal redistributions are potentially very large and have substantial consequences for income distribution. If the allocation parameters corresponding to per capita expenditures and taxes remained unchanged, the net effects on the Gini coefficient would be mostly positive because the endogenous increments in expenditures induced by demography would exceed the increments in taxes. However, the bad news tells us that the evolution of the fiscal redistribution structure could render public debt unsustainable in the absence of appropriate fiscal policies. In particular, the likely evolution of contributory pension transfers might become worrisome in countries like Brazil or Uruguay. Argentina, in turn, presents the problem that non-contributory transfers are already high even though the aging process is still ahead. Health expenditures will also exert pressure on the fiscal balance in some Central American countries.

Finally, we suggest that fiscal interventions are operating with a moving target. For one thing, the aging process might worsen the labor share along with income distribution. This would call for compensatory progressive fiscal interventions in a context in which the fiscal space will tend to shrink because of aging. The NTA age profile implies that the older people are, the income from accumulated assets will be higher. But wealth distribution in older cohorts is likely to be rather unequal across the region. Therefore, new creative policies to fight inequality will be necessary as aging progresses.

References

Bloom, David E., Somnath Chatterji, Paul Kowal, Peter Lloyd-Sherlock, Martin McKee, Bernd Rechel, Larry Rosen- berg, and James P Smith, 2015, "Macroeconomic Implications of Population Ageing and Selected Policy Responses." Lancet 385(9968): 649–57.

CEPALSTAT, bases de datos y publicaciones estadísticas. Accessed August 2017. Link: http://estadisticas.cepal.org/cepalstat/Portada.html

CEQ Standard Indicators database. Accessed May 2018. Link: http://www.commitmentoequity.org/data/

Escolano, J. (2010), "A Practical Guide to Public Debt Dynamics, Fiscal Sustainability, and Cyclical Adjustment of Budgetary Aggregates." IMF Technical Notes and Manuals 10/02.

Heller, P. S. (2005), "Understanding Fiscal Space", *IMF Policy Discussion Paper, PDP/05/4.*

IMF (2011), Modernizing the Framework for Fiscal Policy and Public Debt Sustainability Analysis. IMF staff note 805/11

Fanelli (2018), "Fiscal sustainability, demography, and redistribution in Latin America. A Methodological Framework" paper prepared for the Workshop on Methodological Advances in Fiscal Incidence Analysis: Commitment to Equity Institute (CEQ), Universidad de San Andrés November 7 -8, 2017.

Fatás, A. (2010), "The Economics of Achieving Fiscal Sustainability". Academic Consultants Meeting on Fiscal Sustainability Board of Governors, Federal Reserve. April 9, 2010.

Higgins, J. and C. Pereira (2013), "The Effects of Brazil's High Taxation and Social Spending on the Distribution of Household Income" CEQ Working Paper No. 7.

IMF, Government Finance Statistics database. Accessed August 2017. Link: http://data.imf.org/?sk=a0867067-d23c-4ebc-ad23-d3b015045405

Lee, R. and A. Mason, (2006), "What Is the Demographic Dividend?". Finance and Development magazine vol. 43, number 3.

Lee, R. and A. Mason (2012), Aging, Economic Growth, and Old-age Security in Asia. Cheltenham, UK and Northampton, MA: Edward Elgar.

Lustig, N. and C. Pessino (2013), "Social Spending and Income Redistribution in Argentina in the 2000s: the Rising Role of Noncontributory Pensions" CEQ WP Nro. 5.

Lustig, N., L. F. Lopez-Calva, and E. Ortiz-Juarez (2014), “Deconstructing the Decline in Inequality in Latin America,” in Basu, Kaushik and Joseph Stiglitz, eds. Proceedings of IEA roundtable on Shared Prosperity and Growth, 2015, Palgrave-Macmillan.

Lustig, N. (2017), CEQ Handbook: Estimating the Impact of Fiscal Policy on Inequality and Poverty.

Mason, A.; Lee, R.; Abrigo, M. and Sang-Hyop Lee (2017) "Support Ratio and Demographic Dividends: Estimates for the World" Technical Paper 2017-1 Population Division, Department of Economic and Social Affairs, United Nations.

Moody's Analytics (2011), "Fiscal Space", *Special Report*, December 20.

Ostry, J. D., Ghosh, A.R., Kim, I.J., and Qureshi, M.S. (2010), "Fiscal Space", *IMF Staff Position Note*, September.

Roy, R., Heuty, A., and Letouze, E. (2007), Fiscal Space for What? Analytical Issues from a Human Development Perspective, Paper for the G20 Workshop on Fiscal Policy, Istanbul, June 30, July 2, 2007, UNDP.

United Nations (2017), World Population Prospects 2017. Accessed September 2017. Link:
https://esa.un.org/unpd/wpp/

World Bank (2017), “Debt Dynamics in Emerging Market and Developing Economies: Time to Act?”. Global Economic Prospects, Special Focus 1, June.

World Bank, World Development Indicators. Accessed May 2018. Link:
https://data.worldbank.org/data-catalog/world-development-indicators