*Ligia Alba Melo-Becerra**

Banco de la República,
Bogotá, Colombia

The role of the sub-national public sector in the stabilization function: Evidence from the Colombian case for the period 1990-2001*

ABSTRACT

This paper analyses the impact of fiscal decentralization on the stabilization function. Although traditionally the stabilization function has been attributed to central government, regional and local authorities have a role to play in decentralized contexts. The analysis concentrates on the role that sub-national governments play in counteracting cyclical policy and on the relationship between decentralization and the fiscal position of national and sub-national governments. In particular, the stabilization and redistribution obtained by regions as a result of national tax policy and through the intergovernmental transfers system is estimated for Colombia, where deficits increased substantially both at national and local levels after the decentralization process was strengthened in 1991.

Keywords: Fiscal decentralization, stabilization, intergovernmental transfers, sub- national governments.

JEL : H7, H77, E6

* Economist, PhD. in Economics, Senior Researcher at the Banco de la República, Bogotá, Colombia. Address: Cra. 7 No. 14-78, piso 11, Bogotá, Colombia. email: lmelobec@banrep.gov.co

El rol del sector público subnacional en la función de estabilización: Evidencia desde el caso colombiano en el periodo 1990-2001

RESUMEN

El objetivo del documento es analizar el impacto de la descentralización fiscal en la función de estabilización. Aunque tradicionalmente la función de estabilización se ha atribuido al gobierno central, las autoridades regionales y locales desempeñan un papel en esta función en un contexto descentralizado. El análisis se centra en el papel que los gobiernos sub-nacionales desempeñan para contrarrestar la política cíclica y en la relación entre descentralización y la posición fiscal de los gobiernos nacionales y subnacionales. En particular, la estabilización y redistribución que las regiones obtienen mediante la política tributaria nacional y el sistema de transferencias intergubernamentales se estima para Colombia, donde los déficit aumentaron sustancialmente, tanto a nivel nacional como local después de que el proceso de descentralización se fortaleció en 1991.

Palabras clave: Descentralización Fiscal, estabilización, transferencias intergubernamentales, gobiernos subnacionales.

O papel do setor público subnacional na função de estabilização: o caso da Colômbia no período 1990-2000

RESUMO

O objetivo deste documento é analisar o impacto da descentralização fiscal na função de estabilização. Embora tradicionalmente a função de estabilização tenha sido atribuída ao governo central, as autoridades regionais e locais desempenham um papel nessa função num contexto descentralizado. A análise se enfoca no papel que os governos subnacionais desempenham para neutralizar a política cíclica e na relação entre descentralização e posição fiscal dos governos nacionais e subnacionais. Em particular, a estabilização e a redistribuição que as regiões obtêm mediante a política tributária nacional e o sistema de transferências intergovernamentais que se estima para a Colômbia, onde os déficits aumentaram substancialmente, tanto no âmbito nacional quanto no local, depois do fortalecimento do processo de descentralização em 1991.

Palavras-chave: descentralização fiscal, estabilização, transferências intergovernamentais, governos subnacionais.

INTRODUCTION

According to the classic theory of public finance (Musgrave, 1959) the function of providing public goods and services to the community should be carried out in a decentralized manner, whilst central government should be responsible for the distribution and stabilization branches. With respect to the stabilization function, there is consensus that a central monetary authority should be responsible for the management of the supply of money and credit. According to this view, national governments have comparative advantages in the exercise of the stabilization function and attempt to guarantee an adequate use of resources and to generate minimal economic distortions. Nevertheless, bearing in mind that "from an economic perspective, virtually any public sector is federal in character in that fiscal decisions are made, de facto, at different levels" (Oates, 1990, p. 2), it has been argued that sub-national governments can influence stabilization policies in different ways. Indeed, fiscal decentralization could negatively affect stabilization efforts as a result of the impact of sub-national fiscal decisions on the consolidated public deficit. Fiscal decentralization may aggravate budgetary imbalances and consequently endanger macroeconomic stability, unless local authorities are committed to fiscal discipline, and decentralization includes incentives for prudence in debt and expenditure management (Faguet, 2014; Fusaka & De Mello, 1998; Feltenstein & Iwata, 2005; Jin and Zou, 2002).

If the national government is to affect overall demand, the weight of national taxes and expenditures must be sufficiently large in comparison with total taxes and expenditures (Cassette & Paty, 2010; Bahl & Bird, 2008; Prud'homme, 1995). However, fiscal decentralization results in a large share of taxes and expenditure being committed, and is hard to alter. In particular, taxes are committed when the percentage of taxes assigned to sub-national governments is large, or when a high proportion of national taxes is shared with lower levels of government. As a result, stabilization policies can only be undertaken at the margin, reducing the effectiveness of national governmental measures. Moreover, the fact that an increasing percentage of public expenditure is carried out by local governments, and that a significant proportion of national government spending is not discretionary, also makes it difficult to use fiscal policy to implement stabilization policy. Irregular fiscal behavior by powerful regions can exert an important constraining influence on the conduct of national government policies (see for example Shah, 1998 and Shah, 2004).

In the literature, the link between fiscal decentralization and stabilization has been analyzed in two different ways: first, when sub-national governments undermine the national objectives of stabilization programs, and second, when regional authorities play a direct role in counter-cyclical policy. The first approach focuses on the impact of decentralization on the stabilization policies pursued by central government. This approach assumes that the stabilization function is performed by the national government, as Musgrave (1959) states, given that there is no incentive for sub-national governments to become involved in this function. However, the relatively large size and rapid increase of sub-national governments in different countries around the world produced concern about the ability of national governments to conduct stabilization policies without the cooperation of other levels of government. In particular, given that sub-national governments make fiscal policy decisions, several authors have argued that fiscal decentralization may aggravate budgetary imbalances and, in consequence, endanger macroeconomic stability (Prud'homme, 1995; Tanzi, 1996; Ter-Minassian, 1997; Fukasaku & De Mello, 1998)[1].

The second approach asks whether sub-national governments are capable of conducting some aspects of stabilization policy and whether such policies operate more effectively at sub-national or at national level. This question has

---

[1]   For the particular case of countries of Latin America see Escobar-Lemmon (2001); Falleti (2005); Falleti (2006); and Garman, Haggard and Willis (2001).

been analyzed using both theoretical and empirical approaches. For example, Bayoumi and Masson (1998) find for Canada that the policy model in which the sub-national authorities attempt to stabilize regional income by themselves by running budget deficits during regional recessions and surpluses during booms is less effective than a centrally managed arrangement. Meanwhile, Gramlich (1987) finds, for the United States, that decentralized governments can respond in a counter-cyclical manner to their own demand shocks by accumulating revenues during good times and running them down during recessions. Another interesting aspect related to decentralization and stabilization is the role that different forms of intergovernmental transfers have played in attenuating the impact of regional asymmetric shocks. Indeed, beyond the traditional function of providing local public goods at local level, intergovernmental transfers are an instrument for redistributing income from richer to poorer regions, helping to reduce inequalities and to counteract regional asymmetric income shocks.

The impact of fiscal decentralization on stabilization has been an issue of great interest during the last decade, especially in Latin American, considering that in different countries such as Brazil and Argentina the increasing sub-national debt has negatively affected macroeconomic adjustment efforts. In the Colombian case, the concern also exists that decentralization has been a source of fiscal and macroeconomic problems, given that after the decentralization process was strengthened, spending and fiscal deficits significantly increased at both sub-national and national levels. The increase in local fiscal deficits was fostered by the fact that, after transfers from central government to the regions and municipalities increased, access to debt was not difficult[2]. For their part, regional and local authorities were keen to borrow, since this provided a potential source of untied finance and a three-year electoral cycle, with no re-election

possible for mayors and local administrations, meant there was relatively little concern about the consequences (Ahmad & Baer, 1997, p. 481).

Bearing these general issues in mind, it is important to indicate that the link between decentralization and stabilization is of particular interest, especially in developing countries. This paper starts by identifying how different decentralization measures might affect the overall fiscal management of the country, before going on to develop an empirical analysis focused on the relationship between national and sub-national fiscal results and the impact on stabilization at regional level for the period 1990-2000. In particular, the empirical analysis is focused on the influence of different fiscal deficits (national and sub-national) and national fiscal stabilizers (transfers and taxes) on regional stabilization efforts. Thus, the analysis is an example of how decentralization may disrupt fiscal policy, although, as mentioned above, other approaches to dealing with the issue exist. The empirical analysis is carried out for Colombia, where deficits increased substantially, both at national and local levels, after the decentralization process was strengthened in 1991. The research concentrates on the periods before and after approval of the Political Constitution of 1991, specifically the period 1990-2000. From 2001, the role of sub-national governments in the stabilization function changed due to a redesign of the Colombian transfer system.

The paper is organized as follows. Section 2 illustrates the different ways in which the Colombian decentralization process has affected overall fiscal management and, consequently, the macroeconomic stability of the country. Section 3 analyses empirically the impact of national and sub-national fiscal deficits on regional consumption and income, and the role that intergovernmental transfers have played in attenuating adverse regional fiscal shocks. The last section concludes.

---

2   For a description of the Colombian decentralisation process, see Ahmad & Baer (1997); Junguito, Misas & Melo (1995); World Bank (1995), Iregui, Ramos & Saavedra (2001) & Lozano, Ramos and Rincón (2007).

THE COLOMBIAN DECENTRALIZATION PROCESS AND ITS IMPACT ON THE FISCAL DEFICIT

This section analyses how the Colombian decentralization process affected the overall fiscal position of the country and the capacity to control it. In general, when the margin of maneuver of a central government to influence the tax take and expenditure is reduced and co-ordination between central and local governments is low, decentralization might reduce the ability of central government to conduct fiscal and stabilization policies and to avoid situations in which sub-national fiscal decisions undermine central government macroeconomic targets. The ways in which these two aspects were affected by the Colombian decentralization process is analyzed below, focusing on the period after decentralization was strengthened by the new Political Constitution in 1991.

Low margin of maneuver

In Colombia the margin of maneuver enjoyed by central government to carry out stabilization policy decreased as local and regional governments gained autonomy to manage an increasing percentage of public expenditure. In fact, the share of national expenditure controlled at sub-national

Table 1.

Public expenditure by level of government

	As a percentage of the GDP			Share of the total	
	Colombia (1)	National (2)	Sub-national1/ (3)	(2)/(1)	(3)/(1)
1987	21.7	14.6	7.1	67.3	32.7
1988	22.4	15.0	7.4	66.8	33.2
1989	23.1	15.2	7.9	65.6	34.4
1990	22.0	14.4	7.7	65.2	34.8
1991	22.3	14.4	7.9	64.4	35.6
1992	22.9	14.7	8.2	64.2	35.8
1993	24.3	15.7	8.6	64.6	35.4
1994	26.1	15.2	10.8	58.4	41.6
1995	28.1	17.2	10.9	61.2	38.8
1996	32.7	19.3	13.4	59.1	40.9
1997	34.1	20.9	13.1	61.4	38.6
1998	34.2	20.7	13.5	60.4	39.6
1999	36.5	22.7	13.8	62.1	37.9
2000	36.2	22.6	13.6	62.4	37.6

1/This variable includes municipal and regional expenditures. In order to aggregate information of all sub-national public entities, a net transfer process is considered, which avoids double accounting, considering that resources could be transferred among sub-national entities. Thus, if one entity transfers resources to another, the former will register these resources as expenditure and the latter initially as revenue and then again as expenditure.
Source: Banco de la República (Colombian Central Bank) 1990-1995, Ministry of Finance: 1996-2000.

level increased significantly after decentralization was strengthened. Thus, while in 1987 regions and municipalities carried out 32.7% of total public expenditure, this percentage rose to 41.6 in 1994 and reached overall, on average, 38.9% between 1995 and 2000 (Table 1). This situation, together with the fact that a large share of national expenditure was earmarked for interest and pension payments, reduced the share of public expenditure that the national government could directly control if it were to pursue a stabilization policy.

Furthermore, the ability of central government to manage stabilization policies was affected by the way the intergovernmental transfer system was initially designed. Indeed, considering that intergovernmental transfer resources are directly linked to current national revenue, nearly 50% of national tax collection should be automatically transferred to departments and municipalities. Given, as McLure (1995) points out, that most stabilization is likely to come from changes in transfer payments and taxes, this situation makes national government stabilization efforts more difficult. For these reasons, the establishment of a good co-ordination program between national and regional governments should be crucial if national macroeconomic targets are to be met.

Sub-national government undermining stabilization policy

Fiscal decentralization can also affect macroeconomic stability when sub-national governments counteract central government objectives. This might be the case, for instance, when regional and municipal authorities increase spending or taxes at the same time as central government is trying to reduce them. This situation was observed in Colombia when, as a part of a fiscal adjustment program, sub-national fiscal surpluses were projected for the period 1994-1998. However, during this period, regions in fact registered significant fiscal deficits following the approval of decentralization reforms, undermining the macroeconomic objectives of the national government.

Furthermore, the contribution of intergovernmental transfers to fiscal imbalances was also evident in central government finances, whose overall position deteriorated significantly between 1991 and 2000. This situation can be explained, in part, by the fact that transfers to sub-national governments were not matched by a proportional reduction in the spending share of the national government - given that decentralization implied not only the transfer of resources from central government to the regions, but also a transfer of responsibilities. Thus, in the particular case of Colombia, decentralization affected fiscal policy in two ways: by increasing national government expenditure on transfers without reducing the rest of expenditure and by increasing the sub-national deficits themselves.

In particular, Graph 1 shows that while, in 1987, both national and sub-national fiscal deficits were low and similar in size as a percentage of GDP (0.3% and 0.2% respectively), both increased significantly after the decentralization process was strengthened. The larger increase occurred at national level where, after a period of fiscal surpluses in 1991 and 1992, the national fiscal deficit registered a rapid increase, reaching 6.9% and 6.2% of GDP in 1999 and 2000 respectively. Even if transfers to regions and municipalities had been maintained at the level registered in 1990, before the strengthening of decentralization, the national deficit would have increased rapidly (see Graph 1).

The sub-national deficit, for its part, registered a significant increase in 1993 and 1994, reaching 0.6% and 0.8% of GDP respectively. In 1995, due to central government pressure and some measures that were taken to control regional and municipal debt, the sub-national fiscal deficit fell to 0.1%. During 1996 and 1997 the deficit rose again at the end of 1997. Following this increase a new law on borrowing was approved, which sought to control sub-national borrowing by using restricted indicators to define the payment capacity of sub-national entities.

With respect to public expenditure, it is worth pointing out that both national and sub-national

Graph 1.

National and sub-national fiscal deficits
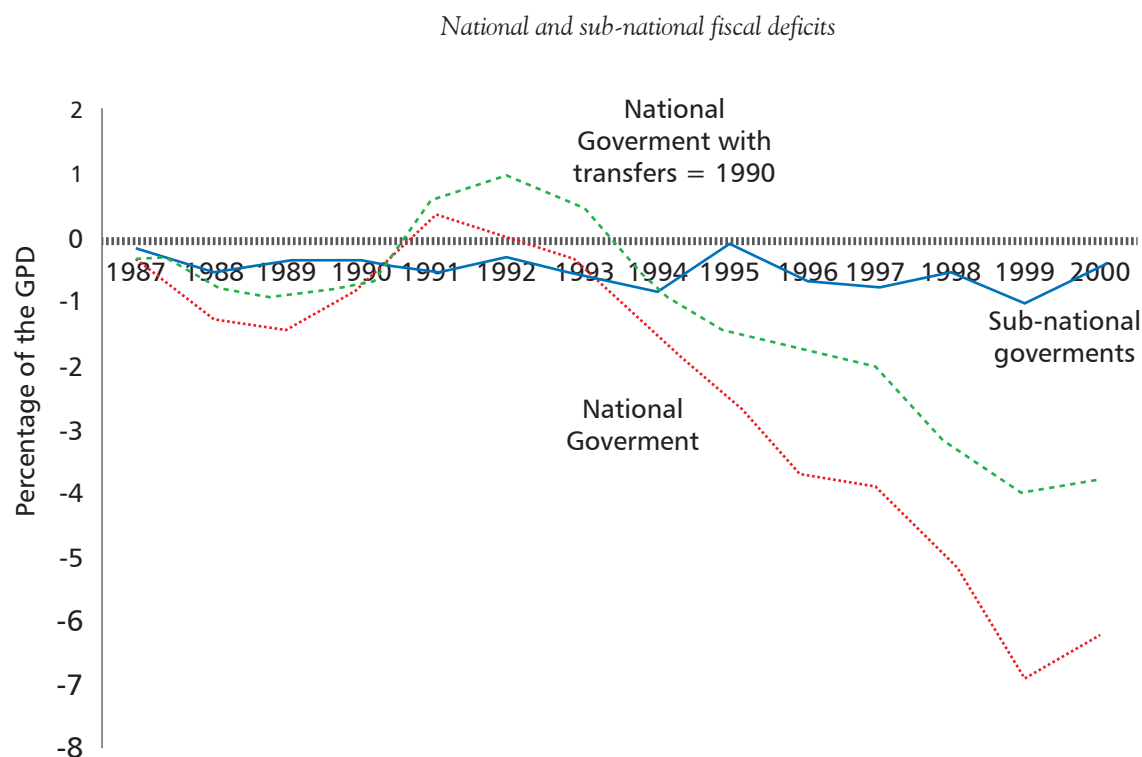
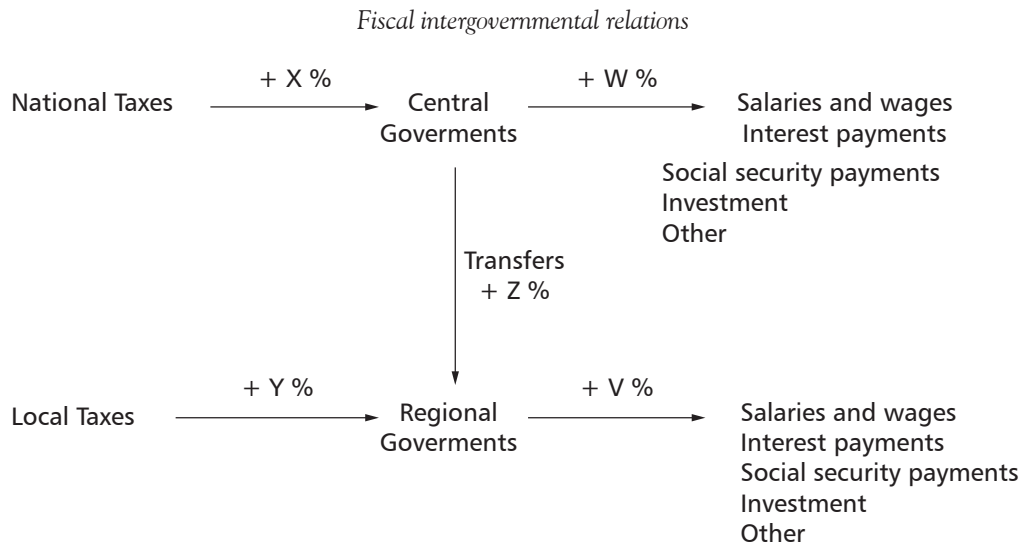Source: Colombian Central Bank and Ministry of Finance.

spending increased significantly in the period under examination. In particular, national government expenditure expanded by 10 points of GDP in ten years, increasing from 11.0% in 1990 to 21.1% in 2000. In Colombia, considering that transfers of resources from central government to the sub-national public sector increased from 2.8% of GDP in 1993 to 5.7% in 1999, some analysts have blamed fiscal decentralization for the rapid increase in public expenditure and its negative consequences for fiscal and macroeconomic policy.

However, it is important to note that even when intergovernmental transfers are subtracted, national expenditure showed a significant increase. In fact, during the period 1993-2000, following the application of Law 60 of 1993, on intergovernmental transfers, total national government expenditure without the transfers grew by 6 points of GDP, passing from 9.8% in 1993 to 15.8% in 2000. A proportion of this increase is explained by other fiscal reforms approved under the terms of

the 1991 Constitution. With the strengthening of the decentralization process, sub-national public expenditure also increased significantly. Actually, while in 1990 expenditure carried out by regions and municipalities represented 7.7% of GDP, by 1997 it had increased to 13.4%. This contrasts with the increase in transfers from central government of only 1.7% of GDP during the same period. Part of this difference was covered by higher regional and local own-revenue, especially taxes and credit resources.

Thus, after the strengthening of the fiscal decentralization process, both national government and sub-national expenditure increased significantly, contradicting the principle that decentralization should not affect the fiscal deficit as a whole. With respect to this topic, Bird and Fiszbein (1998) maintain that "...sub-national expenditures in principle should, in the absence of behavioral reactions, increase by exactly the same amount as sub-national revenue. That is the revenues available for

305

Figure 1.

Fiscal intergovernmental relations

National Taxes $\xrightarrow{\ + X\ \%\ }$ Central Goverments $\xrightarrow{\ + W\ \%\ }$ Salaries and wages
                                                              Interest payments

Social security payments
Investment
Other

Transfers
+ Z %

Local Taxes $\xrightarrow{\ + Y\ \%\ }$ Regional Goverments $\xrightarrow{\ + V\ \%\ }$ Salaries and wages
Interest payments
Social security payments
Investment
Other

expenditure at the national level decline and those available at the sub-national level rise by the same amount as do sub-national expenditures", but as has been explained, this was not the case in Colombia.

In addition, in real terms tax revenues increased less than expenditure at both levels of government, growing more at sub-national than at national level, despite the passage during the 1990s of seven different tax reforms that were intended to increase the collection of national taxes. Indeed, while regional and local taxes grew on average by 7.6% per year between 1993 and 2000, national taxes grew by only 4.9% over the same period, registering negative real increases in 1998 and 1999. As a percentage of GDP, during the period 1993-2000, national tax revenue reached on average 11.8% of GDP, with a peak of 12.8% in 2000. Sub-national taxes represented on average 3.0% of GDP during the same period. Municipal taxes, in particular those levied on property and business, also registered an important increase during this period, increasing by 0.5% of GDP. However, nearly 50% of this increase was observed in Bogotá where, in contrast with the rest of the country's municipalities, different tax-recovery programs had been carried out since the early 1990s. In fact, regional taxes, in particular on cigarettes, beer and alcohol, fell by nearly 0.5% of GDP, going from 1.4% in 1992 to 1.0% in 1997.

From the results described above, it may be suggested that, although the decentralization process negatively affected the overall fiscal position of the country, because of the intergovernmental fiscal relations that the process implied (summarized in Figure 1), a high proportion of the fiscal deficit was generated by central government finances. Note that rather than decreasing, expenditure other than intergovernmental transfers, registered significant increases. In addition, in spite of the different tax reforms carried out by the central government during the 1990s, national tax collection dropped off in real terms, in part as a consequence of the low economic growth observed in the second half of the 1990s.

THE ROLE OF THE SUB-NATIONAL PUBLIC SECTOR IN THE STABILIZATION FUNCTION

Regional consumption and fiscal deficits

From the description provided above, it appears that deficits changed substantially after the decentralization process was strengthened in 1991, both at national and at local level. An important question is

whether these two forms of deficit might have had similar stimulatory effects upon (e.g.) consumption. If not, it implies that the process of decentralization might have had fiscal effects, a phenomenon that can occur even if the overall balance does not change. This is the hypothesis tested by Bayoumi and Masson (1998), using Canadian data, and is the approach followed in this paper. In particular, Bayoumi and Masson test whether, because it uses an intergovernmental transfer system, national fiscal policy is more effective in stimulating regional consumption and hence in carrying out stabilization policy than is sub-national fiscal policy. Although the purpose of this section is not to advocate for fiscal policy being used actively for stabilization, the analysis makes it possible to establish the role that fiscal decentralization has played in attenuating regional asymmetric shocks.

According to the theoretical framework used by Bayoumi and Masson, it is expected that *the national deficit generated in each region* will not involve the creation of future regional tax liability, because the deficit would be matched by surpluses in other regions and the impact on national debt would tend to cancel out. *Regional deficits*, by contrast, are likely to involve an accumulation of liabilities, which would need to be serviced in the future by the same region that accrued them. Consequently, national deficits would not be expected to offset the stimulus of regional consumption as much as regional deficits do. In order to consider the stabilization effects of fiscal policies at both national and regional levels, these policies are held to be involved in the consumption function of a region, which considers the presence of a national government and several regions (indexed by j), as follows:

$$C_{tj} = \rho \left\{ B_{tj}^N + B_{tj}^R + \sum_{i=0}^{\infty} [(1+r)(1+\delta)]^{-i} \right.$$

$$\left. E_t \left(Y_{t+ij} - T_{t+ij}^N - T_{t+ij}^R \right) \right\} \qquad [1]$$

This is subject to two budget constraints:

$$\sum_{j} B_{tj}^N = \sum_{i=0}^{\infty} (1+r)^{-i} E_t \left[T_{t+ij}^N - G_{t+ij}^N \right] \qquad [2]$$

and

$$B_{tj}^R = \sum_{i=0}^{\infty} (1+r)^{-i} E_t (T_{t+ij}^R - G_{t+ij}^R) \qquad [3]$$

where $\rho \geq 0$ is the rate of time preference, r is the interest rate; δ is a constant probability of death. These rates are assumed to be identical across regions and over time. Y represents income, T taxes and B government debt at the beginning of the period. The superscript N and R denote national and regional taxes and spending, respectively. Here, national fiscal policy is both inter-temporal and inter-regional, implying that a national deficit in one region could be compensated for by surpluses in other regions. Therefore, in expected values, national fiscal policy will be balanced in each region by:

$$\sum_{j} T_{tj}^N = \sum_{j} G_{tj}^N \quad \text{and}$$

$$E_t \left(T_{t+ij}^N - G_{t+ij}^N \right) = 0, \, i \geq 1 \qquad [4]$$

This redistribution effect is the factor that increases the effectiveness of national fiscal policy in stabilizing regional consumption in the presence of asymmetrical shocks. In turn, regional deficits need to be covered by the same region and consequently their stimulatory effect on consumption will be less. In particular, the regional budget constraint implies:

$$G_{t+1j}^R - T_{t+1j}^R = -(1+r)(G_{tj}^R - T_{tj}^R) \qquad [5]$$

Now, consumption in region j can be expressed in terms of the two types of (primary) deficits as follows:

$$C_{tj} = \rho \left\{ \sum_{i=0}^{\infty} [(1+r)(1+\delta)]^{-i} E_t \left(Y_{t+ij} - G_{t+ij}^N \right. \right.$$

$$\left. \left. - G_{t+ij}^R \right) + DEF_t^N + \frac{\delta}{1+\delta} DEF_t^R \right\} \qquad [6]$$

According to this approach, both national and regional fiscal policies are held to have positive impacts on regional consumption, but national policy has a larger stimulatory effect than regional policy. Nevertheless, the size of the impact on consumption depends on different factors. In particular, Modigliani (1987) states that it will respond to the source of change in the deficit, which might in turn have an effect on the difference the two types of deficits have on consumption. In addition, in the short run, larger deficits are likely to lead to higher demand and higher output, while in the long run, according to the classical view, the response in consumption may be negative, given that higher government debt has a negative effect on capital accumulation. These arguments suggest that fiscal deficits could have either positive or negative effects on consumption. Nevertheless, the national deficit in a given region, which does not involve the creation of regional tax liability, should have a larger positive or a smaller negative impact on sub-national consumption than does regional deficit, which involves the accumulation of liabilities that need to be covered by the region where they are accrued.

Empirical analysis

In order to test the impact of sub-national and national deficits on regional demand shocks, the impact on regional consumption of deficits that do not create future regional tax liability (NTLD) and deficits that create such a liability (TLD) was estimated, using panel data models. With respect to the national level, it is important to note that the fiscal deficit satisfies a budget constraint that is both inter-regional and inter-temporal. Thus, part of the national deficit does not create such a liability because it can be compensated using surpluses generated in other regions. However, the share of the national deficit that taxpayers in any region can be expected to shoulder in the future does create regional liabilities. Therefore, the implementation of the model requires differentiating the NTLD from the liability-creating part of the deficit, as well as distinguishing between national and regional deficits. In particular, the share of the national deficit that represents a region's future tax burden was estimated by using a model of the incidence of national taxes, which considers the specification:

$$TAX_j / TAX_N = f(GDP_j / GDP_N) \qquad [7]$$

As before, j indicates regions and N denotes national taxes and GDP respectively. Taking into account that the regional share of national taxes and product in the total tax levels of the country is significantly different in per capita terms and in terms of absolute payment levels, different specifications were considered. In fact, as can be seen from Table 2, although on average the regional share of taxes and of GDP is approximately equal to 4.2% in all cases, the standard deviation varies widely. The greatest variation is observed in the case of national tax levels, reaching 10.9, and the lowest in the case of the economic product in per capita terms (at 1.3). This variation is explained by the heterogeneity across regions and, in particular, by the fact that while the collection of national taxes is concentrated in Bogotá, per capita GDP has a more homogenous distribution across the regions than does total GDP.

The results for national tax incidence in the regions, which were estimated using the OLS method and the average value of the variables, are reported in Table 3. They show that there was a higher response in the regional share of national taxes for a one point increase in the GDP share when the model was estimated in per capita terms rather than in levels. Thus, while in the case of the model estimated in levels, the GDP coefficient is 1.9, in per capita terms it is 3.4. Taking these results into account, two alternative ways of estimating the share of the national deficit represented by future tax liability in each region are considered. Firstly, tax liability is assumed to be equal to the regions' share of trend income: $(Y_j / Y_N)DEF_N$. Secondly, liability is assumed to be equal to the proportion of regional per capita income relative to the total per

capita income of the country: $(Y^{PC}_{j}/Y_{N})DEF_{N}$, where j indicates regions, N, Colombia's total income or deficit, and pc, variables in per capita terms.

In addition, two conceptions of central government fiscal deficit were included in the analysis: total and current deficits. The latter excludes investment payments from the total deficit.

Table 2.

Regional share of national taxes and regional product into the total

Region	Levels		Per capita	
	National taxes	Regional product	National taxes	Regional product
Antioquia	15.8	15.7	10.5	5.8
Atlántico	3.5	5.0	6.0	4.9
Bogotá	53.1	23.2	31.3	7.6
Bolívar	1.3	3.7	2.5	3.9
Boyacá	0.5	3.1	1.3	4.2
Caldas	1.3	2.4	4.2	4.1
Caquetá	0.1	0.8	0.7	3.7
Cauca	0.3	1.5	1.0	2.4
Cesar	0.2	1.7	0.8	3.6
Córdoba	0.4	2.1	1.2	3.1
Cundinamarca	4.1	5.0	7.0	4.6
Chocó	0.0	0.5	0.4	2.1
Huila	0.4	1.9	1.6	4.1
La Guajira	0.3	1.3	2.0	5.4
Magdalena	0.3	1.7	0.9	2.6
Meta	0.3	2.0	1.7	5.8
Nariño	0.3	1.9	0.7	2.4
N. Santander	0.5	2.0	1.3	3.3
Quindío	0.3	1.2	2.2	5.0
Risaralda	1.4	2.0	6.0	4.2
Santander	2.0	5.7	3.1	5.5
Sucre	0.2	0.9	0.7	2.6
Tolima	0.9	2.9	1.9	3.9
Valle	12.1	11.9	10.8	5.5
Stand. Dev.	**10.9**	**5.1**	**6.8**	**1.3**
Average	**4.2**	**4.1**	**4.2**	**4.2**

Source: Ministry of Finance for taxes and Department of Statistics for GDP.

Table 3.

Regional incidence of national taxes

$TAX_j / TAX_N = f(GRP_j / GDP_N)$	Constant	GDP coefficient	R^2
In levels	-3.8434 (1.0945)**	1.9224 (0.1631)**	0.8571
In per capita terms	-10.1967 (3.0295)**	3.4473 (0.6924)**	0.5298

Source: Author´s calculations

This distinction is important, as investment may or may not generate a market return for the government, which in turn might result in the borrowing used to finance investment constituting a tax liability, or not. In summary, four different cases for the share of the national deficit which regional taxpayers can expect to cover in the future (TLD) are considered below:

$$TDL_{j1} = (Y_j / Y_N)DEF_N^{Current} \qquad [8a]$$

$$TDL_{j2} = (Y_j / Y_N)DEF_N^{Total} \qquad [8b]$$

$$TDL_{j3} = (Y_j^{PC} / Y_N)DEF_N^{Current} \qquad [8c]$$

$$TDL_{j4} = (Y_j^{PC} / Y_N)DEF_N^{Total} \qquad [8d]$$

According to Bayoumi and Masson (1998) the NTLD is calculated as the region-specific national deficit minus the tax liability part of the deficit, which considers these four cases for TLD:

$$NTLD_{j1} = DEF_j^{N\ Current} - (Y_j / Y_N)DEF_N^{Current} \qquad [9a]$$

$$NTLD_{j2} = DEF_j^{N\ Total} - (Y_j / Y_N)DEF_N^{Total} \qquad [9b]$$

$$NTLD_{j3} = DEF_j^{N\ Current} - (Y_j^{PC} / Y_N)DEF_N^{Current} \qquad [9c]$$

$$NTLD_{j4} = DEF_j^{N\ Total} - (Y_j^{PC} / Y_N)DEF_N^{Total} \qquad [9d]$$

In the specification of regional consumption, the following variables are also included: regional deficits (RD), which are expected to be a tax liability; regional income (Y); pre-existing levels of regional and national debt, which are measured as first lags of liability-creating deficits, since the change in debt is equal to the deficit; and the level of government consumption (G). It is important to bear in mind that $NTLD_{jt}^N$ and TLD_{jt}^N are estimated for the total and current national deficits, as explained above. The equation to be estimated is as follows, where the subscript *j* denotes regions and *t* time under analysis:

$$\Delta C_{jt} = \alpha_j + \beta\Delta Y_{jt} + \delta\Delta G_{jt} + \lambda\Delta NTLD_{jt}^N + \varphi\Delta TLD_{jt}^N + \eta\Delta DEF_{jt} + \gamma TLD_{jt-1}^N + \sigma DEF_{jt-1} \qquad [10]$$

A Keynesian framework would predict that an increase in deficits would have a positive effect on aggregate demand, implying that ,φ, $\eta > 0$. As Modigliani, (1987: 105) maintains, the size of the increase depends on the source of change in the deficit. Nevertheless, according to the classical view, the response in consumption terms can become negative as the fiscal deficit increases, given that higher government debt lowers capital accumulation. Thus, according to the model, it is expected that NTLD should have a larger positive, or a smaller negative, impact on sub-national consumption with respect to the regional deficit and NTLD. This implies that λ should be greater than φ, η. Since, the liability-creating part of the national deficit is assumed to be subject to Ricardian equivalence, as consumers anticipate the future impact of the deficit on their taxes, a small impact in consumption is expected to occur as this kind of deficit increases. By contrast, the non-liability-creating part of the deficit does not generate any expectation of future regional tax liabilities, so that this part of the deficit should have a larger impact on the stabilization policy. For their part, the coefficients

of the pre-existing levels of debt are expected to be negative. The coefficient of government consumption should also be negative, while the coefficient of income is predicted to be positive.

Data

The fiscal variables used in the analysis are from the Colombian Central Bank and information on national fiscal variables from the Ministry of Finance. Regional-specific national deficits (N_j) is equal to: $ND_j = NT_j - NE_j$, where NT_j corresponds to the national taxes collected by each region and NE_j represents the expenditure carried out by the national government in each region, including intergovernmental transfers. The estimate of the national current expenditure (wages, pensions and purchases) carried out in each region was made taking into account the number of public employees working at regional level but paid by central government. This information is available for each ministry and each category of employment. Information on intergovernmental transfers is available for each region. For its part, details of national investment in each region were provided by the National Planning Department. Finally, Graphs for regional GDP and private consumption were obtained from the National Department of Statistics.

Results

Equation (10) is estimated for the four different definitions of TLD and NTLD reported above. These are labeled model1, model2, model3 and model4, respectively. The estimations are carried out by using panel data models for the period 1987-1997, covering the period before and after decentralization was strengthened, for 24 regions. The Hausman and LM tests suggest that the random effects model is the most suitable. The results for this model, using first differences, are reported in Table 4. It is notable that the use of variables for

tax levels and in per capita terms do not make a difference in the significance or in the signs of the coefficients, although, in absolute values, coefficients that use per capita variables (3 and 4) are lower than those for the models that use variables in levels (1 and 2).

As expected, in all four models changes in income have a positive and significant effect on changes in consumption, and changes in government consumption (current expenditure for models 1 and 3 and total expenditure for models 2 and 4) have a negative and significant effect. With respect to fiscal variables, it is found that for models 2 and 4, which use total rather than current deficits, the coefficient of NTLDs is significantly positive and higher than that of TLDs. The results support the theoretical model, considering that the impact on consumption is higher for those deficits that regions do not expect to finance in the future, since they could be covered by surpluses in other regions. However, in the different models the TLDs have different impacts on consumption. In particular, while coefficients of regional deficits are significantly positive, the liability part of the national deficit is significantly negative. This result could be explained, as Fatás (1998) suggests, by the fact that transfers from central government to the sub-national public sector also have an impact on the overall national budget balance.

In Colombia, the national deficit increased significantly after the strengthening of fiscal decentralization. A proportion of this growth has been attributed to the increase in transfers to regions and municipalities. This situation was worsened by the low economic growth observed in the country during the second half of the 1990s, which negatively affected the collection of national taxes in most regions of the country. This fall in tax revenues created a national deficit that needed to be paid in the future by all regions of the country, affecting consumption decisions. Thus, the proportion of the national deficit that regions should expect to cover in the future, rather that stimulating private

Ligia Alba Melo-Becerra

Table 4.

Impact of fiscal stabilization on private consumption

Variables	Model 1[1/]	Model 2[2/]	Model 3[3/]	Model 4[4/]
Δ Non-liability-creating deficit (National level)	-0.344E-02 (0.277E-02)	0.736E-01 (0.381E-02)**	-0.243E-02 (0.357E-02)	0.644E-02 (0.159E-02)**
Δ Liability creating deficit (National level)	-0.100E-01 (0.304E-02)**	-0.492E-01 (0.212E-02)**	-0.111E-01 (0.305E-02)**	-0.268E-01 (0.216E-02)**
Δ Regional deficit5/	0.880E-02 (0.249E-02)**	0.261E-02 (0.227E-03)**	0.753E-02 (0.248E-02)**	0.121E-02 (0.227E-03)**
Lagged national deficit (Liability part)	0.991E-04 (0.209E-04)**	0.849E-03 (0.167E-04)**	0.103E-03 (0.185E-04)**	0.388E-03 (0.149E-04)**
Lagged regional deficit	-0.559E-04 (0.434E-04)	0.496E-03 (0.464E-04)**	-0.742E-04 (0.450E-04)*	0.503E-04 (0.422E-04)**
Δ Government Consumption6/	-0.60335 (0.127E-01)**	-0.94449 (0.741E-02)**	-0.505E-01 (0.133E-01)**	-0.47023 (0.715E-02)**
Δ Income	1.6248 (0.129E-01)**	2.0575 (0.872E-02)**	1.5287 (0.131E-01)**	1.5637 (0.694E-02)**
LM test	14.35**	14.82**	14.11**	14.15**
Hausman test	0.93	1.01	0.93	1.01

Note: ** Coefficient significant at 5% significance level.* Coefficient significant at 10% significance level.
Estimated constant terms are not reported.

[1/]Model 1 $TLD_{j1} = (Y_j / Y_N)DEF_N^{Current}$ and $NTLD_{j1} = DEF_N^{Current} - (Y_j / Y_N)DEF_N^{Current}$

[2/]Model 2 $TLD_{j2} = (Y_j / Y_N)DEF_N^{Total}$ and $NTLD_{j2} = DEF_N^{Total} - (Y_j / Y_N)DEF_N^{Total}$

[3/]Model 3 $TLD_{j3} = (Y_j^{PC} / Y_N)DEF_N^{Current}$ and $NTLD_{j3} = DEF_N^{Current} - (Y_j^{PC} / Y_N)DEF_N^{Current}$

[4/]Model 4 $TLD_{j4} = (Y_j^{PC} / Y_N)DEF_N^{Total}$ and $NTLD_{j4} = DEF_N^{Total} - (Y_j^{PC} / Y_N)DEF_N^{Total}$

[5/] Current regional deficits for models 1 and 3, and total regional deficits for models 2 and 4.
[6/] Current expenditure for models 1 and 3, and total expenditure for models 2 and 4.
Source: Author´s calculations.

consumption, might have crowded out investment, directly reducing aggregate demand[3].

When current deficits are used – models 1 and 3 – coefficients of both the liability and non-liability parts of the national deficits are negative. This might be explained by the fact that the adjustment of the national deficit was carried out via investment payments rather than current expenditure.

---

3   It worth mentioning that the crowding out effect is closely relate to the theory of government spending multiplier, which size according to Christiano, Eichenbaum and Rebelo (2011) is affected by nominal interest rates. When nominal rates are constant, the government multiplier can be very large. Specifically, the authors argue that "the government-spending multiplier can be much larger than one when the nominal interest rate does not respond to an increase in government spending" pp. 79.

In particular, the share of investment in the total public expenditure of the nation dropped from 16.1% in 1993 to 8.3% in 2000. Consequently, the national current deficit registered a greater increase than the national total deficit, implying a lower impact on consumption when it is borne in mind that investment did not generate a market return for the government as it might have. For their part, the coefficients of regional current deficits are significantly positive and are higher than the coefficients of the national deficits, suggesting that when investment is not included in the analysis, regional deficits played a greater stimulatory role on consumption than their national counterparts.

The results of the models suggest that the decentralization process observed in Colombia in the 1990s had an impact on the country's public finances and consequently on regional consumption decisions. Although it is expected that intergovernmental transfers will not have had an impact on regional consumption decisions, since a regional deficit could be financed by surplus in other regions, it is important to consider that such transfers also have an impact on the deficit as a whole. This deficit, which is higher when only current expenditure is included in the analysis, should be covered through future taxes sourced from all regions of the country.

Regional stabilization and redistribution through the central budget

In the previous section, it was assumed that national fiscal policy was more effective than sub-national fiscal policy in counteracting regional negative shocks, bearing in mind that while a national deficit in a region tends to cancel out surpluses in other regions, regional deficits must be financed by the region where they occur. This section focuses on estimating the stabilization and redistribution obtained by regions as a result of national tax policy and the intergovernmental transfers system without affecting the national aggregates, in cases when a shock hits one region and others are unaffected.

In the Colombian case, the intergovernmental transfer system established by Law 60 of 1993 defined the pool of resources to be distributed across regions as a share of national tax collection, implying that the level of transfers from central government towards a region that suffers an adverse shock will not necessarily increase, and might even decrease depending on the economic performance observed in the rest of the regions[4].

Thus, although a regional adverse shock might reduce the collection of national taxes in the region, absorbing part of the initial decrease in income, the role that intergovernmental transfers have played in attenuating regional adverse shocks is less clear.

Most of the research that has addressed the role of national transfer and taxes in attenuating regional adverse shocks has focused on analyzing the intergovernmental transfer system of the European Union. These studies have also estimated the impact of national fiscal stabilizers in federal countries, especially the United States and Canada. The estimates of regional stabilization achieved through national taxes and transfers differ widely across studies. The differences in the impact of national fiscal policy on regional stabilization are mainly explained by the variables used in the studies. In particular, results differ depending on the variable used to measure regional income, which may be based on personal income or gross product (see for example Von Hagen, 1992; Obstfeld & Peri, 1998; Sala-i-Martin & Sachs, 1991; and Mélitz & Zumer, 2001).

In addition to examining stabilization effects, some studies have also looked at the regional redistribution effects of national fiscal policy (Bayoumi & Masson, 1995; Obstfeld & Peri, 1998; and Mélitz & Zumer, 2001). In this section, the role of national fiscal stabilizers on regional stabilization and distribution is estimated using the methodology proposed by Mélitz & Zumer (2001), who summarized most of the methodologies that had previously been employed. In addition, the methodology proposed by Sala-i-Martín & Sachs (1992) is used to measure the independent effects of taxes and transfers, allowing responses to be examined region by region.

The model considering net transfers

In this section, aggregated disposable income is used to establish the role of national fiscal stabilizers in attenuating regional adverse shocks. In addition to the stabilization obtained using the

---

4   Details of the Colombian transfer system defined by Law 60 are found in Bonet, Pérez and Ayala (2014); Iregui, Ramos and Saavedra (2001); Lozano, Ramos and Rincón (2007); Melo (2002).

Table 5.

Stabilization of gross regional product

Net Transfers	Fixed effects			Random effects		
	β	R²	1-β	β	R²	1-β
Indirect taxes and transfers	0.9611 (0.0060)**	0.98794	0.0389	0.9614 (0.0059)**	0.98794	0.0386
Direct taxes and transfers	0.9855 (0.0061)**	0.98831	0.0145	0.9852 (0.0060)**	0.98831	0.0148
Total taxes and transfers	0.9881 (0.0077)**	0.98095	0.0119	0.9878 (0.0076)**	0.98095	0.0122

Note: ** Coefficient significant at 5% significance level.* Coefficient significant at 10% significance level. Estimated constant terms are not reported.
Source: Author´s calculations.

central government budget, estimations of the redistribution role are also carried out, according to the proposition that the national tax and transfer systems are designed, in part, to reduce income differentials and in part to provide insurance against regional asymmetric shocks. The impact of these measures does not always coincide, and "strong redistributive measures do not imply strong stabilization or the converse" (Mélitz & Zumer, 2001:10). The stabilization role of national fiscal flows measures the impact of national taxes and transfers in responding to deviations in income from a growth path, while redistribution is associated with long-term income differentials.

Stabilization effects

The stabilization role is measured as the impact of regional disposable income on deviations in regional income from a growth path.[5] This impact is measured using panel data models, including fixed and random effects methods of estimation. The basic equation to be estimated is described below:

$$\Delta(Y - TX + TR)_{jt} / (Y - TX + TR)_{Nt} = \alpha_{jt} + \beta_{jt} \Delta(Y_{jt} / Y_{Nt}) + \varepsilon_{tj} \qquad [11]$$

Variables are measured in real per capita terms and as a proportion of the national aggregates. In order to be consistent with the analysis of decentralization, Y represents the regional gross product. In the estimation of disposable income, intergovernmental transfers should be included, considering that this kind of transfer supports regional activity. When regional personal income is used, the inclusion of intergovernmental transfers is less clear, considering that part of these resources benefits people from other regions. *TX* and *TR* represent national taxes and transfers, respectively. Subscript *j* refers to individual regions; *N* indicates national information and *t* time under analysis. The stabilization effect is measured as *1*–β and the parameter β in equation 11 is expected to be significantly different from 1.0.

The estimate also considers different categories of net transfers, by using indirect taxes only, direct taxes only, and a combination of the two. According to the results, the role of national fiscal taxes and transfers on regional stabilization has been on average very small. In fact, when both categories of taxes are included in the analysis, national taxes and transfers stabilize on average 1.2% of regional adverse shocks, 3.9% when indirect taxes are used, and 1.5% with direct taxes (see Table 5).

The low stabilization role of national fiscal stabilizers could be associated with the fact that a

---

5   The analysis concentrates on permanent shocks, taking into account, as explained above, that the use of fiscal stabilisers are more effective when deviations are temporary than when they are permanent.

fall in the income of a region is not always offset by an increase in the income of other regions, a factor that is reinforced by the transfers system that was applied in Colombia during the 1990s. This does not imply that some regions might benefit greatly from insurance benefits, while the benefit to others would be minimal.

Redistribution effects

The redistribution impact of national taxes and transfers across regions means it is possible to establish the extent to which national fiscal stabilizers tend to equalize regional income across regions. In the literature, this impact is measured by estimating the relationship between regional average disposable income over a period of time and regional average income over the same period, both variables being defined as ratios of the corresponding national aggregates. The redistribution flows are measured using cross-sectional regressions, which permit the degree to which national taxes and transfers reduce inequalities in income across regions to be established. In particular, the following specification is used:

$$(Y - TX + TR)_j / (Y - TX + TR)_N =$$
$$\alpha + \gamma Y_j / Y_N + \varepsilon_j \qquad [12]$$

As before, Y represents the regional per capita product, TX and TR represent national taxes and transfers, respectively.[6] The subscript j refers to individual regions and N indicates national information. Here, the redistribution effect is measured as $1 - \gamma$ and the parameter γ is expected to be significantly different from 1 in equation (12). Different authors have found that using this specification results in the redistribution of regional income varying between 15 and 20% in the US and between 10 and 15% in Canada.

---

6   Considering our interest on decentralisation, here, we also use regional product rather than personal income, a variable that, according to the Mélitz and Zumer (2001), allows the inclusion of intergovernmental transfers when calculating disposable income. This inclusion is not clear when personal income is used.

The distribution role of intergovernmental transfers and national indirect taxes is 8.6%; it reaches 10.8% when direct taxes are included in the analysis, and 14.1% when the total internal taxes are used (see Table 6). These results suggest that in Colombia the distribution role of national taxes and transfers has been more important than the stabilization role. This aggregated analysis, however, does not make it possible to identify how much of the distribution role comes from intergovernmental transfers and how much from national taxes. This question is analyzed in the next section.

Table 6.

Redistribution of gross regional product

Net Transfers	Γ	R^2	$1-\gamma$
Indirect taxes and transfers	0.9138 (0.0157)**	0.99357	0.0862
Direct taxes and transfers	0.8919 (0.0224)**	0.98631	0.1081
Total taxes and transfers	0.8584 (0.0323)**	0.96985	0.1416

Source: Author´s calculations.

The model considering the effects of transfers and taxes separately

This section examines the separate responses of taxes and transfers to regional product changes. The basic question under analysis is whether national transfers and taxes played a role in attenuating the effect of regional income shocks by redistributing income to adversely shocked regions from others that had been favorably shocked. Variables are measured in real per capita terms and are defined as ratios of the corresponding national aggregates.

In order to carry out this analysis, the response of *regional disposable income* to shocks in that *region's income* is estimated, using the following basic equation based on Sala-i-Martín and Sachs (1992): $\Delta YD \equiv \Delta Y + \Delta TR - \Delta TX$, where disposable income (YD) is defined as the sum of income (Y), plus transfers from national government (TR),

minus tax paid to the national government (TX). Taking into account that disposable income may be expressed as $\Delta YD \equiv \Delta Y * \lambda$, where $\lambda = (1 - \beta_{TX}TX/Y + \beta_{TR}TR/Y)$, $\beta_{TX} = \dfrac{\Delta TX / TX}{\Delta Y / Y}$ and $\beta_{TR} = \dfrac{\Delta TR / TR}{\Delta Y / Y}$, the response in disposable income is equal to λ. Thus, it is expected that pro-cyclical taxes ($\beta_{TX} > 0$) and counter-cyclical transfers ($\beta_{TR} < 0$) will stabilize disposable income in the face of regional income shocks.

In order to calculate this parameter, β_{TX} and β_{TR} elasticities are estimated using relative variables, where *relative x* refers to the ratio of region *i's x* to the overall national value of *x* (where *x* is tax revenue, transfers or personal income). Time variable reflects trends in relative taxes and transfers that are not explained by the relative variations in income.

$$Ln\ (TX_{jt} / TX_N)\ =$$
$$\alpha_{TX} + \beta_{TX}\ ln\ (Y_{jt} / Y_N) + \gamma_{TX}\ TIME + v_j \qquad [13]$$

$$Ln\ (TR_{jt} / TR_N)\ =$$
$$\alpha_{TR} + \beta_{TR}\ ln\ (j_{it} / Y_{Nt}) + \gamma_{TR}\ TIME + \varepsilon_j \qquad [14]$$

The coefficients β_{TX} and β_{TR} tell us by what percentage the region's taxes and transfers change (relative to the rest of the country's national taxes and transfers) when its income changes by one percent and the changes in aggregate income of the country are held constant. As in Sala-i-Martín & Sachs (1992), the use of these equations makes it possible to avoid picking up changes in national budget deficits, when the country as a whole suffers a recession. For instance, if taxes were to remain constant and transfers increase or not change, the national government would absorb some of the initial shock. The coefficients β obtained from the previous equations are used to calculate λ, which indicates by how much the national government absorbs regional income shocks through taxes and transfers, reducing the impact on disposable income.

Variables used in the empirical analysis are measured in real per capita terms, which, considering that in Colombia regions are quite heterogeneous in population, avoids heteroscedasticity problems. Information on transfers was taken from a database developed by the Colombian Central Bank while the information on national taxes was obtained from the Colombian Ministry of Finance. It is worth pointing out that, according to the means of the variables used in the analysis, on average the collection of national per capita taxes is greater than the per capita transfers received from central government in only seven regions of the country. Another interesting point to note is that a large variation in the tax take was observed across regions. For instance, while in Bogotá national per capita taxes reached on average COP361,600 over the period analyzed, 22% of the national total, while in the Department of Chocó taxes reach only COP7,600 per capita, or 0.5% of the total. Per capita transfers, for their part, show a more homogeneous distribution across regions with a standard deviation of COP16,900 and, contrary to what occurred with taxes, Bogotá receives the lowest per capita transfers in the country.

Relative taxes and transfers equations were estimated using panel data models, employing three different methods. The results are reported for each region in Tables 7 and 8. Column one of each table shows βTX and βTR coefficients estimated using OLS, with a common intercept for the different groups. The second column reports coefficients obtained with the GLS estimator, using estimated cross-section residual variances, assuming the presence of cross-section heteroscedasticity. Coefficients reported in column 3 are estimated using the fixed effect method, which considers different intercepts for each pool group. Finally, relative national per capita taxes and relative per capita transfers are shown in column 4 of both Tables 7 and 8.

From Table 7, it is apparent that coefficients of β_{TX} register large variations across regions using each of the three different methods that were used. According to the results, when observations are not weighted, there is a significant positive relationship between relative taxes and relative income, when the share of national taxes in the region is greater

than 3%. The coefficient is not significant when this share is less than 2.2% and greater than 0.5%; in the case of Chocó, where the share is 0.47%, the relationship is negative and significant. When observations are weighted, coefficients are positive and significant when taxes from the region represent more than 1.4% of the total national tax take. Coefficients that are not significant are observed in regions where this share is around 1%; as in the previous case, the coefficient of Chocó is negative and significant. Under the fixed effect method, no particular pattern is observable with respect to the share of taxes in each region. In this case, the largest β_{TX} coefficient corresponds to Bogotá (5.935), which, in turn, has the largest per capita share of national taxes in the country.

With respect to transfers, a negative coefficient in the relative transfer equation would be expected if the transfers were counter-cyclical, reflecting the fact that if constant national aggregate variables are held, an increase in regional income reduces transfers received from national government. For the Colombian case, a negative relationship between these two variables is found only for Bogotá and Atlántico, when the OLS and GLS specifications are used, and only for Antioquia, when the fixed effect model is used. These regions register the highest per capita national tax collection in the country and receive the lowest per capita transfers from national government. The great variance in the β_{TR} coefficients is not surprising since, unlike taxes, the role of the system has not been to trigger an automatic reaction to regional product. In fact, a large percentage of transfers from central government to the sub-national public sector is redistributed according to a formula that takes into account, amongst other variables, population and current and potential education and health services users.

Table 7.

Relative taxes vs. relative income (β_{TX})

Region	OLS	GLS with cross-section weights	Fixed effects	Relative taxes TX_i/TX_{NA}
Antioquia	1.8114 (0.1082)**	1.9380 (0.0621)**	0.7982 (1.6622)	0.123
Atlántico	0.9639 (0.1434)**	1.317 (0.0624)**	-1.0189 (0.5463)*	0.061
Bogotá	2.4774 (0.0765)**	2.5669 (0.1145)**	5.9355 (0.5224)**	0.220
Bolívar	0.3024 (0.1706)*	0.5020 (0.0454)**	0.9391 (0.9917)	0.029
Boyacá	-0.09932 (0.1425)	0.0675 (0.0360)**	0.2006 (1.2459)	0.014
Caldas	1.0471 (0.1693)**	1.2451 (0.0862)**	-2.3055 (0.6997)**	0.058
Caquetá	-0.8885 (0.2441)	0.1966 (0.0690)**	0.8307 (1.0818)	0.016
Cauca	-0.1052 (0.2383)	0.1734 (0.0638)**	0.9838 (1.2923)	0.016
Cesar	-0.3233 (0.2175)	-0.0688 (0.0552)	0.1419 (0.9599)	0.009
Córdoba	-0.1007 (0.2146)	0.1503 (0.0550)**	0.3779 (1.8694)	2.19
Cundinamarca	0.6256 (0.1138)**	0.7587 (0.0311)**	0.2488 (0.3352)	0.053
Chocó	-0.7202 (0.3227)**	-0.3428 (0.0835)**	0.1955 (1.0701)	0.005

Region	OLS	GLS with cross- section weights	Fixed effects	Relative taxes TX/TX$_{NA}$
Huila	-0.0263 (0.1406)	0.1382 (0.0359)**	0.1849 (1.4125)	0.018
La Guajira	0.0816 (0.1172)	0.2183 (0.0343)**	0.1345 (0.1933)	0.023
Magdalena	-0.3180 (0.2373)	-0.0403 (0.0592)	-0.3408 (2.0013)	0.010
Meta	0.0326 (0.1084)	0.0297 (0.0297)**	-0.4454 (0.6849)	0.021
Nariño	-0.4488 (0.2852)	-0.1152 (0.0724)	-0.1731 (1.2865)	0.009
N. Santander	-0.0439 (0.1938)	0.1826 (0.0574)**	0.9845 (0.7237)	0.017
Quindío	0.3037 (0.1097)**	0.4320 (0.0388)**	0.8604 (0.3682)**	0.036
Risaralda	0.8475 (0.1199)**	0.9879 (0.0382)**	1.0878 (0.6350)*	0.063
Santander	0.3658 (0.1127)**	0.4977 (0.0294)**	0.3545 (0.9556)	0.039
Sucre	-0.3797 (0.2807)	-0.0514 (0.0709)**	0.0983 (1.0450)	0.010
Tolima	0.4384 (0.1584)*	0.6238 (0.0473)**	-1.1478 (0.9730)	0.036
Valle	1.3108 (0.1040)**	1.4326 (0.0504)**	0.3968 (0.6961)	0.097
R-squared	0.959481	0.934111	0.967495	
Common Coefficient	2.2497 (0.0985)**	1.8322 (0.0442)**	0.4590 (0.1354)**	

(1) and (2) consider a common intercept for all regions (3) considers different intercepts for each pool member.
Source: Author´s Calculations.

Table 8.

Relative transfers vs. relative income (β_{TR})

Region	OLS	GLS with cross section weights	Fixed effects	Relative transfers TR/TR$_{NA}$
Antioquia	0.0628 (0.0480)	0.1464 (0.0445)**	-1.8786 (0.7590)**	0.038
Atlántico	-0.1264 (0.0637)**	-0.0157 (0.0531)	0.2136 (0.2494)	0.029
Bogotá	-0.1215 (0.0340)**	-0.0624 (0.0293)**	0.6376 (0.2385)**	0.024
Bolívar	-0.0173 (0.0758)	0.1144 (0.0619)*	0.0323 (0.4528)	0.034
Boyacá	0.2807 (0.0633)**	0.3908 (0.0559)**	0.1275 (0.5689)	0.047
Caldas	0.2390 (0.0752)**	0.3697 (0.0617)**	-0.3082 (0.3195)	0.043
Caquetá	0.6546 (0.1084)**	0.8431 (0.1039)**	2.2796 (0.494)**	0.051
Cauca	0.0958 (0.1059)	0.2799 (0.0918)**	0.1293 (0.5901)	0.038

Region	OLS	GLS with cross section weights	Fixed effects	Relative transfers TR_i/TR_{NA}
Cesar	-0.0695 (0.0966)	0.0984 (0.0821)	0.0233 (0.4383)	0.032
Córdoba	-0.0192 (0.0953)	0.1464 (0.0821)*	-1.1163 (0.8536)	0.034
Cundinamarca	0.1155 (0.0506)**	0.2034 (0.0451)**	0.2688 (0.1530)*	0.040
Chocó	1.1431 (0.1434)**	1.3922 (0.1495)**	0.4901 (0.4886)	0.056
Huila	0.6156 (0.0625)**	0.7243 (0.0565)**	0.0289 (0.6450)	0.062
La Guajira	0.4943 (0.0520)**	0.5846 (0.0491)**	0.3585 (0.0882)**	0.059
Magdalena	-0.0410 (0.1054)	0.1422 (0.0891)	0.1948 (0.9139)	0.033
Meta	0.2127 (0.0481)**	0.2964 (0.0411)**	-0.0410 (0.3127)	0.046
Nariño	0.1623 (0.1267)	0.3825 (0.1034)**	0.6816 (0.5874)	0.377
N. Santander	0.2935 (0.0861)**	0.4431 (0.0710)**	0.9192 (0.3305)**	0.043
Quindío	0.2467 (0.0487)**	0.3314 (0.0429)**	0.4124 (0.1681)**	0.048
Risaralda	0.1700 (0.0533)**	0.2626 (0.0465)**	0.1837 (0.2900)	0.043
Santander	0.1918 (0.0501)**	0.2788 (0.0418)**	0.5169 (0.4363)	0.045
Sucre	0.4119 (0.1247)**	0.6286 (0.1266)**	-1.6422 (0.4772)**	0.044
Tolima	0.2196 (0.0704)**	0.3420 (0.0584)**	0.6444 (0.4443)	0.043
Valle	-0.0351 (0.0462)	0.0452 (0.0381)	0.4829 (0.3178)	0.032
R-squared	0.822692	0.931369	0.849790	
Common Coefficient	-0.0649 (0.0309)**	0.0106 (0.0234)	0.3461 (0.0492)**	

(1) and (2) consider a common intercept for all regions; (3) considers different intercepts for each pool member.
Source: author´s calculations.

Finally, in order to analyze whether the national government actually absorb regional shocks, following Sala-i-Martín & Sachs (1992), the estimated elasticities are evaluated at the average levels of income, taxes and transfers and then λ is calculated. Thus, when income changes by one peso, taxes change by $\lambda_{TX} = \beta_{TX} * TX_j/Y_j$ and transfers change by $\lambda_{TR} = \beta_{TX} * TR_j/Y_j$, where TX_j/Y_j is the average tax rate and TR_j/Y_j is the average transfers received by the region. Disposable income for region i increased by $\lambda = (1-\lambda_{TX} - \lambda_{TR})$ cents after a one peso shock to that region's income.

Results for λ_{TX}, λ_{TR} and λ are reported in Table 9. The parameters of the first three columns are calculated using the estimated β obtained by using the GLS method, and the last three columns by using the coefficients of the fixed effects method. The results suggest that, on average, when a region suffers a one peso adverse shock to income, its average national tax payments reduce by approximately 4 cents and its average transfers by between

1 and 3 cents.[7] Hence, disposable per capita income decreases on average 98 cents. Thus, on average, only 2% of the initial regional shock is absorbed by the national government. When the analysis is undertaken region by region, important differences are observed. For instance, in the case of Bogotá, it is found that a one peso reduction in income led to reductions in the national tax take of between 35 and 81 cents, while transfers changed by one cent. Hence, the fraction of the initial shock absorbed by the national fiscal system fluctuates between 35% and 80%. This large variation in the case of Bogotá can be explained by the fact that whilst taxes in per-capita terms represent 22% of the total taxes, transfers only represent 2.4%. Thus, a reduction in Bogotá's income will reduce national tax payments significantly, but not necessarily the levels of transfers received from central government, which do not depend directly on regional income variations.

Another interesting finding is that, in some cases, disposable income falls by more than the original adverse shock. For instance, in the Department of Caquetá, disposable income falls between COP1.08 and 1.23. In this case, an adverse shock in income generates a reduction in national taxes of between 6 and 2.5 cents and in transfers of between 9.5 and 25.5 cents. In most cases, final disposable income falls by one peso, when the average region suffers a one peso adverse shock. In these cases, central government does not necessarily absorb regional shocks. Thus, as analyzed below, the role of national taxes and transfers has been redistributive rather than stabilizing.

An estimation of the relative income variance between regions, effected using the formula $V(Y) = V(DY) + V(TX) + V(TR) + 2Cov(DY,TX) + 2Cov(DY,TR) + 2Cov(TX,TR),$ shows a variance of regional relative income of 28.9. The main source of this variation is national taxes, which register a variance of 23.0. In turn, intergovernmental transfers only show a variance of 0.9. These results indicate that

stabilization policy derives mainly from a reduction in the national tax take rather than an increase in intergovernmental transfers. This is not surprising bearing in mind that in Colombia the main purpose of transfers is the provision of public goods rather than responding to regional adverse shocks.

From the results, it may be suggested that, by using national tax and intergovernmental transfers, the Colombian fiscal system redistributed income from high income to lower income regions. The results also suggest that on average the national government did not absorb a substantial fraction of the interregional shocks by redistributing income from favorably shocked to adversely shocked regions. However, large asymmetries are observed across regions in terms of the beneficial role played by national fiscal stabilizers in attenuating regional adverse shocks. The secondary role of regional stabilization can be, in part, explained by the intergovernmental transfers system, which linked the definition of the pool of transfers to the total collection of national taxes. Thus, regions were affected not only by their own regional cycles, but also by the national cycle as a whole. One region was responsible for the transfers that all the others received. Consequently, a given region's volatility affected the insurance benefits accrued by other regions. This phenomenon is explained by Fatás (1998), who suggests that for the national government "to be able to generate any amount of interregional insurance, regional incomes must not be perfectly correlated. Otherwise, all the risk would be aggregate risk, which cannot be insured by interregional transfers".[8] In particular, if a region's income falls, total tax revenue will decrease unless the tax revenue of other regions offsets the shortfall.

---

7   Calculations for the USA suggest that a one-dollar shock to the regional income reduces taxes to the federal government by 34 cents. For the European tax system, it was found that this reduction reached only half a cent.

8   The correlation coefficients between regional income and the country's income for the different regions are: Antioquia, 0.99; Atlántico, 0.89; Bogotá, 0.98; Bolivar, 0.84; Boyacá, 0.23; Caldas, 0.83; Caquetá, 0.78; Cauca, 0.85; Cesar, 0.95; Cordoba, 0.92; Cundinamarca, 0.99; Choco, 0.07; Huila, 0.93; La Guajira, 0.65; Magdalena, 0.99; Meta, 0.96; Nariño, 0.91; Norte de Santander, 0.89; Quindio, 0.44; Risaralda, 0.85; Santander, 0.91; Sucre, 0.93; Tolima, 0.98; and Valle, 0.99.

Table 9.

National impact on regional disposable income

Region	GLS with cross section weights			Fixed effect model		
	λ_{TX}	λ_{TR}	$\lambda = (1-\lambda_{TX}-\lambda_{TR})$	λ_{TX}	λ_{TR}	$\lambda = (1-\lambda_{TX}-\lambda_{TR})$
Antioquia	0.200	0.006	0.806	0.082	-0.072	0.846
Atlántico	0.080	-0.001	0.919	-0.072	0.008	1.080
Bogotá	0.351	-0.001	0.648	0.812	0.011	0.199
Bolívar	0.020	0.006	0.986	0.037	0.002	0.965
Boyacá	0.001	0.023	1.022	0.003	0.008	1.004
Caldas	0.094	0.024	0.930	-0.174	-0.020	1.154
Caquetá	0.006	0.095	1.089	0.025	0.256	1.230
Cauca	0.005	0.022	1.017	0.029	0.010	0.982
Cesar	-0.001	0.006	1.007	0.002	0.002	0.999
Córdoba	0.005	0.009	1.004	0.011	-0.065	0.924
Cundinamarca	0.036	0.009	0.972	0.012	0.011	0.999
Chocó	-0.004	0.229	1.233	0.002	0.081	1.078
Huila	0.003	0.056	1.053	0.004	0.002	0.999
La Guajira	0.005	0.038	1.033	0.003	0.023	1.021
Magdalena	-0.001	0.010	1.011	-0.007	0.014	1.020
Meta	0.003	0.014	1.011	-0.008	-0.002	1.006
Nariño	-0.002	0.037	1.039	-0.004	0.066	1.069
N. Santander	0.005	0.034	1.029	0.025	0.069	1.045
Quindío	0.013	0.016	1.003	0.026	0.019	0.994
Risaralda	0.058	0.012	0.954	0.064	0.008	0.944
Santander	0.017	0.013	0.996	0.012	0.024	1.011
Sucre	-0.001	0.072	1.073	0.002	-0.188	0.810
Tolima	0.028	0.021	0.993	-0.051	0.040	1.090
Valle	0.115	0.001	0.886	0.032	0.015	0.983
Average	0.043	0.031	0.988	0.036	0.013	0.977

Source: Author´s calculations.

Concluding remarks

Although traditionally the stabilization function has been attributed to central government, in a decentralized context, where fiscal policy is undertaken at different levels of government, regional and local authorities have a role to play too. In particular, when an increasing percentage of total public expenditure is carried out by local governments, the margin for maneuver available to central government to carry out stabilization is reduced. Similarly, irregular fiscal behavior by powerful regions can exert an important influence on national government policies.

These factors were observed in Colombia following the strengthening of the decentralization process. Indeed, a significant proportion of national taxes were transferred to the sub-national public sector, affecting the national government's margin for maneuver and its ability to manage fiscal policy. Similarly, regions and municipalities registered important fiscal deficits, which in several cases undermined national fiscal targets, with consequences for the macroeconomic program. On the other hand, the national fiscal deficit also registered a significant increase, a high proportion of which was generated by factors associated with the decentralization reforms. In particular, the increase in the scale of transfers to regions and municipalities implied greater current expenditure from central government, which was not offset by other current national expenditure. On the contrary, total national spending increased at a greater rate than transfers.

During the application of the decentralization reforms in Colombia both national and local fiscal deficits increased significantly. An evaluation of the impact of these deficits on regional consumption found that they had different stimulatory effects upon consumption, suggesting, effectively, that decentralization had fiscal effects. In particular, it was found that while regional deficits had a positive impact on regional consumption, the part on the national deficit that regions might expect to finance in the future had a negative impact on this variable, suggesting that it could crowd out investment rather than stimulate aggregated demand. These results support the findings obtained when the role of the national fiscal stabilizers on attenuating regional adverse shocks (found to be very low) was analyzed. The minor impact of national transfers on regional stabilization can be, in part, explained by the intergovernmental transfers system established by Law 60 of 1993, which linked the size of the pool of transfers to the total collection of national taxes. Thus, regional income is affected not only by the regional cycle but also by the overall national cycle. A region is also responsible for the transfers that other regions receive. Consequently, one region's volatility affects the stabilization benefits on other regions. Thus, for the national government to be able to generate interregional insurance, any decrease in a region's income should be offset by another region's tax revenue. Otherwise, as Fatás (1998) maintains "all the risk would be aggregate risk, which cannot be assured by interregional transfers". This phenomenon was aggravated by the significant increase in the national fiscal deficit[9], which was paid by all regions of the country.

---

9   The annual average national fiscal deficit represents as a percentage of GDP 1.2% during the first half of the 1990s and 4.8% during the second half.

REFERENCES

1. Ahmad, E. & Baer, K. (1997). Colombia, in (Ter-Minassian, T.), *Fiscal federalism in theory and practice* (pp. 457-485), International Monetary Fund).

2. Bahl, R., & Bird, R. (2008). Subnational Taxes in Developing Countries: The Way Forward. *Public Budgeting & Finance*, 28(4), 1-25.

3. Bayoumi, T. & Masson, P. (1998). Liability-creating versus non liability-creating fiscal stabilisation policies: Ricardian equivalence, fiscal stabilisation, and EMU, *Economic Journal*, 108, 1026-1045.

4. Bayoumi, T. & Masson, P. (1995). Fiscal flows in the United States and Canada: lessons for monetary union in Europe, *European Economic Review*, 39, 253-274.

5. Bonet, J., Pérez, G., & Ayala, J. (2014). Contexto histórico y evolución del SGP en Colombia. *Documento de Trabajo Sobre Economía Regional*, (205).

6. Cassette, A., & Paty, S. (2010). Fiscal decentralization and the size of government: A European country empirical analysis. *Public Choice*, 143(1-2), 173-189.

7. Christiano, L., Eichenbaum, M., & Rebelo, S. (2011). When Is the Government Spending Multiplier Large?. *Journal of Political Economy*, 119(1), 79-121.

8. Escobar-Lemmon, M. (2001). Fiscal Decentralization and Federalism in Latin America. *Publius: The Journal of Federalism*, 31(4), 23-41.

9. Faguet, J. (2014). Decentralization and Governance. *World Development*, 53, 2-13.

10. Falleti, T. (2005). A Sequential Theory of Decentralization: Latin American Cases In Comparative Perspective. *American Political Science Review*, 99(03), 327-346.

11. Falleti, T. (2006). Una Teoría Secuencial de la Descentralización: Argentina y Colombia en Perspectiva Comparada. *Desarrollo Económico*, 46(183), 317-352.

12. Fatás, A. (1998). Does EMU need a fiscal federation?, *Economic Policy*, 26, 165-203.

13. Feltenstein, A., & Iwata, S. (2005). Decentralization and macroeconomic performance in China: Regional autonomy has its costs. *Journal of Development Economics*, 76(2), 481-501.

14. Fukasaku, K. & De Mello, L. (1998). Fiscal decentralisation and macroeconomic stability: the experience of large developing and transition Economies, in (Fukasaku, K & Hausmann, R. eds.), *Democracy, decentralisation and deficits in Latin America*. IDB/OECD).

15. Garman, C., Haggard, S., & Willis, E. (2001). Fiscal Decentralization: A Political Theory with Latin American Cases. *World Politics*, 53(2), 205-236.

16. Gramlich, E. M. (1987). Federalism and federal deficit reduction, *National Tax Journal*, 40, 299-313.

17. Iregui, A. M., Ramos, J., & Saavedra, L. A. (2001). Análisis de la descentralización fiscal en Colombia. *Borradores de Economía*. Banco de la República, Subgerencia de Estudios Económicos.

18. Jin, J., & Zou, H. (2002). How does fiscal decentralization affect aggregate, national, and subnational government size?. *Journal of Urban Economics*, 52(2), 270-293.

19. Junguito, R., Misas, M. & Melo, L. (1995). Descentralización y Finanzas Públicas: Colombia 1967-1994, *Ensayos sobre política económica*, 27, 7-38.

20. Lozano, I., Ramos, J., & Rincon, H. (2007). Implicaciones Fiscales y Sectoriales de la Reforma a las Transferencias Territoriales en Colombia. *Borradores de Economía*, 437. Banco de la República.

21. Mélitz, J. & Zumer, F. (2002). Regional redistribution and stabilisation by the center in Canada, France, the UK and the US: A reassessment and new test, *Journal of public Economics,* 86, 155-306.

22. Melo, L. (2002). The flypaper effect under different institutional contexts: The Colombian case. *Public Choice, 111*(3-4), 317-345.

23. Modigliani, F. (1987). The economics of public deficits, in (Johnson, S. Ed.), *The collected paper of Franco Modigliani,* vol 5. The MIT Press.

24. Musgrave, R.A (1959). *The theory of public finance*. New York, McGraw-Hill.

25. Oates, W. (1990). Fiscal federalism: An overview, in (Prud'homme R eds.), *Public finance with several levels of government*, pp. 1-18), Foundation Journal Public Finance.

26. Obstfeld & Peri (1998). Regional non-adjustment and fiscal policy, *Economic Policy, a European Forum*, 26, 207-247.

27. Prud'homme R. (1995). On the dangers of Decentralisation, *World Bank Research Observer*, August.

28. Sala-i-Martín, X. & Sachs J. (1992). Fiscal federalism and optimum currency areas: evidence for Europe from the United States, in (Canzeroni, M., Grilli, V., & Masson P.), *Establishing a Central Bank: Issues in Europe and lessons from the US*, pp. 195-219, Cambridge University Press.

29. Shah, A. (1998). Fiscal federalism and macroeconomic governance. For better or for worse?, *Policy Research Working Paper,* 2005, The World Bank.

30. Shah, A. (2004). Fiscal decentralization in developing and transition economies: progress, problems, and the promise. *World Bank Policy Research working paper*, (3282).

31. Tanzi, V. (1996). Fiscal federalism and decentralisation: A review of some efficiency and macroeconomic aspects, *Annual World Bank conference on development economics*, pp. 295-316.

32. Ter-Minassian, T. (1997). Decentralisation and Macroeconomic Management, *Working Paper of the International Monetary Fund*, November.

33. World Bank (1995). *Colombia: Local government capacity-beyond technical assistance,* The World Bank, Washington.