Looking at the nexus between personal income distribution and regional GDP inequality in decentralized systems[1]

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Version 22/09/2016

Introduction

In the recent years, the debate on inequality and its economic and social impacts re-emerged with force at the global level, in academic discussions and the public policy debate. The use of new information and methodologies has made it possible to collect new evidence, allowing better visualization of the magnitude of the problem, its multiple dimensions and constraints with which was parsed previously (Amarante and Jimenez, 2015).

Although is clear that high inequality has deep consequences in terms of economic development, it is not so clear and exempt of controversies how this inequality has to be measured, what indicators we have to analyze and the public policies initiatives to faced it.

Between the multiple dimensions which observed inequality, two have deserved particular attention by fiscal policy: that related to the personal distribution of income by households, and that coming from the uneven distribution of income between regions. Because of its magnitude and persistence, these two dimensions are of particular interest for Latin America, both in analytical terms and policy design.

The overlapping of the typical measures of these two dimensions: personal inequality (measured by household income through household surveys) and regional inequality (measured through regional GDP), results in some countries that those regions most rich in terms of GDP are where the Gini coefficients are higher, those that most unequal in terms of personal income. This apparent paradox has been a worry for policy makers and cause of debate and conflict for what must be the indicator to analyze, the political public tool to use (transfers to region or persons?) and the dimension to attend.

Governments intentionally (and also non-intentionally) modify with their action the distribution of income by territories and by individuals. In a centralized system with only one level of government, both the territorial and the individual redistribution are operated only by the central government.

In a decentralized system the personal distribution of income is affected by fiscal and other, regulatory type, policies pursued by all level of governments when they intend to

[1] Paper prepared for the V Jornadas Iberoamericanas de Financiación Local, October 5-6, Santiago de Compostela.
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reduce the gaps. Fiscal policies include the, central, regional and local, provision of goods and services and transfers to individuals and, on the revenue side, the levying of central and regional taxes and fees. Their overall impact on personal distribution can be appreciated by using the concept of comprehensive income, which is the sum of remunerations to production factors net of taxes, other levies and transfers, plus the value of the goods and services provided.

Also territorial gaps of income/GDP can be and are reduced with various instruments and within various time frames. Summarizing, gaps are reduced in the immediate, but without the security of long lasting effects, through the re-localization of government offices (and employees) in the less developed regions. This can be captured by looking at the expenditure for factors of public production and their spatial allocation.

More in general, governments can reduce territorial gaps through the differential impact -estimated with the regional fiscal residuum - of all their expenditure and revenue policies, i.e. provision of goods and services and transfers to both individuals and firms and, on the revenue side, the levying of taxes and fees. In the medium term -meaning in a time long enough to fully display all rounds of reception and expense of income- the impact of the fiscal residuum on GDP can be estimated with a use of its income multiplier.

In the long run governments can reduce territorial gaps adding to the previous policies other fiscal and regulatory policies (usually referred to as regional or convergence policies) impacting on the localization of private firms, residents, and on the productivity of factors.

The variable commonly used to measure territorial disparities and the process of (long term) convergence is GDP. It implies looking at the production side of national and regional accounts, which is correct, although it is extremely difficult to assign long term changes in GDP to these policies. The notion of adjusted disposable income calculated in the national accounts provides an indicator of the redistribution operated by fiscal policies. It is the result of primary, secondary and in kind distribution of income operated through the various fiscal instruments, and is arrived to through various accounting steps that include the determination of the balance of primary income, the disposable income before reaching the adjusted disposable income.

While these indicators are widely available in the national accounts referred to the whole of the national economy, they are almost missing in the case of regional, or more geographically detailed accounts. This is because, as we will see in the paper, their calculation requires making crucial but delicate assumptions concerning the spatial incidence of public expenditure and revenues.

As a substitute, economists working of regional disparities use the fiscal residuum. As we will show, when we add to GDP the fiscal residuum we obtain the adjusted disposable income.

There are, however, (at least) two ways to look at the fiscal residuum. The first one, called in the literature the monetary income support, looks at the income generating impact of the fiscal residuum. The second one, called in the literature the welfare or real income impact, looks more closely at the impact of central government policies on the welfare of the residents of various regions. While in both cases territorial disparities are the focus of the analysis, the two approaches are distinct. While the monetary income support approach is more consonant with regional analysis, the welfare impact approach is more consonant, and establishes a link, with the typical analysis of fiscal policies on personal income distribution.

Governments can assign different weights and priorities to the correction of regional and personal inequalities. One could hence observe different long-term trends in territorial and personal inequalities, even in the case of perfectly successful policies. Also they can assign different weights to policies and especially to their temporal perspective. Governments may, for example, prefer short term policies that close/reduce gaps in the immediate, but are not suited to alter in a durable way the factors that originate the disparities.

As we can see, the issues are quite complex and modeling them is very difficult and very little tried in the literature.

By the side of the regional disparity, existing literature primarily focuses on the impact of intergovernmental relations and decentralization on the growth of the product between regions and their possible convergence. Feld, Zimmermann and Döring (2004) provide a comprehensive review regarding this literature. Brosio and Jimenez (2016) discussed the relationship between territorial inequality in some countries of the region and the asymmetrical allocation and distribution of natural resource rents.

By the other side, in the last years have grown significantly the analysis and publications (in Latin America and the world) referred to the impact of fiscal policy on the distribution of personal income. This debate, with methodological differences, has studied the incidence of fiscal policy in the personal distribution of income among households, through public spending and taxes, either at the level of the central government (Lustig, Pessino and Scott, 2013; Hanni, Martner, and Podesta, 2015) as those derived from fiscal policies carried out by different levels of government (Cont and Porto, 2016).

Other studies, abstract from assignments and fiscal policies and look at the differential stemming from operation of governments. For example, Bardhan and Mokerjee (2000) provide one of the best analytical contributions by focusing on the possibility of capture of local resources by the elites to the detriment of the poor.

Ramirez, Diaz and Bedoya (2016) look empirically at the operation of local governments in Colombia after decentralization. In their analysis reduction of poverty and personal inequality are linked to the effective provision of services and exploitation of local tax bases in a decentralized setting. They also suggest that more reliance on local tax would

help, while more transfers could provide bad incentives, which is possibly true only in the long run.

This paper intends to provide a contribution to the assessment of the impact of fiscal policies on the territorial and personal income distribution by developing, first, a unified approach focused on the notion of comprehensive income/ adjusted disposable income.

It provides also an empirical analysis of the impact of central government fiscal policies on the territorial disparities in Mexico by estimating the fiscal residuum in both the approaches mentioned. Mexico represents a very interesting case being a country with deep regional and personal inequalities and with a vast array of federal and regional policies aimed at correcting them, but also with still incomplete statistical information on these issues allowing limited analysis.

This exploration requires a lengthy and complex work of information collection and elaboration aimed at building the variables that can be used to evaluate the impact of policies. Obviously the intent of the paper is not the development of the missing parts or national/ regional accounts which has to be left to the national authorities.

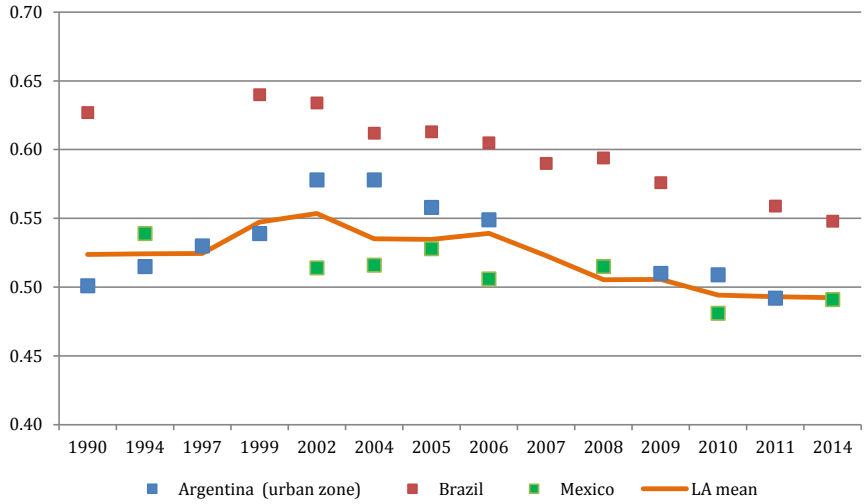
The paper is structured into four sections. The first section revises the significance and persistence of the two dimensions of inequality in Latin America in general and Mexico in particular, emphasizing the relevance of its analysis. The second section provides the unified analytical framework developed. The third section analyzes the distribution impact of federal government fiscal policies on regional disparities by estimating the fiscal residuum. The four section attempts to estimate the medium term impact of fiscal policies on regional GDP by means of a modified version of the export-base model of regional growth that includes, in addition to the export sector, also the impact on the regional economy deriving from the fiscal residuum, the difference between expenditure and revenue policies performed by the government within each region (Brosio and Revelli, 2000 y 2003). The main findings are summarized in the conclusions.

1. Latin America and Mexico: personal and regional inequality

Latin America has shown historically a persistent inequality in the dimensions analyzed in this article: personal and regional.

It is well known that Latin America is the region with the highest unequal personal distribution. Also in the late 1990s, as we can see in graph 1, the personal income distribution profile of most of the Latin American countries deteriorated. This was reflected, among other things, in the fact that a substantial share of total income was in the hands of the wealthiest 10% of households, whose income was 19 times higher than the average income of the poorest 40% of households. In addition, between two thirds and three quarters of the population, depending on the country, receive per capita incomes that are below the overall average (ECLAC, 2002).

Graph 1. Evolution of inequality
(*Gini coefficient*)



Source: Own elaboration on the basis of ECLAC official data.

The years 2002 and 2003 were a turning point when inequality began to trend downward in a large group of countries, whether measured by the income shares of the groups at the bottom and top of the distribution or by synthetic indicators of inequality. Although the decline in inequality was small, and was not enough to change Latin America's status as the world's most unequal region, it is nonetheless positive, especially in the wake of a prolonged period when general distributional improvements were lacking. Recently, the average coefficient for the countries with recent information available fell from 0.497 in 2013 to 0.491 in 2014. When the most recent figures are compared with those from the start of the 2010s, a more substantial reduction is found. The regional index stood at 0.507 in 2010, so that by 2014 there had been accumulative fall of 3.2%, equivalent to 0.8% per year. There were statistically significant changes in the Gini coefficient in 9 of the 16 countries considered during this period. The largest reductions were in Uruguay (-2.7% a year), Argentina (-2.3%) and Ecuador (-2.2%).

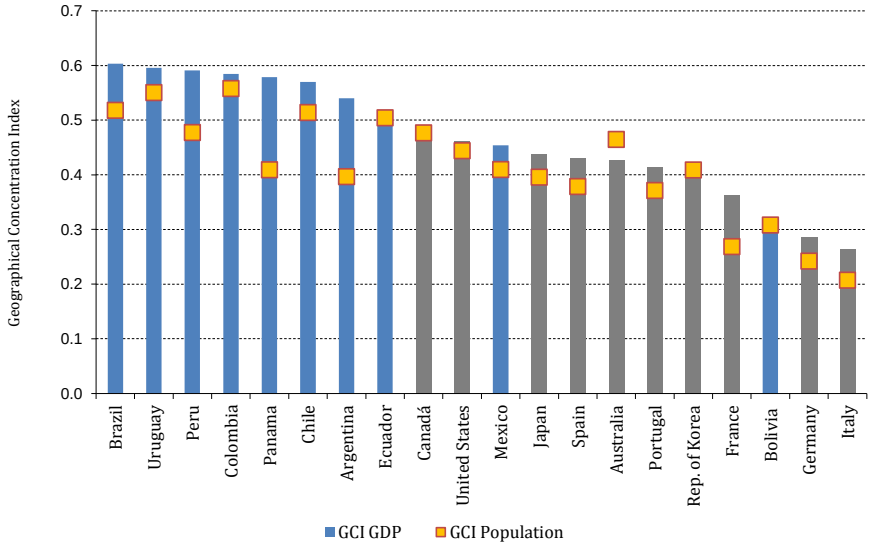
By the regional side, inequality has been also significant and persistent. Territorial concentration, like social inequality, also tends to be inherited and reproduced, particularly through market mechanism (the price of land and housing), urban planning regulations, local financing rules and public policies and procedures (ECLAC, 2014 pp. 97). The territorial character of segregation means, however, that people's geographical mobility is a key factor, as it can alter their residential situation and, in the aggregate, change the levels and patterns of residential segregation. In sum, territorial inequalities restrict personal development too.

Interested in territorial dimension, Modrego and Berdegué (2015) analyze the manifestation of inequality that is between different territories within each country in Latin America. As they said, we can easily distinguish the differences between Northern and Southern Mexico (Aroca, Bosch and Maloney, 2005; González Rivas, 2007),

Colombia's Pacific Region and Central Region (Galvis and Meisel Roca, 2010; Galvis and Meisel Roca, 2012), or the Coast and Highlands of Peru (Escobal and Ponce, 2011a, 2011b). According with authors, even in countries with rapid growth and sharp reduction in poverty, we still find localized pockets of economic and social stagnation as Chile's Araucanía region (Agostini, Brown and Góngora, 2008), or Northeastern Brazil (Ferreira-Filho and Horridge, 2005).

According with ECLAC, territorial inequality comes in two forms. The first is that the population and economic activity is heavily concentrated in a small number of geographical locations within each country, usually the major metropolitan areas. As next graph shows, geographical concentration (GDP and population) is, in general, very high in Latin America compared with OECD countries.

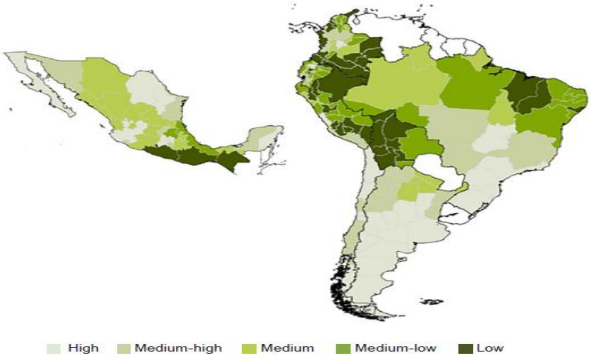
Graph 2. Territorial inequality in Latin America and OECD (selected countries)
(Geographical concentration index of GDP and population, 2012)



Source: Economic Commission for Latin America and the Caribbean (ECLAC), Horizons 2030: Equality at the Centre of Sustainable Development.

The second form of territorial inequality is the wide gaps in the general living conditions of the populations of different areas. ECLAC (2016) show an interesting indicator of territorial development, which is calculated for 8 countries and 182 territorial entities in 2010 and sorts the territorial entities into five groups, or quintiles, from least to most developed. Some examples of disparities within countries occur in North-East Brazil, southeastern Mexico, the Andean areas of Peru and the Plurinational State of Bolivia, Greater Northern Argentina and southern Chile.

Map 1. Latin America (8 countries and 182 territories): regional development indicator, 2010



Source: Economic Commission for Latin America and the Caribbean (ECLAC, 2016), Horizons 2030: Equality at the Centre of Sustainable Development.

According with this indicator, on average, for the least developed quintile, life expectancy is six years less, the infant mortality rate is three times higher and the illiteracy rate is five times higher than for the most developed quintile. The percentage of households with access to a computer in the highest quintile is three times that of the lowest, while the rural population accounts for 10% of the highest quintile and for 45% of the lowest.

Mexican inequality

Official data shows that in 2014, 53.2 percent of the Mexican population lived below the national income poverty line and 20.6 percent lived in extreme poverty, the level of minimum well-being (CONEVAL). In contrast, in last year's more than ten (fifteen in 2016) Mexicans have been highlighted among the world's billionaires (see Jiménez and Solimano, 2012; and Forbes list).

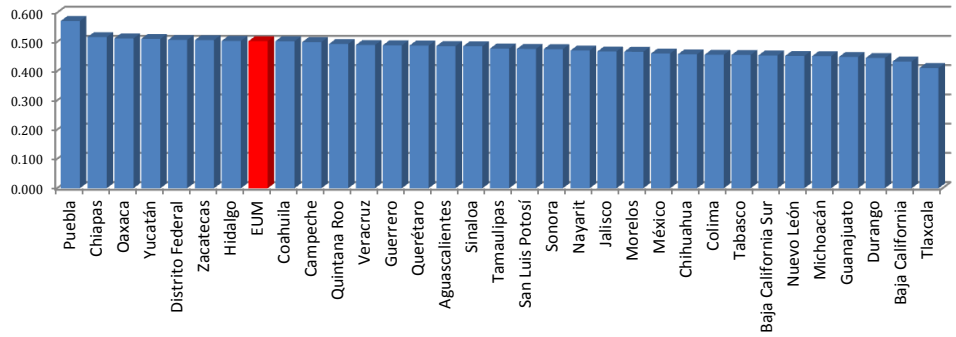
Recently, Campos, Chavez and Esquivel (2016) propose an alternative to circumvent the problem related to lack of tax returns data by using national accounts income information and applying statistical methods to correct for the misrepresentation of top earners in households surveys. Taking only income data from Household Surveys (ENIGH), the authors show that income share of Mexican top 10 percent earners has decreased since 1992.

However, with the corrections proposed, they find that income shares of the richest 10 percent have actually increased in the last two decades. Moreover, they find that the income share of the richest 1 percent of Mexicans is approximately 25 percent of total income, making Mexico one of the countries where the rich take the largest share of income (see graph above). Then, contrary to the conclusion that is usually obtained from household surveys information, Mexico is one of the countries where the rich take the largest share of total income.

Also, CONEVAL provides information of poverty and inequality by states. This information is relevant for inequality analysis as a proxy of territorial disparities. In this

sense, concentration of income is similar among 32 states, being the highest in Puebla and smallest in Tlaxcala. Particularly, in the case of Campeche, who GDP is highest among 32 states, shows a normal index of inequality that's below to the mean, but more of 70% of population has at least one social deprivation (in a multidimensional point of view).

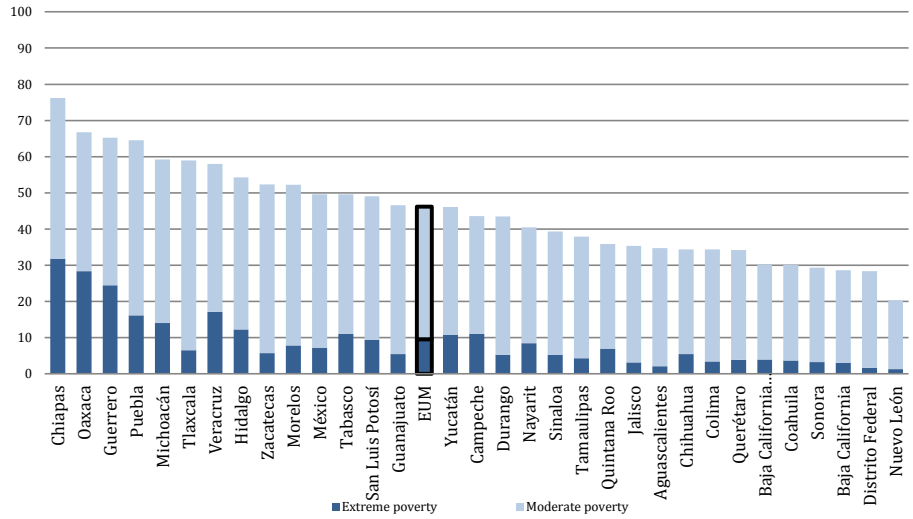
Graph 3. Inequality between Mexican states
(Gini coefficient by states, 2014)

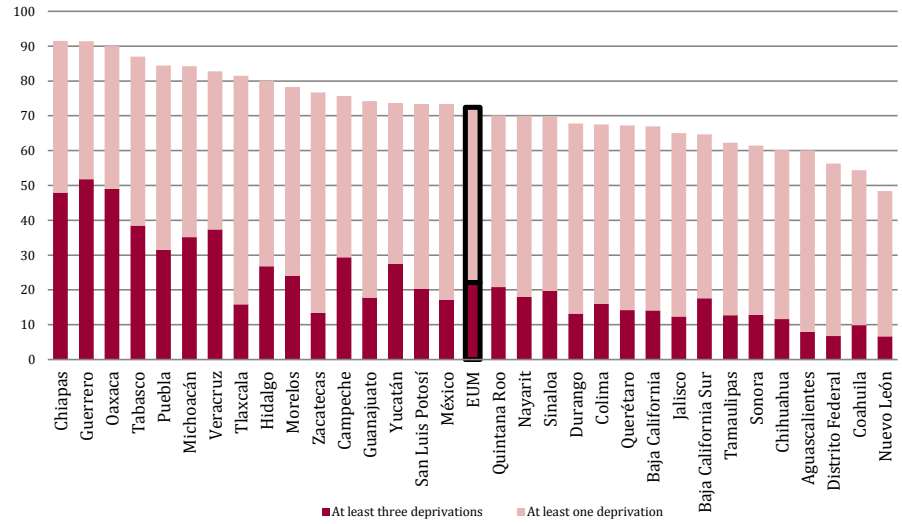


Source: elaboration on the basis of CONEVAL.

However, more of 70% of population in Chiapas live below poverty, more of 30% live in extreme poverty and more of 90% live with at least one social deprivation. This is contrasted with Nuevo Leon (productive region) where less than 50% of population lives with at least one social deprivation, only 20% of population lives below poverty and only 1.3% lives in extreme poverty.

Graph 4. Mexico: Poverty, extreme poverty and deprivations, 2014
(Percentages)





Source: elaboration on the basis of CONEVAL.

2. The analytical framework

2.1. The distribution of personal income

Personal inequality is measured by comprehensive income, *CI*, (also called ex-post income by Cont and Porto, 2015), which for group of individuals, *i*, is salary and other remunerations to production factors, W_i, minus the taxes paid to the central, RC_i, and the local, RL_i, government, plus the value of the goods and transfers centrally, $BC_{\text{i and}}$ TC_i, and locally, $BL_{\text{i, and}}$ TL_{i}, provided.

$$CI_i = W_i + BC_i + BL_i + TC_i + TL_i - RL_i - RCi \qquad (1)$$ [5]

There are two Regions, A and B, with five individuals each. Individuals are of two groups, Rich and Poor. There are two Rich individuals in A and only one in B, originating regional differences in total income.

Fully centralized setting

All goods and services are provided centrally, according also to centrally determined standards – *wyr* (pupils per teacher, for example) for the central good; *xtz* for the local good; *k* (simply tax rate) for central tax; and *h* for local tax - which in principle are geared to provide uniformity of treatment across all the areas.

$$CI_i = W_i + BC_{wyr,\,i} + BL_{xtz,\,I} + TC_i + TL_i - RL_{k,\,i} - RC_{h,\,I} \quad (2)$$

[5] In national accounts terminology it is referred to as the adjusted disposable income. See Eurostat, Building the System of National Accounts - basic concepts available at http://ec.europa.eu/eurostat/statistics-explained/index.php/Building_the_System_of_National_Accounts_-_basic_concepts

Consequences:

- Regional disparities do exist and they depend on the distribution of *W* between Regions and not from government expenditure and revenue policies.

- Interpersonal differences of income do exist: depending on the standards used for the expenditure and taxes the government reduces them; however, residence does not create differences between citizens in their access to the public services and to the cost of access.

- Individuals in each group *i*, are treated in the same way across the country.

Pure decentralization: no central government intervention

There are no more standards on locally provided goods and transfers and local governments are left with their own revenue only.

Consequence: disparities in regional income/GDP will increase, since part of revenue collected in A is no more used for funding part of cost of local good (or transfer) in B.

If the Regions do not intend to operate on income distribution and keep the same structure and incidence of taxes and of expenditure as before:

- Poor people in (poor) Region B will be worse off receiving less since the tax base is lower here, poor people in rich Region A will be better off, receiving more.

- Hence: the personal income distribution at the national level becomes more unequal: three poor people become poorer.

If the Regions intend to operate on income distribution, A may reduce the tax for all (*r* and *p* are the changes in tax) improving the condition of the rich without impacting on the poor, while B has to increase taxes on rich to protect its poor

Hence:

A: (R-r,R-r, P-p,) B : (R+r+ P+p,P+p) (3)

In all cases the income condition of all individuals depends on their residence.

Regional differences in total income/GDP impact on the capacity of Regions of operating fiscal policies and likely to raise demands in B for central government intervention.

"Partial decentralization"

More realistically, the central government will maintain (some) standards for expenditure and/or transfers continuing to ensure equality of benefits, and will hence provide compensation of differences in fiscal capacity through grants.

But if the difference between the cost of providing $BL_{xtz,}$ and transfers TL_i and the revenue raised in Region B, $RC_{h,i}$, is not fully compensated with grants to the Region, decentralization will still lead to following consequences:

- Poor (and rich) people in poor regions are still made worse off, although less than with pure decentralization;

- The national distribution of personal income will still be more unequal with reference to centralization, although less than with pure decentralization;

- Disparities in regional income/GDP impact on the capacity of Regions of operating fiscal policies.

A general implication that can be derived from this approach is that, if the central government grants are not fully equalizing, decentralization increases personal inequality**.** In other words, a main instrument for, at least short-term equalization of personal income in a decentralized government setting is the operation of intergovernmental grants.

A second important implication is that decentralized fiscal policies cannot be equalizing per se. Were the same responsibilities assigned to the federal government instead to the federated states, their equalizing impact would be higher. *(This makes some clarity on issues debated in the literature).*

2.2. The regional income distribution

When looking at regional disparities we have to introduce firms in addition to individuals and governments. Firms produce and pay remuneration to factors of production, *W*, pay taxes and benefit from public expenditure.

Total income of regions, Y_j, will be determined, when all firm profits are distributed to their owners, by the sum of comprehensive income of all individuals plus the difference between taxes paid, RF_j, and benefits of expenditure received by firms, BF_j. That is:

$$Y_j = \Sigma\, CI_i + BF_j - RF_j \qquad (4)$$

By developing, it becomes:

$$Y_i = \Sigma\, W_{ij} + BC_{ij} + TC_{i\,j,} + BF_j - RC_{ij} - RF_{ij} \qquad (5)$$

The central government contributes to the determination of regional income through its expenditure and revenue policies. Hence, regional differences in total income/GDP are originated by regional differences in *W* and regional differences in the fiscal policies towards firms and individuals of the central government. The impact of these policies is summarized by the fiscal residuum to whose estimation for Mexico we proceed in the next session. Also as mentioned by adding the fiscal residdum to GDP, we obtain adjusted disposable income and allow the insertion of the fiscal residdum in the framework of national accounts.

3. Estimating the fiscal residuum

Approaches

The fiscal residuum (FR) is determined through the construction of what is referred to in the literature as the balance sheet of federations. This is a quite demanding exercise

for both analytical and statistical reasons. Data on the distribution by states/regions of the expenditure and revenue done and levied by central government is generally not available, as also we will see for Mexico, with few but important exceptions, such as, in the case of expenditure in Mexico, all the intergovernmental transfers to the states and municipalities and some social security and protection payments. But even when data is available, its use presents some delicate problems.

These problems refer to:

1. The link to be established between the location (i.e. the state) where a payment is made and the location of its effective beneficiary. For example, a firm located in Aguascalientes receives a payment from the Mexican Treasury for the sale of a personal computer to be used by Treasury headquarters in Distrito Federal. Should this expenditure be allocated to Aguascalientes, to the Distrito Federal or should it be divided on an equal per capita basis among all states and territories? Or suppose the computer is imported from Taiwan. Should we in this case put aside the expenditure since it has an almost 100 per cent imports content?

2. To the evaluation of the advantages brought by the expenditures. To continue with the previous example: the purchase of a computer made in Aguascalientes produces, on the one hand, pecuniary gains to the people involved in the computer industry in Aguascalientes, but, on the other, in so far as it is used to speed procedures in Distrito Federal it also confers benefits, which can be evaluated in terms· of consumer surplus, to every resident of Mexico. Which of the two has to be considered?

To help us understand the problem, we may distinguish several classes of agents that are differentially advantaged or harmed, via the expenditure and tax payments, by a project, for an example a road built in a state (B.R. Weingast, Shepsle & Johnsen, 1981).

These classes of agents are:

a) in-state residents who receive benefits through the consumption of the road;

b) out-of state residents who also may receive benefits through the (less frequent) consumption of the road;

c) in-state factor owners -for example, manual workers -who obtain pecuniary gains (higher salaries than otherwise) in the construction of the road; in addition, they also obtain benefits as consumers;

d) out-of state factor owners, who obtain pecuniary gains from the construction but do not benefit as consumers;

e) in-state consumers who make factor market purchases -they benefit from the project as consumers, but can suffer pecuniary losses in the form of higher prices for factors they buy.

f) out-of-State purchasers of factors who suffer from pecuniary losses derived from higher prices for factors and who obtain no consumer benefit because they do not reside in the state.

Consideration of the above list of different advantages (and losses) suggests following two main approaches in drawing a balance sheet of a federation. Let us call the first the 'welfare', or 'real income' approach and the second the 'monetary income support' approach.

The first approach looks at the contribution made by the federation budget to the welfare of residents in each state, the second one looks at the income generating process. The first approach is appropriate when looking at the impact of central government action on the personal distribution of income within states/regions, while the second one is more appropriate when looking at the impact of central government action on the territorial distribution of income. Another way of looking at them shows that the first approach is typical of public finance, distribution-oriented studies, and the second of regional analysis. Since we are looking to both approaches we need trying to build two distinct balances. The distributive impact emerging in the two approaches has not only a distinct meaning, but it is also quite different in the numbers.

There can also be a strict complementarity between the two approaches, especially from a political point of view. Post World War II Italy provides a good illustration; Massive flows of public funds were spent in favor of the depressed Southern regions for sustaining family incomes, for building infrastructure, and for inducing firms to establish themselves in the most depressed areas. In terms of the first approach the Southern regions were the net beneficiaries, whereas the Northern and (to a smaller extent) the Central regions were the net contributors. However, the latter were, at least partly, compensated in terms of the second approach, as Northern firms built many infrastructural projects. Those regions also benefited from the expenditure of purchasing power created in the South by transfers to families and other kinds of public support. This contributed to create a 'regional' political agreement.

Studies of the balance sheet of federal and unitary states are on the increase. Studies to be mentioned include, Bieri 1982, and Grosclaude & Schwab 1991 for Switzerland; Davezies 1989, and Prud'homme 1986 for France; Formez 1992 for Italy; Short, 1978 for Britain; Whalley & Trela 1986 for Canada. Messamcher and Gamboa (2003) have provided an accurate estimate of the Mexican fiscal residuum in the year 2000 that does not include, however, all categories of revenue and expenditure but only those the authors consider crucial for the evaluation of the relationships between the federal government and the states. A full exercise for Mexico has been done by Saucedo (2011) but data refers to 2004 making the estimates already relatively outdated and needing actualization. Brosio (1994) and Brosio and Petchey (2003) have estimated the fiscal residuum for Australia. Uriel and Ramón Barberán (2007) provide an analysis for Spain. Also, Barberán (2001, 2004, 2005) did a recompilation of studies about regional fiscal balances including general spatial coverage on Spain and particularly Cataluña and Madrid.

Some countries, like the US, have started, on a yearly basis, the publication of official data on the distribution by states of federal expenditures and taxes.

Mexico: the totals of expenditure and revenue.

A correct appreciation of the fiscal residuum requires considering a balanced budget, where revenues match expenditure, using borrowing when needed, as it is the case of Mexico. A budget deficit would provide a distorted figure of government policies. If big enough the deficit could show that every state would gain from the federal government fiscal policies, which is clearly unrealistic at least in the long run. We hence estimate the fiscal residuum according to total expenditures as determined by the federal expenditure budget of the federation for 2015[6] and to total revenue as determined by the federal law on revenue for 2015.[7]

Mexico: the regionalization of revenue

Revenues are less of a problem for the construction of a federation balance sheet. Furthermore, there is no need to differentiate between the welfare and monetary income approaches when determining the fiscal residuum, since what is crucial is to determine the place where taxpayers suffer a loss of money income because of taxes of other levies, or a prospective loss as in the case of debt financing.

In Mexico there is some official information about taxes and social contributions collections by the states, published by Tax Administration Service in coordination with INEGI and each state.[8] There are, however some problems in using official information for taxes and other levies, in so far as taxes collected in a state may refer to a tax base created in another state, as for example with the income tax on businesses and VAT, where the collections are allocated in the official Mexican statistics to the states according to the location of the headquarters of the declaring firms. What in fact we need to know is the geographical incidence of taxes that implies to refer revenues to the place where taxes and other revenue bring up a loss of income, through their incidence on income, consumption or other activities. To do this we apply the usual criteria found in the literature.

Table 1 reports the main categories of revenue and the criteria used for their allocation to states. Some, in fact the most important, of them have been elaborated on purpose for the exercise.

More specifically:

- Taxes on business income are allocated according fifty/fifty according to gross profit estimated from *Censos Economicos* and household consumption estimated

[6] Presupuesto de Egresos De La Federación para el Ejercicio Fiscal 2015.
[7] Ley de Ingresos de la Federación para el Ejercicio Fiscal de 2015.
[8] Published by Service Tax Administration (SAT), Coordination Office with Federal Entities.

from Encuesta de Hogares. The choice of the criteria is due to the recognition of partial (50%) shifting of the tax on consumers, while the remaining tax is paid by firms.

- Personal income tax collections are allocated to the states according to income received by residents, which in turn has been estimated through the elaboration of the information on personal income provided by the *Encuesta de Hogares* 2014.
- VAT is allocated according to household consumption, which has been determined using again the information provided by the *Encuesta de Hogares* 2014.
- Excises on production and consumption refer to a small number of levies on alcohol, tobacco and energy products. Production excises go to the states, where production takes place and energy products are consumed also by firms suggesting use of PIB as the criterion of allocation. A reasonable alternative would be the combination of PIB and household consumption.
- Social security contributions do not present problems for their allocation that is made here on the basis of number of people enrolled in the Mexican Social Security Institute.

- Revenue from federally owned enterprises is allocated according to the consumption of electricity for the Electricity Company and to population for PEMEX. Revenue from this company derives from the upstream rent that in the case of Mexico is national property, meaning that in principle each Mexican citizen is entitled to the same share of the rent.

- Transfers from other bodies to the federal government are a challenge for the allocation exercise as are also other miscellaneous revenues that include various fees and charges, dividends and income from sale of assets. The GDP for each state has been adopted for the allocation of this revenue.

- Net borrowing has been allocated according to the shares of all the previous categories. Debt is not final revenue, since it has to be repaid in the future. It seems reasonable to estimate this future liability assuming no change in the present allocation pattern of all revenues.

Table 1. Revenue of federal government by major categories and criteria used for their regionalization

Revenues sources	Mexican pesos (millions)	Criteria for allocation
Business income taxes	556,192.7	½ gross profit as estimated from *Censos Economicos*; ½ consumption expenditure

Personal income taxes	477,350.2	Tax collection from individuals (estimated on the basis of income from salaries and other remunerations derived from ENIGH, 2014)
Income taxes: other	25,663.0	GDP
VAT	703,848.5	Consumption expenditure
Excises	215,925.9	GDP
Social security contributions	243,482.8	Number of people enrolled in the Mexican Social Security Institute (IMSS)
Revenue from public enterprises: Electricity Commission	439,706.9	Consumption of electricity
Revenue from public enterprises: PEMEX	356,816.7	Population
Revenue from public enterprises: other	78,064.0	IMSS and ISSSTE enrollment
Transfers from other bodies	745,099.3	GDP
Net borrowing	672,595.0	On the basis of the share estimated for all revenues but borrowing
Other miscellaneous	179,931.9	GDP
Total	**4,694,677**	

Source: Own elaboration on the basis of *Ley de Ingresos de la Federación para el Ejercicio Fiscal de 2015*

Table 2. Allocation of federal revenue to the States in Mexican pesos (millions), 2015

State	Business income taxes	Personal income taxes	Income taxes: other	VAT	Excises	Social security contributions	Revenue from public enterprises: Electricity Commission	Revenue from public enterprises: PEMEX	Revenue from public enterprises: other	Net Borrowing	Other miscellaneous	Transfers from other bodies	Total	% of GDP
Aguascalientes	5,094	5,756	313	7,638	2,343	3,659	5,661	3,764	1,070	7,809	2,197	9,100	54,405	33.2
Baja California	22,228	11,830	734	21,240	6,516	10,403	18,895	10,022	2,834	22,015	5,144	21,303	153,164	40.0
Baja California Sur	3,534	2,368	188	4,466	1,370	1,950	4,310	2,023	779	4,615	1,316	5,448	32,367	33.0
Campeche	4,180	13,815	1,170	5,478	1,681	1,990	2,708	2,612	639	12,783	8,203	33,967	89,227	14.6
Coahuila	53,352	16,609	869	16,445	5,045	9,570	22,415	8,730	2,545	27,997	6,092	25,228	194,897	43.0
Colima	3,126	2,206	153	4,544	1,394	1,648	3,785	2,066	502	4,174	1,072	4,438	29,108	36.5
Chiapas	6,409	9,637	450	20,383	6,253	2,981	6,304	15,235	1,701	14,185	3,155	13,064	99,758	42.5
Chihuahua	12,956	11,020	736	17,951	5,507	10,843	24,288	10,820	2,555	20,755	5,157	21,356	143,944	37.5
Distrito Federal	125,083	70,880	4,320	65,710	20,159	42,758	30,756	28,114	12,800	93,176	30,285	125,412	649,452	28.8
Durango	2,191	5,174	304	9,862	3,026	3,067	6,625	5,187	1,393	7,924	2,133	8,833	55,718	35.1
Guanajuato	15,532	24,951	1,066	37,469	11,495	11,463	24,612	17,426	3,275	31,121	7,471	30,939	216,820	39.0
Guerrero	3,507	7,190	377	18,002	5,523	2,116	6,123	10,764	1,805	11,348	2,642	10,940	80,335	40.8
Hidalgo	5,157	10,227	413	14,068	4,316	2,820	7,847	8,465	1,446	11,556	2,896	11,991	81,201	37.7
Jalisco	30,316	29,113	1,627	51,288	15,734	20,680	27,110	23,348	4,448	44,232	11,410	47,249	306,555	36.1
México	83,288	57,274	2,311	111,889	34,325	19,303	39,234	48,203	8,649	81,155	16,200	67,084	568,917	47.2
Michoacán	6,302	11,340	609	24,510	7,519	5,120	16,057	13,820	2,209	18,205	4,269	17,679	127,639	40.1
Morelos	3,729	6,450	301	11,707	3,591	2,741	5,853	5,645	1,123	8,654	2,111	8,743	60,649	38.6
Nayarit	3,861	3,233	168	7,364	2,259	1,759	2,990	3,446	888	5,302	1,179	4,880	37,331	42.5
Nuevo León	45,180	35,404	1,915	37,648	11,550	19,434	35,808	14,781	4,031	46,317	13,426	55,597	321,089	32.1
Oaxaca	3,636	11,274	400	17,502	5,369	2,719	5,644	12,076	1,696	12,359	2,804	11,612	87,092	41.7
Puebla	8,511	19,589	813	33,768	10,359	7,333	16,657	18,359	2,649	24,592	5,702	23,614	171,947	40.5
Querétaro	9,932	9,701	559	11,655	3,576	6,381	10,593	5,806	1,440	13,447	3,922	16,241	93,253	31.9

Quintana Roo	7,447	5,425	410	10,405	3,192	4,583	8,787	4,210	1,226	10,154	2,877	11,916	70,634	33.0
San Luis Potosí	5,776	9,598	494	14,018	4,301	5,114	12,948	8,212	1,625	13,362	3,463	14,340	93,250	36.2
Sinaloa	14,063	8,439	530	17,036	5,226	6,463	11,351	8,791	2,256	15,566	3,718	15,395	108,833	39.3
Sonora	20,540	13,509	756	17,431	5,347	7,587	18,117	8,457	2,675	20,304	5,298	21,941	141,962	36.0
Tabasco	7,115	13,221	834	13,925	4,272	2,691	7,154	7,111	1,312	14,587	5,844	24,201	102,267	23.5
Tamaulipas	16,614	12,216	792	15,208	4,666	8,252	17,259	10,382	2,453	19,499	5,556	23,009	135,907	32.8
Tlaxcala	1,724	3,805	140	7,411	2,274	1,149	4,001	3,716	573	4,957	983	4,069	34,801	47.6
Veracruz	12,381	24,166	1,295	36,787	11,285	10,229	22,760	24,277	3,321	32,298	9,080	37,600	225,480	33.3
Yucatán	6,293	8,286	375	15,163	4,652	4,463	6,782	6,212	1,237	11,232	2,628	10,881	78,203	40.0
Zacatecas	7,137	3,645	242	5,873	1,802	2,214	6,273	4,735	910	6,916	1,697	7,029	48,473	38.3
Total	**556,193**	**477,350**	**25,663**	**703,849**	**215,926**	**243,483**	**439,707**	**356,817**	**78,064**	**672,595**	**179,932**	**745,099**	**4,694,677**	**35.0**

Source: Own calculations on the basis of Ley de Ingresos, 2015

Mexico: the regionalization of expenditure

Expenditure is classified, in the Mexican federal budget, according to institutional criteria, that are not related either to the functional, or to the economic classification. The main categories refer, as reported in Table 3, to: a) constitutional agencies, b) federal government agencies, i.e. mainly to ministries; c) transfers to autonomous bodies, including states and municipalities, d) transfers to bodies under government control including mostly social security agencies, e) transfers to federally owned enterprises.

This peculiar classification complicates the task of regionalization, because it very partly reflects the economic classification that is crucial for the determination of the fiscal residuum.

For a share of the expenditure, amounting to one/third of the total, the regionalization is done by the parliamentary budget office (Reyes 2015). This includes, first and obviously, all transfers to states and local governments and a fairly large share of investment expenditure, in particular that regarding projects whose geographic impact can easily identified. The remaining two thirds of the expenditure are regionalized in this study.

Table 3. Main categories of federal expenditure according to budget classification, 2015

Items	Total (Millions of Mexican pesos)	Regionalized by the Parliamentary Office (Millions of Mexican pesos)	Regionalized in this study (Millions of Mexican pesos)	Criteria for regionalization according to 'monetary income support'	Criteria for regionalization according to welfare approach
Constitutional agencies	100,623	72,814	27,809	Salaries of federal employees	Population
Federal Government agencies	1,184,295	279,612	904,683	Salaries of federal employees for most items	Population/gdp
Transfers to autonomous bodies	2,223,545	1,265,026	958,519	Enrollment to social security/population	Enrollment to social security/population
Transfers to bodies under government control	706,453	8,985	697,468	Enrollment to social security	Enrollment to social security
Transfers to federally owned enterprises	923,525	409,630	513,895	Value added in sectors concerned	Consumption in the concerned sectors

Netting	-443,764	0	-443,764	Population	Population
Total	**4,694,677**	**2,036,067**	**2,658,610**		

Source: Own elaboration on the basis of *Presupuesto de Egresos De La Federación para el Ejercicio Fiscal 2015*.

The criteria are summarized in Table 3 according to the two initially mentioned approaches to the fiscal residuum, namely the 'monetary income support' approach and the 'welfare impact' approach. There are three main cases for differentiation of criteria. The first case is expenditure for constitutional agencies, such as for example the Constitutional Court. The monetary income approach demands to look at the income generation impact, suggesting the use of salaries paid for federal employees as the main criterion for regionalization, while according to the welfare impact approach the expenditure serves to provide public goods whose consumption is taken here, according to the predominant assumption about the benefits of public goods, to be proportional to population. The same antithesis, between wages and population, applies to the expenditure for government agencies.

The third case refers to transfers to federally owned enterprises. In the first approach regionalization is made according to the added value created in the sectors receiving the transfers. In other words, the states were public enterprises – mainly electricity and petroleum products - are concentrated benefit mostly from this expenditure. In the second approach, transfers are meant to provide in principle welfare benefits to the consumers, hence the regionalization is done according to the distribution by states of the consumption of the products of the enterprises.

The fiscal residuum according to monetary income support approach

The final result of the calculation, the FR, is observable in Table 5 that follows, reporting first the expenditure and the revenue and then their difference, the residuum. Per capita GDP is reported on the last column to the east to facilitate evaluation, especially on the redistribution impact of fiscal residuum. Evaluation is facilitated by graphs reported after the table.

The overall relation between the FR and level of income and wealth as shown by per capita GDP is negative, although with a number of outliers that reduce somewhat the redistributive impact of the fiscal policies of the central government. The poorest state, Chiapas, has a substantial positive fiscal residuum amounting to almost one third of its GDP. The richest state, Campeche, has a negative fiscal residuum, although not one of the highest.

Table 4. The balance sheet of the Mexican federation and the FR in Mexican pesos (per capita), 2015

State	Expenditures pc	Incomes pc	FR	Expenditures as % of GDP	Incomes as % GDP	Gdp pc
Aguascalientes	46,742	45,911	831	33.84	33.24	138,115
Baja California	46,615	48,545	-1,930	38.39	39.98	121,439
Baja California Sur	76,513	50,810	25,703	49.74	33.03	153,829
Campeche	92,904	108,490	-15,586	12.51	14.61	742,813
Coahuila	45,447	70,913	-25,466	27.53	42.95	165,093
Colima	75,452	44,744	30,708	61.50	36.47	122,684
Chiapas	36,277	20,798	15,479	74.05	42.46	48,986
Chihuahua	39,206	42,256	-3,050	34.77	37.48	112,757
Distrito Federal	77,688	73,375	4,312	30.49	28.79	254,839
Durango	49,492	34,121	15,371	50.87	35.07	97,287
Guanajuato	31,978	39,520	-7,542	31.53	38.97	101,423
Guerrero	42,006	23,706	18,300	72.35	40.83	58,062
Hidalgo	42,202	30,469	11,733	52.15	37.65	80,923
Jalisco	31,483	41,704	-10,221	27.23	36.07	115,608
México	28,406	37,488	-9,083	35.73	47.15	79,504
Michoacán	33,479	29,335	4,144	45.81	40.14	73,077
Morelos	38,771	34,126	4,645	43.82	38.57	88,482
Nayarit	56,347	34,407	21,940	69.65	42.53	80,902
Nuevo León	44,928	69,000	-24,072	20.91	32.11	214,881
Oaxaca	37,866	22,907	14,959	68.93	41.70	54,932
Puebla	29,733	29,750	-17	40.46	40.49	73,481
Querétaro	42,187	51,015	-8,829	26.40	31.92	159,800
Quintana Roo	46,481	53,285	-6,804	28.75	32.96	161,674
San Luis Potosí	40,599	36,066	4,532	40.70	36.16	99,751
Sinaloa	45,236	39,322	5,915	45.22	39.31	100,037
Sonora	50,817	53,320	-2,503	34.29	35.97	148,216
Tabasco	50,430	45,683	4,747	25.94	23.49	194,441
Tamaulipas	46,904	41,580	5,324	37.05	32.84	126,609
Tlaxcala	43,713	29,746	13,967	69.88	47.55	62,558
Veracruz	33,631	29,501	4,130	38.01	33.34	88,479
Yucatán	41,627	39,990	1,637	41.60	39.96	100,075
Zacatecas	42,752	32,518	10,234	50.41	38.34	84,811

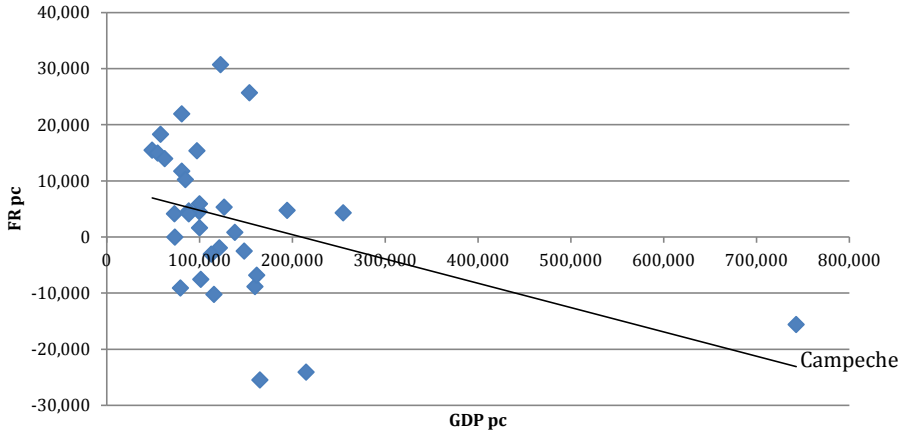
Sources: Own elaboration on the basis of INEGI, *Ley de Ingresos* and *Presupuesto de Egresos, 2015*

The emergence of the FR and its sign are determined by the separate trends of expenditure and revenue with reference to GDP. The trend of revenue is almost stable showing an absence of an overall redistribution effect, which is understandable given the very limited role of taxes and levies with an explicit redistributive impact. Expenditure has a more demarcated and negative trend, meaning that poorer states benefit of a relative larger amount of expenditure that the richer states. This is due mostly the indivisility character of large components of public expenditure and to the

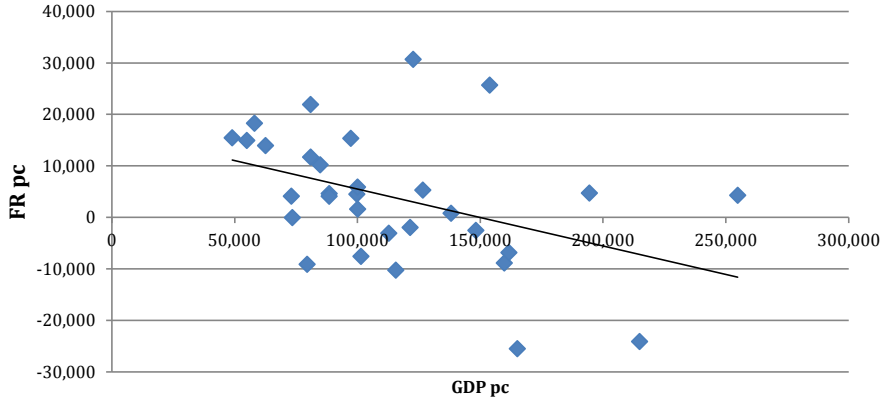
intended redistribution impact of some other components, such as primarily transfers to individuals and households and, more mildly, intergovernmental transfers to states and municipalities. The redistribution impact of federal expenditure for 2015 benefits also from the absence, due to the low international price of oil, in that year of the subsidy to transport fuels that a strong pejorative impact on the income distribution going mostly to the advantage of rich households.

Graph 5. Correlation between FR and GDP
(In Mexican pesos, per capita)

a) *Correlation including Campeche*



b) *Correlation without Campeche*



Sources: Own elaboration on the basis of INEGI, *Ley de Ingresos* and *Presupuesto de Egresos, 2015*

The fiscal residuum according to welfare impact approach

Like the previous approach, the overall relation between the FR and level of income and wealth as shown by per capita GDP is negative too,. If it is analyzed, but without Campeche (considering as outlier), we can see a strong negative correlation, unlike the previous approach. This is to be expected, since this approach looks at the welfare of the individuals, as consumers and not as producers of public and other goods, hence requiring a larger use of population – equal per capita consumption of public goods – and of consumption, rather than GDP, for the allocation of large categories of the expenditure.

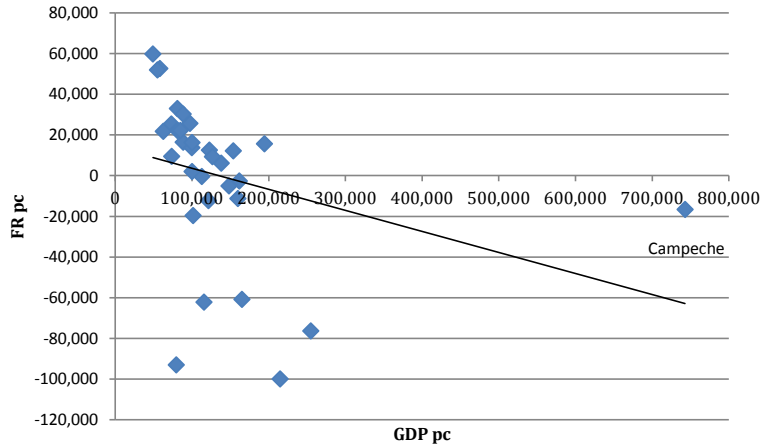
Table 5. Welfare impact approach: the balance sheet of the Mexican federation and the fiscal residuum in Mexican pesos (per capita), 2015

State	Expenditures pc	Incomes pc	FR	Expenditures as % of GDP	Incomes as % GDP	Gdp pc
Aguascalientes	60,576	54,405	6,171	37.01	33.24	138,115
Baja California	140,945	153,164	-12,219	36.79	39.98	121,439
Baja California Sur	44,587	32,367	12,219	45.50	33.03	153,829
Campeche	72,659	89,227	-16,568	11.89	14.61	742,813
Coahuila	134,138	194,897	-60,759	29.56	42.95	165,093
Colima	41,697	29,108	12,589	52.24	36.47	122,684
Chiapas	159,574	99,758	59,816	67.91	42.46	48,986
Chihuahua	143,564	143,944	-379	37.38	37.48	112,757
Distrito Federal	573,199	649,452	-76,253	25.41	28.79	254,839
Durango	81,443	55,718	25,725	51.27	35.07	97,287
Guanajuato	197,241	216,820	-19,579	35.45	38.97	101,423
Guerrero	133,024	80,335	52,689	67.61	40.83	58,062
Hidalgo	114,224	81,201	33,023	52.96	37.65	80,923
Jalisco	244,456	306,555	-62,099	28.77	36.07	115,608
México	475,969	568,917	-92,947	39.45	47.15	79,504
Michoacán	153,056	127,639	25,417	48.14	40.14	73,077
Morelos	77,125	60,649	16,475	49.05	38.57	88,482
Nayarit	59,577	37,331	22,246	67.87	42.53	80,902
Nuevo León	221,235	321,089	-99,855	22.12	32.11	214,881
Oaxaca	139,086	87,092	51,994	66.60	41.70	54,932
Puebla	181,451	171,947	9,504	42.72	40.49	73,481
Querétaro	82,053	93,253	-11,200	28.09	31.92	159,800
Quintana Roo	68,051	70,634	-2,583	31.75	32.96	161,674
San Luis Potosí	107,043	93,250	13,793	41.50	36.16	99,751
Sinaloa	125,145	108,833	16,311	45.20	39.31	100,037
Sonora	136,959	141,962	-5,003	34.71	35.97	148,216
Tabasco	117,962	102,267	15,695	27.10	23.49	194,441
Tamaulipas	145,268	135,907	9,362	35.10	32.84	126,609
Tlaxcala	56,609	34,801	21,807	77.35	47.55	62,558
Veracruz	255,777	225,480	30,298	37.82	33.34	88,479
Yucatán	80,263	78,203	2,061	41.01	39.96	100,075
Zacatecas	70,721	48,473	22,248	55.94	38.34	84,811

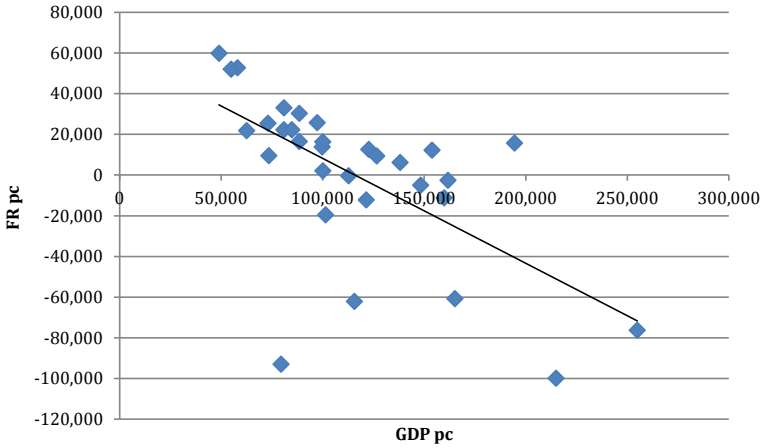
Sources: Own elaboration on the basis of INEGI, *Ley de Ingresos* and *Presupuesto de Egresos, 2015*

Graph 6. Correlation between FR and GDP according welfare approach
(In Mexican pesos, per capita)

a) Correlation including Campeche



b) Correlation without Campeche



Sources: Own elaboration on the basis of INEGI, *Ley de Ingresos* and *Presupuesto de Egresos, 2015*

4. An expanded economic -base model for Mexico

A convenient way to determine the impact of central government policies, is as mentioned in the Introduction, the use of a standard 'economic base model' (North, 1955; Tiebout, 1956) augmented by an additional component, the 'government export

sector,' that is generated by the fiscal/financial relationships between each jurisdiction and the central government. The difference between the expenditures made by the central government in each jurisdiction and the taxes paid by its residents - the 'fiscal residuum' calculated according to the monetary income support approach - impacts on the regional economy as the export sector does. A positive fiscal residuum increases consumption in the local sector, while a negative one has a depressing effect on the regional economy. In other words, each regional economy is modeled as consisting of three sectors: a) the base or export sector, that comprises all those productions that are sold outside the region; b) the government export sector, whose size and sign depend on the fiscal residuum; c) the local sector that is supported by the expenditure generated by the proceeds of the two previous sectors.

From a macroeconomic viewpoint, the fiscal residuum enters the fundamental equation of gross regional product determination, according to which income equals total final expenditure. For region *j*, total income, Y_j, is the sum of regional gross domestic product, Y_j, and gross imports, IMP_j. Final expenditures equal private demand - consumption C_j and investment IN_j plus the demand for consumption and investment of national PS_j and sub-national, PR_j, governments, plus exports X_j:

$$Y_j + IMP_j = C_j + IN_j + PS_j + PR_j + X_j \qquad (6)$$

Holding the budget constraint for sub-national governments implies that total expenditure has to be financed by own revenues (taxes, tariffs and miscellaneous revenues, IR_j, net of transfers to households and firms, the share q of national taxes $qISj$, and transfers from higher levels of government TSj :

$$PRj = IRj + qISj + TSj \qquad (7)$$

The fiscal residuum FRj of each region is defined as central government direct expenditures in region j, PS_j plus central government transfers to individuals residing in region j, TCj, plus central government transfers to the regional government TSj, plus sub-national shared taxes, qIS_j, minus central government revenues in the region ISj:

$$FRj = PS_j + GSj + TSj + qIS_j - ISj. \qquad (8)$$

Using (7) and (8), and defining $mj = IMP_j / Y_j$; $cj = C_j / Y_j$; $ir_j = IRj / Y_j$ and $is_j = IS_j / Y_j$ equation (6) can be expressed as the product of the exogenous components of expenditure with the multiplier:

$$Y_i = \frac{1}{1 + m_i - C_i - ir_i - is_i} * (IN_i + X_i + FR_i) \qquad (9)$$

The main results are shown in Table 6

Column (2) in Table 6 reports the level of GDP, the next three columns the three components singled out to represent exports. They are manufacturing, more precisely the excess of the share of value added in manufacturing in each state over the national mean. The hypothesis is that this excess represents exports to the rest of the world, including the other Mexican states.. The second component is value added in natural resource sector, i.e. minerals and hydrocarbons. The third component is the excess of the share if tourism in each state over the national mean. The hypothesis is the same as for manufacturing allowing to take into account the fact that for the states tourist exports are represented not only by international tourists but also by domestic tourists coming from other states. Column 6 reports their total while the 7th column reports investment. The following three columns illustrate the building of the fiscal residuum and its amount (column 10). Finally, column 11 reports the value of the income multiplier.

Values of the multiplier are in line with those obtained in other analyses (see, for example, Brosio and Revelli 2003). They also show a relatively small variation between states.

Table 6. Income multiplier: data of fundamental equation (9)

State	GDP	X				I	FR			Multiplier
		Manufacturing	Natural Resources	Tourism	Total	Investment	CG expenditure	CG revenues	FR	
Aguascalientes	163,666	9,332.5	0.0	0.0	9,332.5	46,720.9	55,389.0	54,404.6	984.4	1.5
Baja California	383,149	2,272.4	0.0	222.6	2,495.0	40,502.3	147,073.5	153,163.9	-6,090.4	2.0
Baja California Sur	97,993	0.0	0.0	2,253.2	2,253.2	11,599.9	48,741.0	32,367.4	16,373.6	1.6
Campeche	610,920	0.0	346,517.7	8,815.3	355,333.0	430,687.4	76,407.8	89,226.7	-12,818.8	0.7
Coahuila de Zaragoza	453,740	46,797.0	0.0	1,940.8	48,737.8	130,129.4	124,906.5	194,897.1	-69,990.6	1.5
Colima	79,813	0.0	44.9	361.3	406.3	15,415.4	49,085.6	29,108.1	19,977.5	1.2
Chiapas	234,966	0.0	1,130.5	162.2	1,292.8	98,953.5	174,003.2	99,757.9	74,245.3	0.9
Chihuahua	384,102	3,246.9	0.0	313.5	3,560.4	52,481.5	133,552.6	143,943.9	-10,391.3	2.0
Distrito Federal	2,255,599	0.0	0.0	266.9	266.9	572,867.3	687,619.4	649,452.4	38,167.0	1.8
Durango	158,864	500.1	0.0	6,469.9	6,970.1	15,807.6	80,817.3	55,718.0	25,099.3	1.5
Guanajuato	556,446	21,645.3	0.0	29.4	21,674.7	88,057.5	175,440.6	216,819.8	-41,379.2	2.0
Guerrero	196,757	0.0	0.0	270.1	270.1	14,518.8	142,349.8	80,335.0	62,014.8	1.3
Hidalgo	215,660	7,114.6	0.0	350.7	7,465.2	19,517.5	112,469.8	81,200.5	31,269.3	1.5
Jalisco	849,795	4,176.4	0.0	22.7	4,199.1	103,595.7	231,423.9	306,555.3	-75,131.4	2.5
México	1,206,549	15,278.5	0.0	3,989.5	19,268.0	179,117.5	431,078.8	568,916.8	-137,838.0	1.9
Michoacán de Ocampo	317,961	0.0	0.0	639.9	639.9	28,452.3	145,668.5	127,638.9	18,029.6	1.8
Morelos	157,253	1,561.1	0.0	85.4	1,646.5	26,481.6	68,905.4	60,649.5	8,255.9	1.6
Nayarit	87,777	0.0	0.0	349.4	349.4	12,180.0	61,135.6	37,330.7	23,804.9	1.2
Nuevo León	999,938	16,812.0	0.0	2,377.9	19,189.9	203,263.7	209,071.4	321,089.3	-112,017.9	2.3
Oaxaca	208,849	0.0	0.0	2,306.7	2,306.7	18,103.4	143,965.1	87,091.7	56,873.4	1.3
Puebla	424,709	4,697.9	0.0	216.7	4,914.5	82,354.6	171,851.4	171,947.2	-95.8	1.6

Querétaro	292,104	9,091.1	0.0	1,109.1	10,200.1	44,815.5	77,114.4	93,252.9	-16,138.5	2.2
Quintana Roo	214,311	0.0	0.0	297.2	297.2	19,611.8	61,614.6	70,633.5	-9,018.9	2.6
San Luis Potosí	257,908	6,807.6	0.0	34,796.8	41,604.4	49,044.8	104,968.8	93,250.2	11,718.6	1.3
Sinaloa	276,879	0.0	0.0	351.1	351.1	27,317.9	125,203.4	108,833.3	16,370.0	1.8
Sonora	394,623	1,675.1	3,851.6	686.9	6,213.6	63,233.5	135,298.4	141,962.2	-6,663.8	1.9
Tabasco	435,276	0.0	129,498.4	471.5	129,969.9	224,752.8	112,893.1	102,267.2	10,625.9	0.9
Tamaulipas	413,829	0.0	2,133.7	243.9	2,377.5	73,976.7	153,308.3	135,906.6	17,401.7	1.8
Tlaxcala	73,189	2,653.1	0.0	291.3	2,944.4	10,016.5	51,141.7	34,801.4	16,340.3	1.1
Veracruz de Ignacio de la Llave	676,265	3,789.4	753.9	9.7	4,553.0	209,397.6	257,045.7	225,479.6	31,566.0	1.4
Yucatán	195,705	0.0	0.0	162.2	162.2	17,179.2	81,404.3	78,202.8	3,201.5	2.0
Zacatecas	126,425	0.0	4,408.6	961.7	5,370.3	59,038.9	63,728.7	48,472.9	15,255.8	1.0

Sources: Own elaboration on the basis of INEGI, *Ley de Ingresos* and *Presupuesto de Egresos, 2015*

The ground is now set for the determination via the multiplier of the income impact of the FR on the states. To appreciate it we bring as in Table 7 the value of the FR to zero and then calculate the GDP. The predicted value is reported in column 5 and the change in column 6. Obviously, states with a positive fiscal residuum, such a Chiapas, will lose with bringing it to zero, meaning also in institutional terms the elimination of the federal government and the transformation of the states into fully independent countries. The comparisons between GDP before after zeroing of the FR show the extent of the territorial redistribution operated by the central government.

Table 7. The estimated level of income if the FR were equated to zero is shown in column

State	GDP	FR	Income multiplier	Predicted GDP without FR	% Change
Aguascalientes	163,666	984	1.47	162,220	-0.9
Baja California	383,149	-6,090	2.02	395,426	3.2
Baja California Sur	97,993	16,374	1.57	72,360	-26.2
Campeche	610,920	-12,819	0.71	620,000	1.5
Coahuila	453,740	-69,991	1.49	558,283	23.0
Colima	79,813	19,978	1.23	55,248	-30.8
Chiapas	234,966	74,245	0.86	171,356	-27.1
Chihuahua	384,102	-10,391	2.03	405,154	5.5
Distrito Federal	2,255,599	38,167	1.79	2,187,315	-3.0
Durango	158,864	25,099	1.53	120,374	-24.2
Guanajuato	556,446	-41,379	1.95	637,188	14.5
Guerrero	196,757	62,015	1.25	119,107	-39.5
Hidalgo	215,660	31,269	1.55	167,303	-22.4
Jalisco	849,795	-75,131	2.51	1,038,011	22.1
México	1,206,549	-137,838	1.92	1,470,755	21.9
Michoacán	317,961	18,030	1.82	285,158	-10.3
Morelos	157,253	8,256	1.62	143,873	-8.5
Nayarit	87,777	23,805	1.19	59,412	-32.3
Nuevo León	999,938	-112,018	2.32	1,259,508	26.0
Oaxaca	208,849	56,873	1.27	136,588	-34.6
Puebla	424,709	-96	1.64	424,866	0.0
Querétaro	292,104	-16,139	2.21	327,782	12.2
Quintana Roo	214,311	-9,019	2.63	238,020	11.1
San Luis Potosí	257,908	11,719	1.32	242,458	-6.0
Sinaloa	276,879	16,370	1.81	247,230	-10.7
Sonora	394,623	-6,664	1.93	407,467	3.3
Tabasco	435,276	10,626	0.93	425,385	-2.3
Tamaulipas	413,829	17,402	1.80	382,473	-7.6
Tlaxcala	73,189	16,340	1.14	54,532	-25.5
Veracruz	676,265	31,566	1.44	630,942	-6.7
Yucatán	195,705	3,202	1.98	189,360	-3.2
Zacatecas	126,425	15,256	0.99	111,373	-11.9

Source: Own elaboration on the basis of INEGI, *Ley de Ingresos* and *Presupuesto de Egresos, 2015*

5. Following territorial redistribution by looking at national accounts concepts

As mentioned in the introduction, comprehensive income has an equivalent in the national accounts in the notion of the adjusted disposable income that is the result of primary, secondary and in kind distribution of income operated through the various fiscal instruments, and that is arrived to through various steps that include the determination of the balance of primary income, the disposable income before reaching the adjusted disposable income. In turn, adjusted disposable income is equal to GDP plus the fiscal residuum. As a consequence, the estimates done in this paper provide a substitute to the missing information from the national accounts, but they do not replace them, since they are made according hypotheses concerning the spatial incidence of public expenditure and revenues made on purpose for this paper.

Table 8 provides the equivalence check between fiscal residuum and national accounting. It also shows the extent of the redistribution process operated by the federal budget. The range of variation between maximum and minimum decreases going from GDP to ADI, mainly through a substantial increase of the minimum. More importantly the GINI coefficient goes down from 0,321 to 0,293 implying a less unequal distribution.

Table 8. Per capita gross domestic product and adjusted disposable income (ADI) and FR

State	Adjusted disposable income per capita	GDP per capita	Difference
Aguascalientes	138,945.9	138,115.2	831
Baja California	119,508.8	121,439.1	-1,930
Baja California Sur	179,532.0	153,828.9	25,703
Campeche	727,226.9	742,813.2	-15,586
Coahuila	139,626.9	165,093.0	-25,466
Colima	153,392.9	122,684.5	30,708
Chiapas	64,464.9	48,986.2	15,479
Chihuahua	109,706.3	112,756.8	-3,050
Distrito Federal	259,151.0	254,838.8	4,312
Durango	112,658.2	97,287.5	15,371
Guanajuato	93,881.1	101,423.3	-7,542
Guerrero	76,361.6	58,061.5	18,300
Hidalgo	92,655.8	80,922.5	11,733
Jalisco	105,386.6	115,607.6	-10,221
México	70,421.8	79,504.5	-9,083
Michoacán	77,220.8	73,077.1	4,144
Morelos	93,127.6	88,482.2	4,645
Nayarit	102,842.4	80,902.0	21,940
Nuevo León	190,808.7	214,880.6	-24,072
Oaxaca	69,890.9	54,931.9	14,959
Puebla	73,464.7	73,481.2	-17
Querétaro	150,971.0	159,799.8	-8,829

Quintana Roo	154,869.9	161,673.6	-6,804
San Luis Potosí	104,283.4	99,751.0	4,532
Sinaloa	105,951.7	100,037.2	5,915
Sonora	145,713.5	148,216.3	-2,503
Tabasco	199,187.6	194,440.9	4,747
Tamaulipas	131,933.2	126,609.2	5,324
Tlaxcala	76,525.0	62,558.1	13,967
Veracruz	92,609.3	88,479.4	4,130
Yucatán	101,712.4	100,075.3	1,637
Zacatecas	95,045.2	84,811.0	10,234
Max	727,226.9	742,813.2	-15,586
Min	64,464.9	48,986.2	15,479
Gap	11.3	15.2	-3.9
Mean	137,783.7	134,549.0	3,235
Gini	0.293	0.321	-0.028

Source: Own calculations on the basis of INEGI, *Ley de Ingresos* and *Presupuesto de Egresos, 2015*

Table 9 shows that the equalization process is not steady and the main step is moving from disposable income to adjusted disposable income, meaning that the main actor in the redistribution process are benefits in kind, i.e. the provision of goods and services by the federal government.

Table 9. Moving from GDP to ADI through the various redistribution stages of national accounts

State	GDP	Balance of Primary Income	Disposable Income	Adjusted Disposable Income
Aguascalientes	138,115	122,948	125,195	138,946
Baja California	121,439	113,166	113,230	119,509
Baja California Sur	153,829	146,509	155,336	179,532
Campeche	742,813	729,570	716,846	727,227
Coahuila	165,093	152,813	138,288	139,627
Colima	122,684	121,282	123,076	153,393
Chiapas	48,986	42,620	45,129	64,465
Chihuahua	112,757	101,517	102,534	109,706
Distrito Federal	254,839	239,760	236,091	259,151
Durango	97,287	86,797	95,518	112,658
Guanajuato	101,423	87,638	87,671	93,881
Guerrero	58,062	50,750	57,127	76,362
Hidalgo	80,923	71,799	74,724	92,656
Jalisco	115,608	103,146	100,946	105,387
México	79,504	66,067	65,581	70,422
Michoacán	73,077	61,407	65,065	77,221
Morelos	88,482	73,961	77,652	93,128
Nayarit	80,902	70,084	76,688	102,842

Nuevo León	214,881	201,085	191,759	190,809
Oaxaca	54,932	46,611	50,219	69,891
Puebla	73,481	62,420	64,031	73,465
Querétaro	159,800	147,451	144,750	150,971
Quintana Roo	161,674	144,308	145,571	154,870
San Luis Potosí	99,751	90,574	92,955	104,283
Sinaloa	100,037	89,067	92,325	105,952
Sonora	148,216	136,302	137,569	145,713
Tabasco	194,441	181,261	181,232	199,188
Tamaulipas	126,609	121,382	122,115	131,933
Tlaxcala	62,558	48,991	52,071	76,525
Veracruz	88,479	80,108	81,114	92,609
Yucatán	100,075	87,977	88,236	101,712
Zacatecas	84,811	73,465	75,348	95,045
Max	742,813	729,570	716,846	727,227
Min	48,986	42,620	45,129	64,465
Mean	134,549	123,526	124,250	137,784
Gap	15.16	17.12	15.88	11.28
Gini	0.321	0.346	0.331	0.293

Source: Own calculations on the basis of INEGI, *Ley de Ingresos* and *Presupuesto de Egresos, 2015*

6. Conclusions

This paper is focused on two of the multiple dimensions of inequality: personal and regional income distribution, on their interplay and on the role of fiscal policies in the reduction of equality. In this framework, the intent of the paper is to provide a contribution to the assesment of the impact of fiscal policies on the territorial and personal income distribution.

The paper provides also an empirical analysis of the impact of fiscal policies on territorial disparities in Mexico by estimating the fiscal residuum following two distinct approaches focused on the impact on welfare of individuals and on the support of the economy, respectively . Mexico represents a very interesting case being a country with deep regional and personal inequalities and with a vast array of federal and regional policies aimed to correcting them.

The preliminary results of FR estimates show that the operation of the federal government produces a corrective impact on regional inequality that is larger for individual's welfare than in terms of the support to the economy. However, there are outliers such as Campeche with high GDP because of oil but with low tax collectecions.

The modified economic base regional growth model used to estimate the impact of fiscal residuum on GDP shows the important role of regional expenditures in improving the situation of the most disadvantaged states. Also looking at the territorial redistribution through the lens of distinct national accounts concepts referred to the distribution side of the accounts provides confirmation of the extent of the redistribution process operated by federal budget.

We would like to terminate this paper with an important *caveat*. The implicit assumption made in balance sheet exercises, which says that what one region gains from some policy instrument is necessarily lost by another region, is not necessarily true. A state, federal or unitary, is generally a non-zero-sum game, from the point of view of its constituent units. It should in fact be a positive-sum game, otherwise there is no point in keeping it. This caveat is made here to stress the point that regions that are net contributors to the balance sheet -that is they pay more than they get -are not ipsofacto disadvantaged by their forming part of the state. For example, net contributors to the budget of the European Community (or to the Mexican federal government) retain advantages from the increased volume of economic activity fostered by the existence of a unified market and from the existence of supranational (or national) institutions.

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ANNEX

A numerical example of personal income redistribution policies.

Legenda: as done usually in the literature, there are only two types of individuals, rich and poor, whose number differs by regions, hence producing differences in total income/GDP between them. To simplify the only activity of government is redistribution. When government is decentralized the policy is assigned to the regions and the only responsibility of the national government is to supervise it.

	Region A: Income of individuals (2 rich and 1 poor)			Region B: Income of individuals ((1 rich and 2 poor)		
Income before redistribution	100	100	50	100	50	50
PERSONAL REDISTRIBUTION						
THE IMPACT OF FISCAL POLICY WITH ONLY ONE GOVERNMENT: levies 10 from each individual and distributes the proceeds only to the poor (20 to each)						
Income after redistribution	90= 100-10+0	90=100-10+0	60= 50-10+20	90 = 100-10+0	60 = 50-10+20	60= 50-10+20
THE IMPACT OF FISCAL POLICY WITH TWO GOVERNMENTS: Regions perform redistribution while national government supervises . **Case 1**: same fiscal policy as before						
Income after redistribution	90= 100-10-0	90= 100-10-0	70= 50 -10+30	90= 100-10+0	55= 50-10+15	55= 50-10+15

IMPACT OF FISCAL POLICY WITH TWO GOVERNMENTS: Regions perform redistribution, while the national government supervises. **Case 2** : each Region applies its own (majority dictated) rule. Región A protects its rich, levying 5 from each individual; Región B protects the poor levying 20 from rich and 10 from poor.						
Income after redistribution	95=100-5+0	95=100-5+0	60 =50-5+15	60 = 100-20+0	60 =50-10+20	60=50-10+20
REGIONAL REDISTRIBUTION						
Regional Income (GDP) before personal redistribution policy	250			200		
Regional Income (GDP) after (national) personal redistribution policy	240			210		

Redistribution is operated by the central government by the combination of an equal for all lump tax and the allocation of its proceeds only to the poor individuals. When regionalized a taxation is slightly modified by region B to reach the goal of guaranteeing the same level of income of the poor as before decentralization.

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