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Value Added Tax: Revenue, Efficiency, Tax Expenditure and Inefficiencies in Latin America

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Acknowledgement

Overview

This working paper belongs to a series of brief analyses that we want to offer from CIAT as presentation of the updating of the Databases on Collection, Tax Rates and Tax Expenditures available in CIATData.

The study describes the characteristics of the respective economies with their collection figures, tax rate levels and estimated amounts of tax expenditure, using various standard indicators and developing a new methodology that analyses jointly: C-efficiency (the amount collected) + G-inefficiency (what is not collected due to tax expenditures -G stands for "Gastos", Expenditure in Spanish-) + X-inefficiency (loss of collection by fraud and mismanagement and errors of quantification of the components directly measured).

With respect to the results, in average, in the selected countries:
• 56.9% of the VAT potential is collected (C-efficiency, with maximum values in Paraguay- 91.1- and minimum in Mexico-31.5-),

• Due to tax expenditures, 19.9% of the potential collection is sacrificed (the so-called "G-inefficiency", with maximums in Panama-62.6-and minimum in Chile-5.1-),

• The remnant of that lost potential collection is 23.2%. We call it X-inefficiency

In summary, according to this methodology, in the region of every 10 dollars of possible collection, 5.7 are collected, 2 are "forgiven" 2 (tax expenditure) and the remainder, $2.3, is lost, mainly by evasion and mismanagement.

The figures obtained show the diversity of VAT situations in Latin America, their independence from the relative level of wealth of each country and their connection with the political will -concreted in the choice of the level of taxes and tax expenditures, highly correlated with the options adopted by the geographically closest neighboring countries-.

Content

Introduction

This work paper is part of a series of brief analyses that from CIAT we want to offer as presentation of the updating of the databases of Collection, Tax Rates and Tax Expenditures available in CIATData.

Taking advantage of this rich information we have opted to carry out a study that interlock all these dimensions and put them in relation to the basic characteristics of the different economies of the region through the indicators of productivity, collection efficiency, tax expenditure and inefficiency, in this case focusing on value-added tax (VAT). Despite the shortcomings of the different methodologies used in different countries and the limitations of the indicators, we consider that the results will be useful to better understand the reality of the region and improve the basis for its analysis.

In the first section we briefly present the databases used and available for the whole community of analysts and tax administrators in CIATData. Next, we will relate the characteristics of the respective economies with their collection figures, tax rates levels and estimated tax expenditure figures, using various standard indicators (Productivity and C-efficiency) and others of our own elaboration (G-inefficiency and X-inefficiency). Finally, we will summarize the results and point out possible lines of future work to continue to improve our knowledge of the tax systems of the region.

1. THE DATABASES USED: UPDATING CIATDATA

In relation to the collection, in 2010, following the LAC fiscal initiative of the OECD, CIAT, ECLAC and the OECD itself launched a project to jointly develop a report of tax statistics for Latin America, whose first edition was published in 2011. The main advantage of this work has been to allow the regional comparisons between the different Latin American countries, and also for the first time, international comparisons between them and the member countries of the OECD. On the occasion of the fourth edition published in 2015, the IDB joined these efforts to standardize and systematize the tax revenue statistics. In 2017 the latest edition has been published, including two special sections: the first refers to tax revenues from non-renewable natural resources and the second to trends in taxation and fiscal autonomy in sub-national governments in Latin America and the Caribbean.

At the same time, in the year 2011, the CIAT and IDB statistical efforts were combined to build a statistical database of supplementary tax revenues under an innovative methodology that, in addition to the usual tax revenues, includes compulsory contributions to private health and pension systems and income from natural resources (royalties and other extraordinary levies on extractive companies of publicly owned resources). The details of this new methodology and some analyses based on this new database are in the article "Putting pressure: estimating the real tax burden in Latin America and the Caribbean. The equivalent tax pressure" published in the Institute of Fiscal Studies of Spain in 2013. The updating of this database is the one that will be used for completing this analysis.

In addition, CIAT publishes on its website a summary of the Tax Rates in Latin America, offering a temporal series of Tax Rates of Value-Added Taxes (VAT), Corporate Income, and income from Individuals, and Financial Transactions. In relation to the VAT analyzed in this work, the database offers: General Aliquots (1968-2016); General, Reduced and Increased Aliquots (2011-2016); Aliquots reduced and increased by type of goods and services (2012-2016); Exclusions and Exemptions by type of goods and services (2012-2016).

Finally, we will use the new data available regarding tax expenditures. The analysis of tax expenditures has been part of many General Assemblies and Technical Conferences programs of CIAT. In diverse activities, our organization has been involved in relation to this topic. The main study that was carried out on this topic from the methodological point of view was the Handbook of Best Practices on Tax Expenditure Measurement: an Ibero-American experience, published in 2011 in

Spanish, English and Portuguese. Since then, CIAT monitors the evolution of tax expenditures in Latin America. Using this information, the Directorate of Tax Studies and Research has developed a database of the most important tax benefits and incentives that are in effect in the countries of the region under the jurisdiction of Central, National or Federal governments. This allows us to know the evolution of their cost over time, both at aggregate level and by tax, as well as their composition by type of tax expenditure and budget or economic sector[1].

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1   The data for VAT of Colombia (before and after the methodological change that they introduced in 2011), have been obtained from the last public official reports available: "El gasto tributario en Colombia. Principales beneficios en el impuesto sobre la renta, IVA e importaciones. Años gravables 2009 y 2010" Coordinación de Estudios Económicos Subdirección de Gestión de Análisis Operacional Dirección de Gestión Organizacional; "Marco fiscal del Mediano Plazo" 2015 y 2016: Ministerio de Hacienda y Crédito Público

2.   VAT COLLECTION IN LATIN AMERICA

VAT is the most important source of tax collection in Latin American countries, representing almost 30% of the 2015 tax revenues of the countries in the region included in our database (compared to an average of 21% in the OECD[2]).

The VAT collection that can be achieved in one country is determined by at least three dimensions: its economic characteristics (the size and structure of the economy, particularly consumption); the tax law dimension (tax rate/s and restrictions on taxable base); and the degree of compliance (the level of evasion and efficiency in management).

Table 1 presents, for fifteen countries in the region (last year available with tax expenditure -whose analysis will be added later- and collection data[3]), the value of the variables needed for a first approximation to the effects of the basic characteristics of the economies and their general rates on VAT collection (in relation to the GDP, the final consumption and with respect to the total collection).

Table 1.   **Tax collection, taxes, GDP and final expenditure**

Country	Year	GDPpc	ConHous/ GDP	ConGov/ GDP	ConTotal/ GDP	Rate	VAT/Con	VAT/GDP	VAT/Tot	Tot/GDP
Ar	2015	20.472	65,8	18,2	84,0	21	9,7	7,4	23,1	32,0
Bo	2013	6.303	60,2	13,8	74,0	14,94	11,8	7,8	28,7	27,1
Ch	2015	23.682	64,4	13,4	77,8	19	12,2	8,4	40,2	21,0
Co	2015	13.833	63,8	18,0	81,8	16	6,8	5,2	25,5	20,4
CR	2014	15.050	65,1	17,8	82,9	13	6,1	4,7	21,5	22,1
Ec	2014	11.417	58,9	14,0	72,9	12	9,5	6,3	31,3	20,2
ES	2013	8.111	92,7	11,6	104,2	13	7,2	7,0	38,6	18,1
Gu	2015	7.759	85,0	10,4	95,3	12	5,3	4,8	39,7	12,0
Mx	2015	18.463	68,4	12,5	80,9	16	5,0	3,9	25,1	15,5
Ni	2013	4.712	85,4	7,0	92,4	15	7,2	6,2	29,0	21,5
Pan	2012	18.448	54,0	10,6	64,6	7	4,8	3,0	17,0	17,5
Par	2015	9.040	69,6	12,8	82,4	10	9,1	6,9	36,8	18,7
Pe	2015	12.389	65,5	13,0	78,5	16	9,7	7,0	39,7	17,5
DR	2015	15.019	71,0	11,8	82,7	16	6,2	4,9	35,3	13,8
Ur	2014	20.680	72,4	14,8	87,2	22	12,1	9,4	29,2	32,3
Md		13.692	69,5	13,3	82,8	14,9	8,2	6,2	30,7	20,6

Sources: CIATData (IDB-CIAT Collection; Aliquots; Tax expenditures). GDP and Consumption data: World Economic Outlook (WEO), International Monetary Fund (IMF).
Notes: Countries and years selected for the availability of the latest collection and tax expenditure figures. Per capita GDP in dollars (purchasing power parity). Rest of the variables in percentage. Md = non-weighted average.
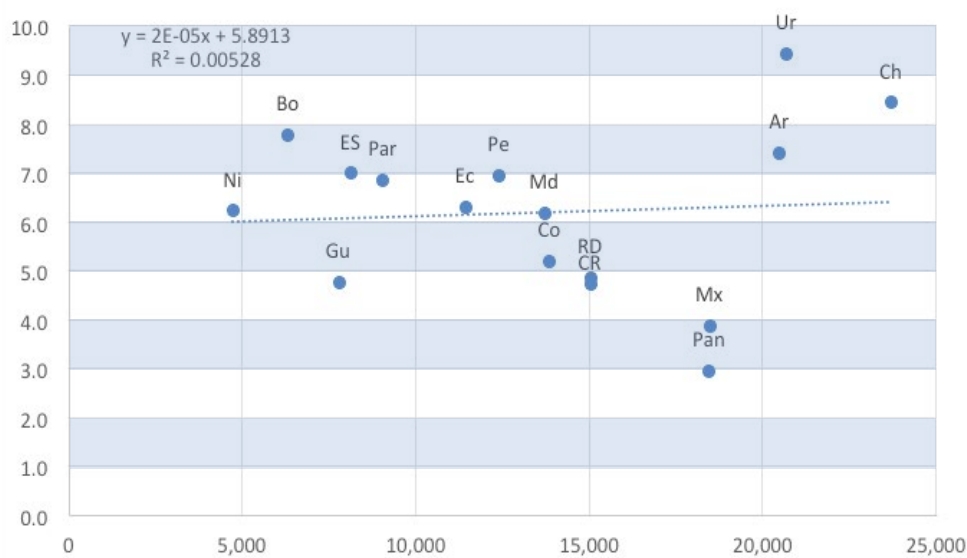ConHous: Households Final Consumption Expenditure; ConGov: Government Final Consumption Expenditure; ConTotal: Total Final Consumption Expenditure; VAT/Con: VAT collection/Total Final Consumption Expenditure; VAT/GDP: VAT collection/GDP; VAT/Tot: VAT Collection/Total Tax Revenue; Tot/GDP: Total Tax Revenue/GDP.

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2   OECD et al (2017), OECD (2016A).
3   The non-inclusion of other countries is due to our lack of information about any of the study variables. In the case of Brazil, the decentralization of consumption taxation at the state level was excessively complicated for the analysis.

From a descriptive and basic statistical analysis, we find no significant relationship between GDP per capita (corrected by price differences) and VAT collection, total collection or VAT participation in the total *(Graphs 1, 2 and 3)*. Similarly, the relationship between the level of income and the weight of the final consumption-the potential basis of VAT-in GDP is also not significant *(Figure 4)*.

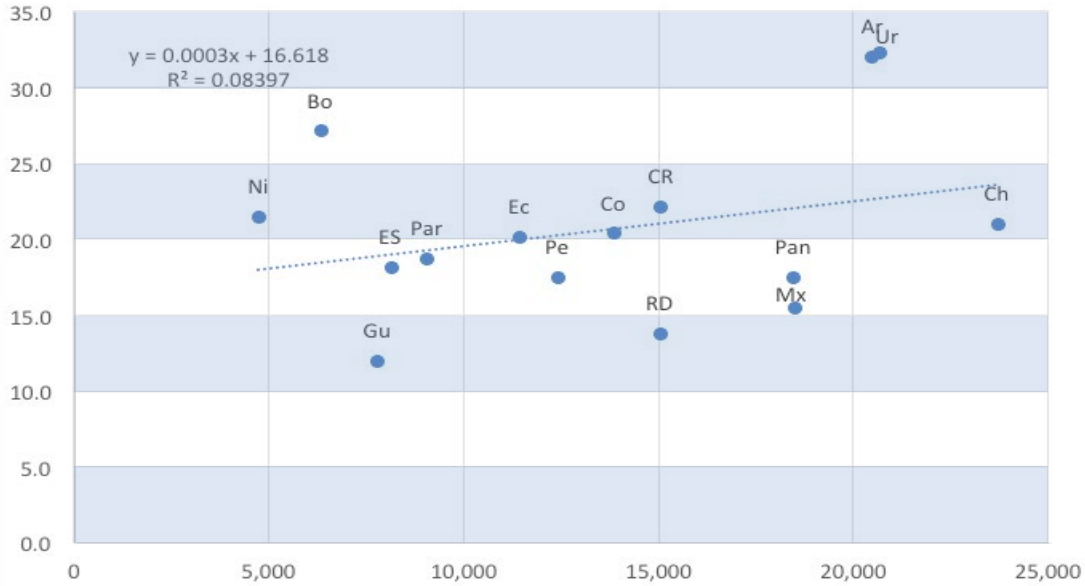**Graph 1.   Collection VAT/GDP and GDP pc in PPP**

Source: own elaboration from data in table 1.
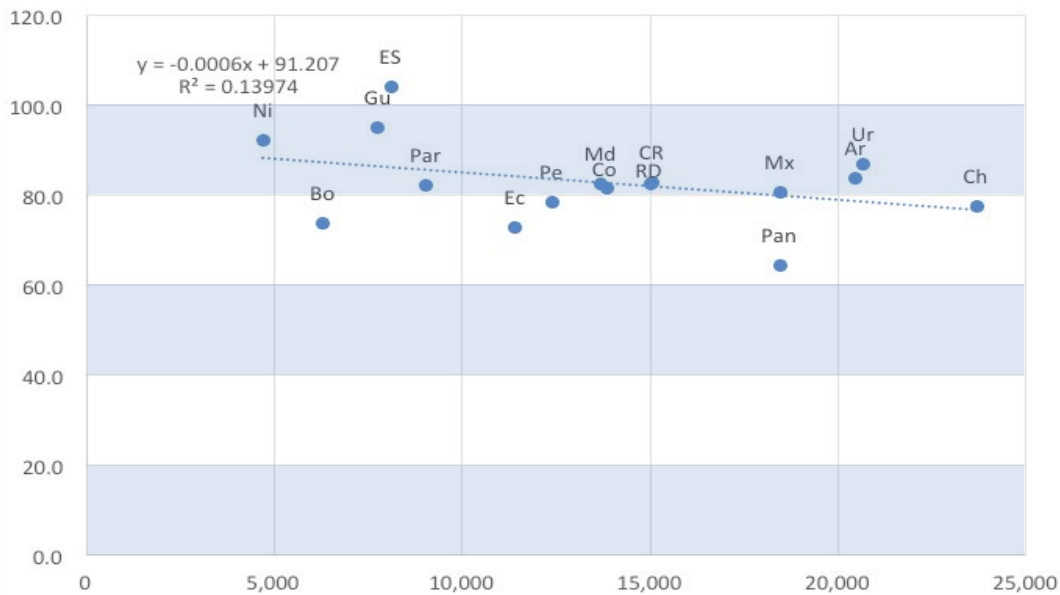
Graph 2.   VAT Collection/Total and GDP pc in PPP
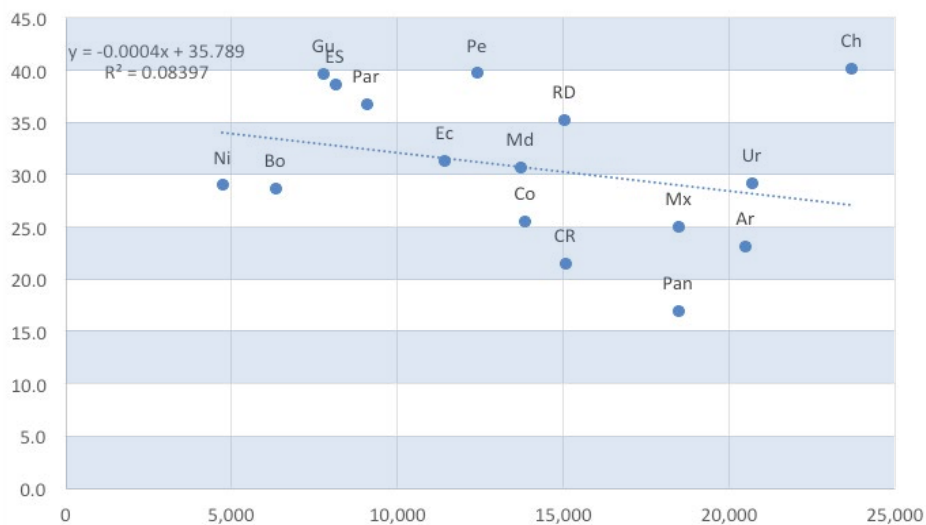
Source: own elaboration from data in table 1.

Graph 3. **Total Collection/GDP and GDP pc in PPP**

$y = 0.0003x + 16.618$
$R^2 = 0.08397$

Source: own elaboration from data in table 1.

Graph 4. **Final Consumption Expenditure/GDP and GDP pc in PPP**

$y = -0.0006x + 91.207$
$R^2 = 0.13974$

Source: own elaboration from data in table 1.

The only variables in table 1 that have some relevance (coefficient of determination, R^2, with values 0.4 and 0.3) to explain the differences in VAT collection are those that present a more mechanical than explanatory relationship with the collection: the level of the general rates (Figure 5) and the overall level of collection (Figure 6). When we try to establish again a causal bridge between the characteristics of the economy and the collection, in this case analyzing the relationship between

the level of income per capita and the choice of rates more or less high, the statistical relationship again weakens (R^2 of 0.22) and the coefficient of the explanatory variable -per capita GDP- is extraordinarily reduced, despite aiming in the expected sense (the more per capita income, the higher tax rate, *Graph 7*).

Graph 5. **VAT Collection/GDP and tax rates**
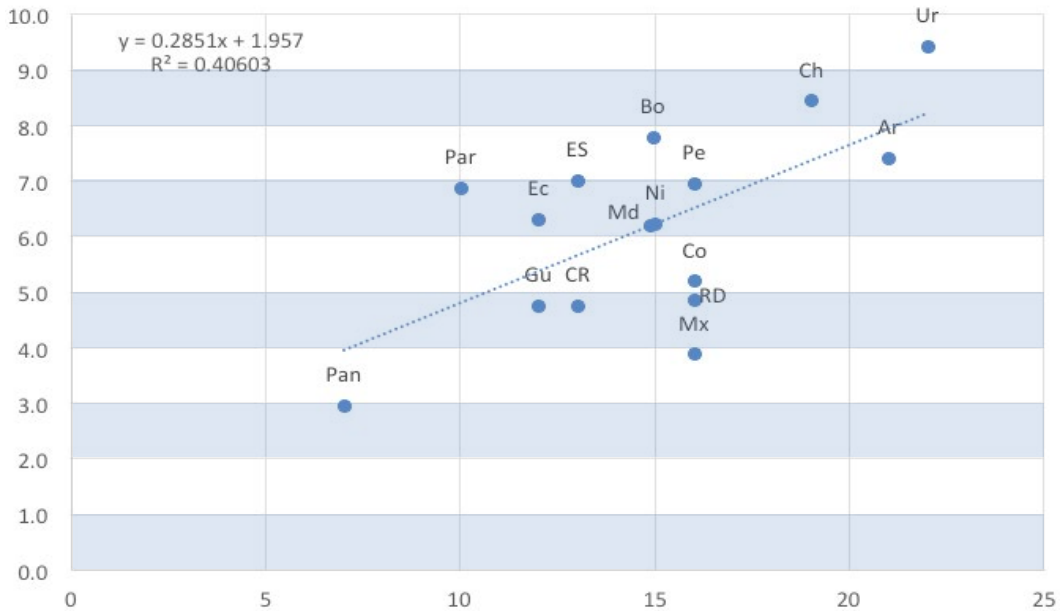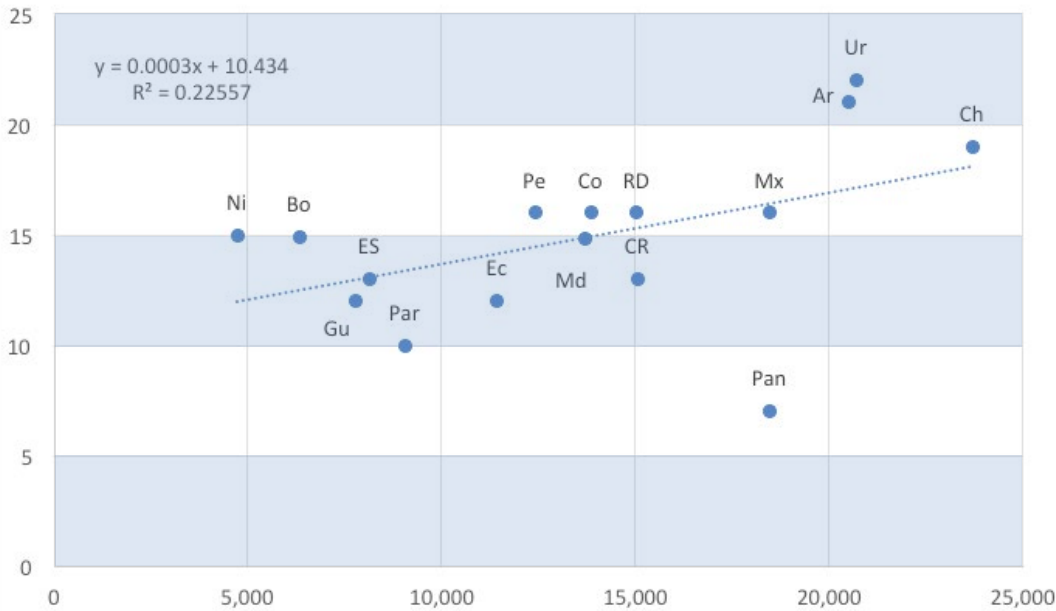

Source: own elaboration from data in table 1.

Graph 6. **VAT Collection/GDP and Total Collection/GDP**
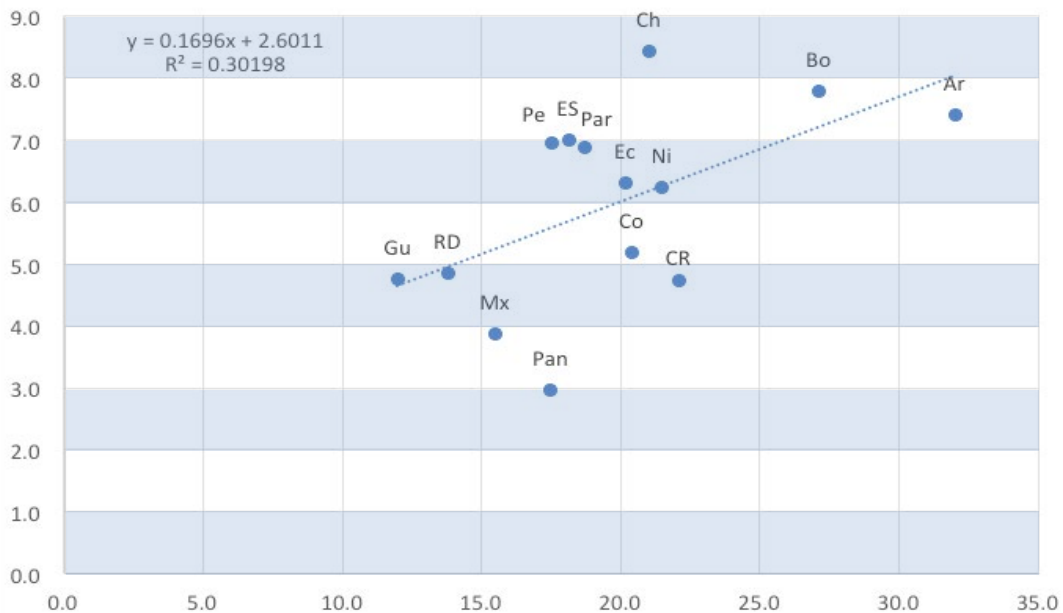
Source: own elaboration from data in table 1.

Graph 7. General VAT rate and GDP pc in PPA

$y = 0.0003x + 10.434$
$R^2 = 0.22557$

Source: own elaboration from data in table 1.

All of the above shows the lack of consideration of other key factors influencing the country's choices in relation to the use of a particular tax figure (in this case the VAT) and the level of collection reached, among them the use of tax expenditure and the level of efficiency of the tax administration that we will analyze below.[4]

In any case, and prior to incorporating these new tax dimensions to the analysis, it is worth highlighting an additional statistical "curiosity". Figure 8 shows the relationship between the latitude of each country (simplified its measurement by the one corresponding to the capital of each of the States) and its VAT collection by GDP. The statistical significance is surprisingly high, with a R^2 of 0.65, for a negative connection between latitude and collection. The farther south, the higher the VAT collection. This connection is repeated regarding the total collection relative to GDP (R^2 of 0.52, Figure 9).

Although it is a well-known statistical concept, it is worth remembering that the correlation, despite not implying causation, can be interpreted as the increase in probability with which we count to predict the values of one of the variables, given the other. Thus, an R^2 of 0.65 corresponds to a correlation coefficient of Pearson (square root of the coefficient of determination) of -0.8. If we assume a normal bivariate distribution between the two variables, the probability that, for example, the VAT collection on a country's GDP is higher than average when its latitude is less than average is equal to 0.798[5], this is a significant increase of almost 30% compared to the base

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4   Of course, also the breadth and quality of the data used limits the scope of the analysis, which in this approximation can be nothing more than descriptive of basic signs of relationship, which could be completed with an analysis of a sample of countries and years broader and more sophisticated econometric techniques.

5 $P(B>\mu B|A>\mu A)=1/2+\arcsin \rho/\pi$.

probability that, without further information, we would have supposed that each country can have the same probability -50%- of having a collection above or below the average of the group[6]. In short, for now our best option for "guessing" the relative position of each country regarding its level of VAT collection is its latitude.

Graph 8.   VAT Collection/GDP and Latitude

$y = -0.0702x + 5.9395$
$R^2 = 0.65216$
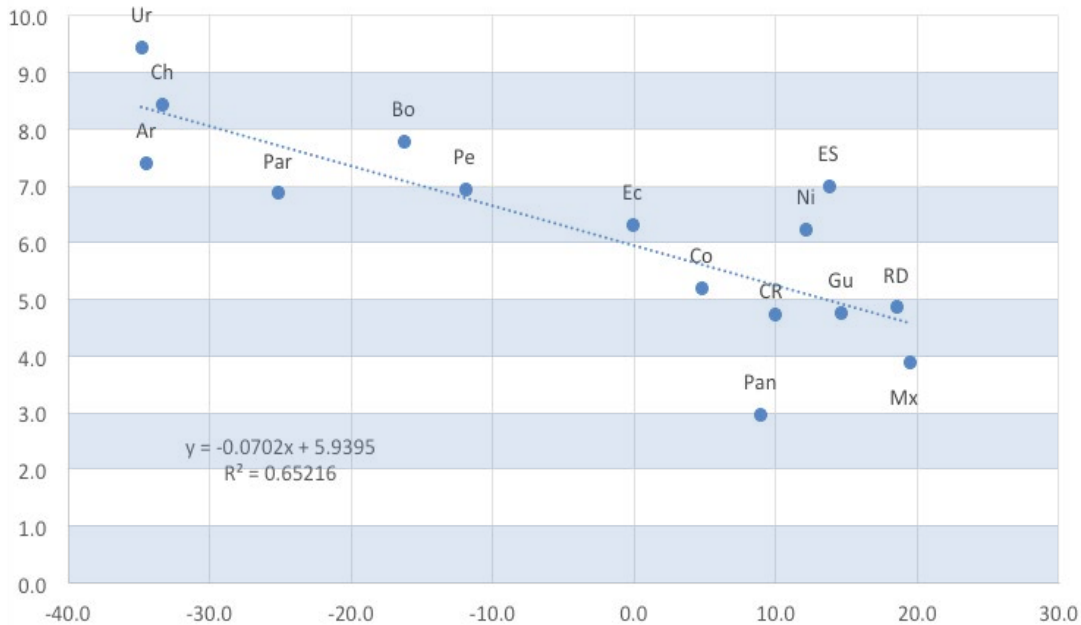
Source: own elaboration from data in table 1.

Graph 9.   Total Collection/GDP and Latitude


$y = -0.2095x + 19.887$
$R^2 = 0.5231$
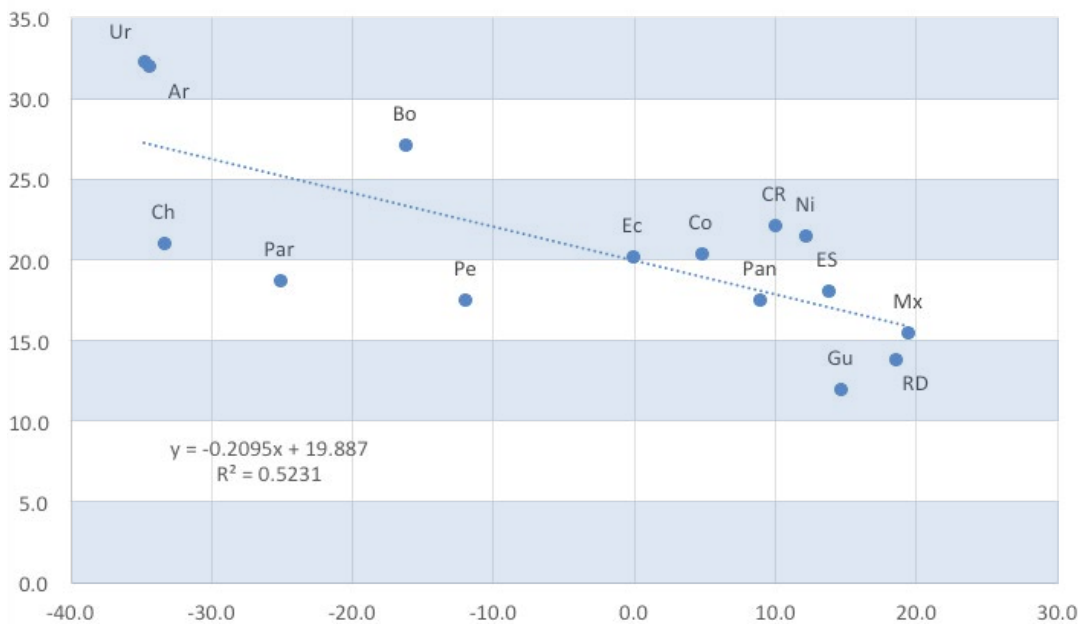
Source: own elaboration from data in table 1.

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6   Similarly, by having another reference, an R^2 of 0.1 represents a correlation of 0.3 and a gain of probability compared to 50% of only 10%.

Of course, such a relationship could be no more than a result of coincidence or evidence of the existence of common explanatory factors between the geographical situation and the tax policies decisions. In this second sense, it cannot be ruled out that the tax "culture" of each country is influenced by the existing one in the geographically closest countries, especially given the peculiar circumstances of the United States, where the indirect tax collection is relatively low in the international environment due to the decentralization of the normative competences with respect to the indirect taxes -with some race to the bottom in the rates- and in absence of a VAT type tax -whose superiority in revenue collection with respect to other forms of general taxation on consumption has been noted-[7]. This relationship with the latitude is lower for the tax rates (although more significant than the one between them and the GDP pc level) and reduced with the level of GDP per capita (*graphs 10 and 11*).

Graph 10.   VAT rates and Latitude
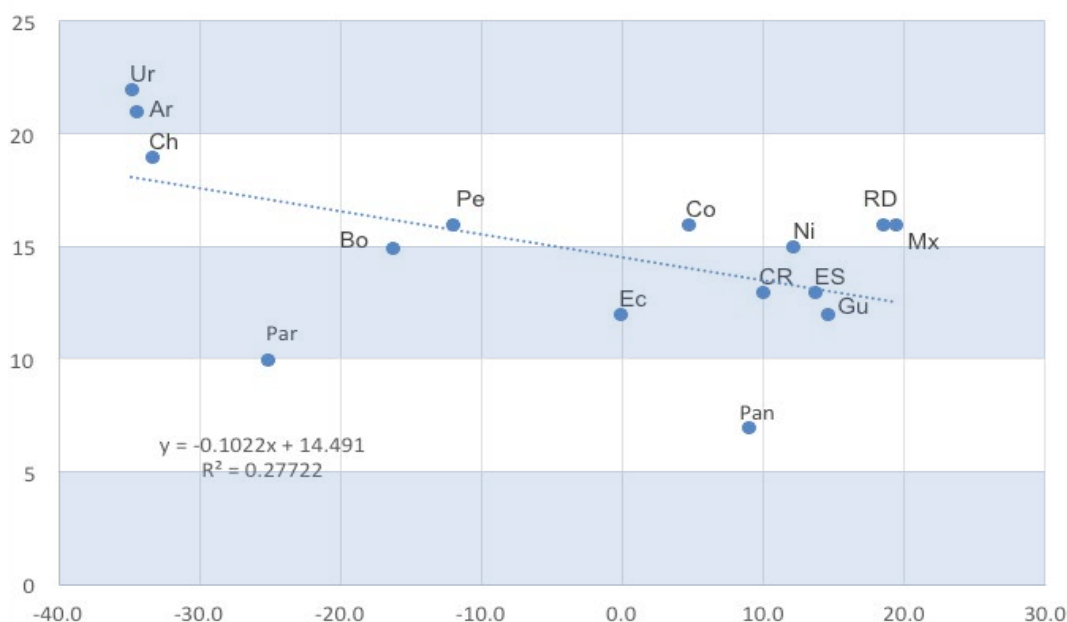
Source: own elaboration from data in table 1.

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7   See for example https://taxfoundation.org/state-and-local-sales-tax-rates-in-2017/ . Currently, the five states with the highest combined (state and local) sales tax rates are Louisiana (9.98%), Tennessee (9.46%), Arkansas (9.30%), Alabama (9.01%), and Washington (8.92%). Lowest rates are found in Alaska (1.76%), Hawaii (4.35%), Wyoming (5.40%), Wisconsin (5.42%), and Maine (5.5%).

Graph 11.   GDP pc and Latitude
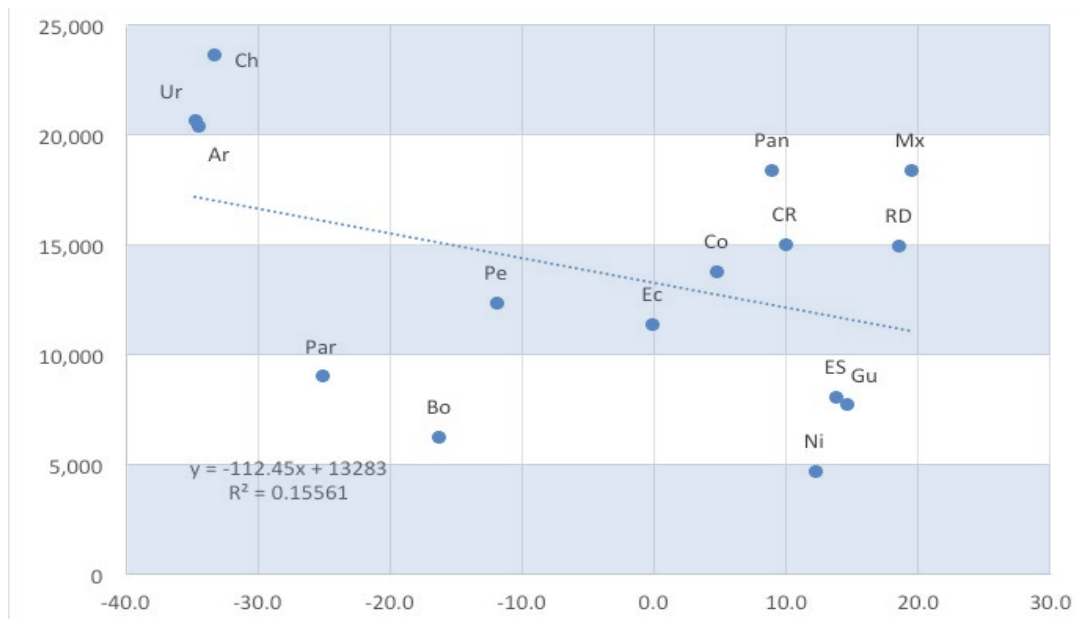
Source: own elaboration from data in table 1.

3. VAT PRODUCTIVITY AND C-EFFICIENCY

Table 2 and Graph 13 reflect the values of the two main indicators used to assess efficiency in VAT collection: Productivity and C-efficiency.

Table 2.

Country	Productivity	C-efficiency
Par	68,8	91,1
ES	53,9	55,4
Ec	52,6	79,1
Bo	52,2	78,8
Ch	44,5	64,1
Pe	43,5	60,7
Ur	42,9	55,2
Md	42,7	56,7
Pa	42,4	68,7
Ni	41,6	48,3
Gu	39,7	43,9
CR	36,5	46,7
Ar	35,3	46,1
Co	32,5	42,5
DR	30,4	39,0
Me	24,3	31,5

Source: own elaboration from data in table 1.
Note: The figures of Colombia correspond to 2010, due to a subsequent change in the methodology of the tax expenditure measurement that hindered the comparability.
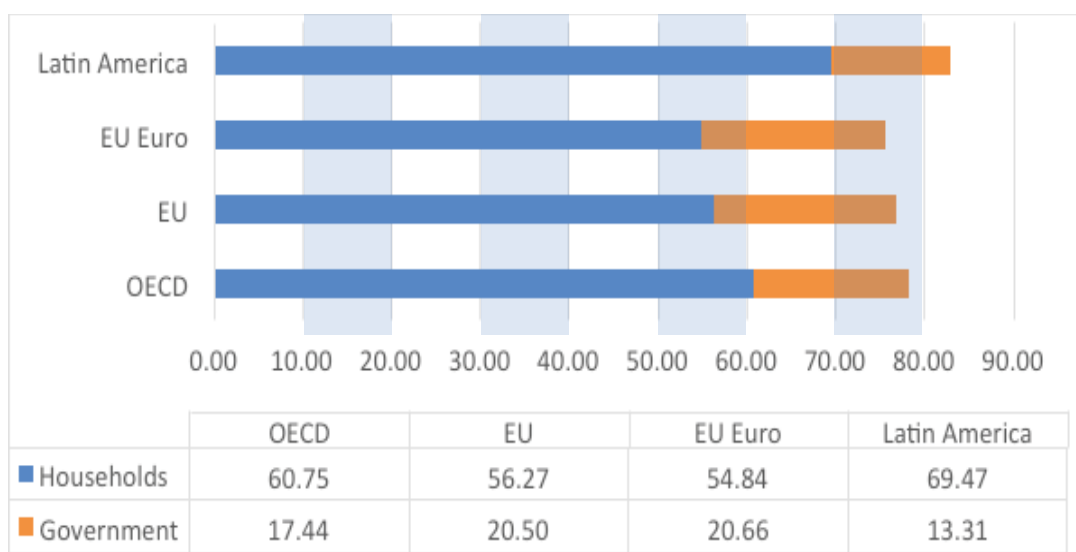
A first approach to the analysis of these dimensions to understand how much collection is achieved, is the "VAT Productivity index", which is defined as the ratio between VAT collection, measured in percentage of GDP, and the overall tax rate. The value taken by the index represents the revenue obtained as a percentage of GDP for each tax rate point. This indicator allows evaluating the collection power of a VAT point, determined by the breadth of the taxable base and the level of tax compliance.

With the data that we used, there is a wide variability between countries in the index. Thus, for example, it oscillates between 0.24-or 24%-in Mexico, which presents the most eroded tax base of the region, and 0.68 in Paraguay. The simple average for the sample of table 2 is 0.42.

However, these comparisons can be misleading because the existing VAT in the vast majority of countries taxes consumption (VAT-consumption type), not the totality of GDP (which would be closer to a product-type VAT). Consequently, the comparisons are only appropriate between economies in which consumption represents the same share of GDP (which, in fact, would affect

those carried out both in Latin America -in the analyzed sample they vary between 104% in El Salvador and 64% in Panama, with an average of 82%- as compared to the OECD or EU since total consumption rates as a percentage of GDP are on average lower, about 78% and 75%, respectively, in 2015).

Graph 12.   Consumption % of GDP. 2015

	OECD	EU	EU Euro	Latin America
■ Households	60.75	56.27	54.84	69.47
■ Government	17.44	20.50	20.66	13.31

Source: United Nations. National Accounts statistics

Therefore, a second indicator, which is called the C-efficiency-consumption index (C-efficiency)[8] of VAT, which is defined as the quotient between the tax collection (CVAT) and the potential collection (PC) calculated as a product of the theoretical basis of final consumption (C), multiplied by the general tax rate (GT). In this case, unlike the usual rate of C-efficiency, this calculation has corrected the VAT collected, deducting it from the value of the final consumption, calculated at market prices.[9]

$$\text{Efficiency } C = \frac{CVAT}{PC} = \frac{CVAT}{C \times GT}$$

It is important to emphasize that this indicator is conditioned by the relative participation of private and public consumption in GDP. Whereas in OECD countries and, above all, in the EU Euro Zone, the private consumption has a lower relative share than in the Latin Americans GDPs, the opposite is true for public consumption (*Graph 12*). This structure skews the ratio against Latin America -and in particular against some of the countries of the region- because the greater private consumption implies the possibility of greater evasion, although this is partially compensated because the provision of public goods and services are usually exempt from VAT.

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8   The concept of C-efficiency is a terminology rooted in the tax literature referring to VAT. It should not be confused with the use of the concept of efficiency that prevails in economic literature.

9   The OECD in its calculation of the so-called VAT revenue ratio (C-efficiency equivalent) also performs this adjustment. OECD et al (2017) performed the calculation for a group of Latin American countries in 2014, with results very similar to those obtained in this study.

Graph 13.   Productivity and C-Efficiency
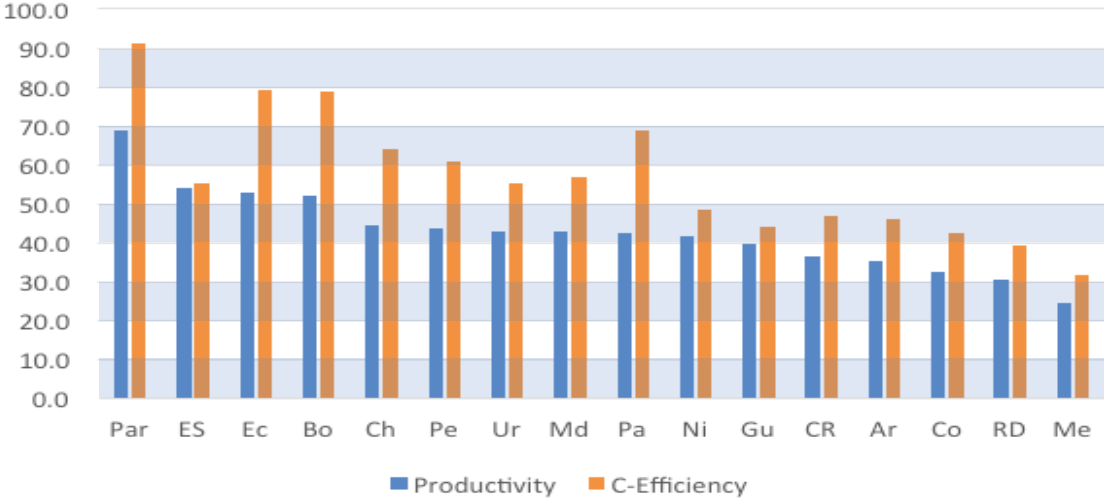
Source: own elaboration from data in table 2.

Graph 14.   C-Efficiency. OECD 2014
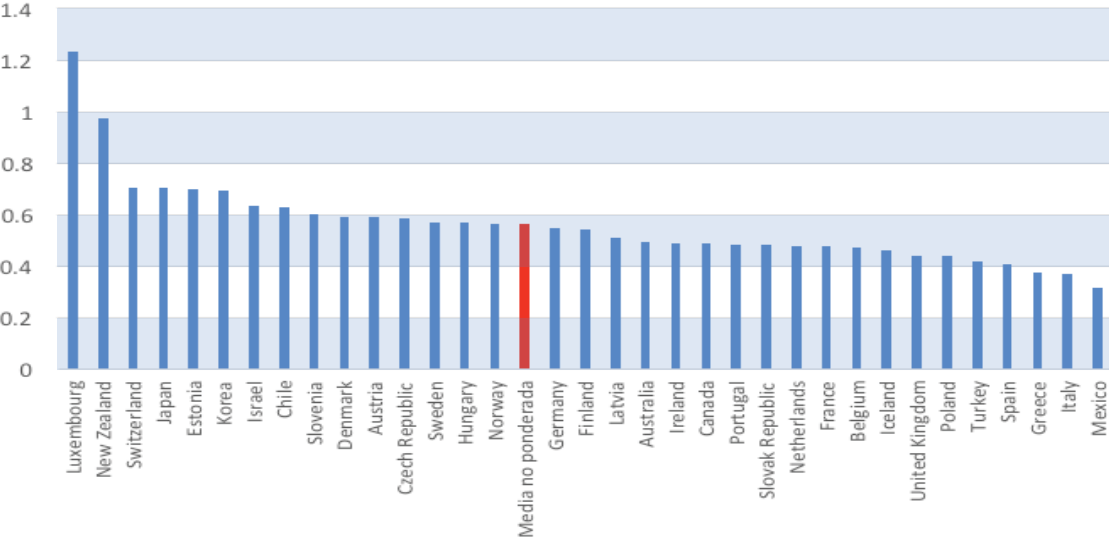
Source: OECD (2016B) consumption tax trends.

In average, Latin American countries collect about $5.7 per 10 of potential collection in VAT, that is, a C-efficiency (relative to consumption) of 0.57, a similar level to that obtained by developed countries (OECD, 0.56 or 56%, Graph 14).[10] By moving from the indicator of Productivity to the C-efficiency, the countries that register the biggest difference, logically, are those in which consumption represents a lower percentage of their GDP (Panama, Ecuador, and Bolivia).

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10   The OECD average rate of 2014 is 19.1%, with maximum levels in Hungary, 27%, and lowest in Canada-5%, while it is necessary to bear in mind that the provinces can also tax consumption-and Japan-5% in 2014, 8 from 2015 and with the project to rise to 10% delayed to 2019), compared to a 14.9% average in the LAC countries analyzed, maximum in Uruguay, 22%, and minimum in Panama, 7%.

In order, the highest levels of C-efficiency in the region are recorded in Paraguay, Ecuador, Bolivia and Panama (91, 79, 78 and 68%), while the lowest are produced in Mexico, Dominican Republic, Guatemala and Colombia (31, 39, 43 and 42%). In the OECD, we find exceptionally high values in Luxembourg, 1.23 or 123%, and New Zealand, 0.97, while the remainder does not exceed 0.7. Below are the Mediterranean countries, Turkey, Spain Greece and Italy, around 0.4.

With regard to the highest extreme values, it should be taken into account that there may be reasons linked to the peculiar characteristics of their economies or regulation, as in the case of Luxembourg where the taxation of financial services (very concentrated in the country and that cannot deduct the VAT supported because for technical reasons the provision of services is exempted) and electronic commerce (which took advantage, till the change in 2015 from the criterion of origin to the destination for internet sales, of having the lowest possible rate within the EU, 15%[11], an essential competitive advantage) cause an extraordinary collection with regard to potential national consumption, or in New Zealand, virtually the only country in the world in which all government activities are taxed. Of course, the different rates and procedures of return/compensation of the supported VAT or the existence of errors (underestimation) in the macro magnitudes derived from the national accounts could also alter the results, while other factors (such as a high wage burden within the public-sector final public expenditure macro component) could skew results downwards (by overestimating the potentially taxed base)[12].

In addition, it should be taken into account that the "normative" implications of obtaining a higher or lesser level of C-efficiency are not always indisputable. Firstly, a very high value would not have to be considered positive if it would imply the refusal to refund exporters or the effect of introducing exemptions for intermediate goods that would extend the collection by infringing VAT neutrality. On the other hand, in terms of welfare and optimal taxation, the superiority of a uniform levy at a single rate is not supported by the theory, which would recommend in any case rates inversely proportional to the elasticity of the compensated demands (after eliminating the income effect). Thirdly, in redistributive terms the use of differentiated rates lower than the general or exemptions for products consumed exclusively by the citizens of lower income (and that assume a significant percentage of their consumption) could contribute to improving the distribution of the income. However, we must emphasize that, despite all these nuances, practical experience has led to the preference of simplified, single-rate schemes for VAT taxation, given the problems to identify the

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11   In general, the inclusion of the collection generated by non-residents in the numerator, together with the exclusion of the consumption of the denominator, will skew the indicator of the countries with the greatest influence of this type of operations. Moreover, the theoretical basis of VAT can be influenced by its connection with selective taxation, for example, in most oil-producing countries, Central America, and the Dominican Republic, fuels are taxed only selectively, thus lowering VAT productivity. Meanwhile, Argentina, Chile and Uruguay do tax diesel.

12   Other factors related to the measurement of the variables that could affect the results are: the taxation in origin of the services rendered to resident; The value of the income imputed to homeowners, considered as domestic consumption in terms of national accounts; The aforementioned inclusion of public consumption at the cost of factors-without distinction of taxable and non-taxable expenditures; The existence of compulsory exemptions, as in the case of the EU; etc. See Keen (2013)

different elasticities, to differentiate the products for distributive reasons and to manage and fight fraud in a context of differentiated rates by products. [13]

With all these cautions, we can analyze the values obtained for Productivity and C-efficiency in relation to the possible explanatory variables considered so far. And the results, not graphically exposed in their entirety to not overload the exposure, bring no surprise: again, in general, productivity is not related to the level of GDP per capita, or to the percentages of consumption in relation to GDP, nor, significantly, with the level of the general VAT rates existing in the different countries. With the C-efficiency, the same process happens, its levels are also not significantly correlated with the variables contemplated so far.

The results regarding the relationship between the level of the rates and the level of productivity and efficiency-with some R^2 that in no case exceed 0.15-appear in Graphs 15 and 16 for the countries of Latin America and Graph 17 for those of the OECD.
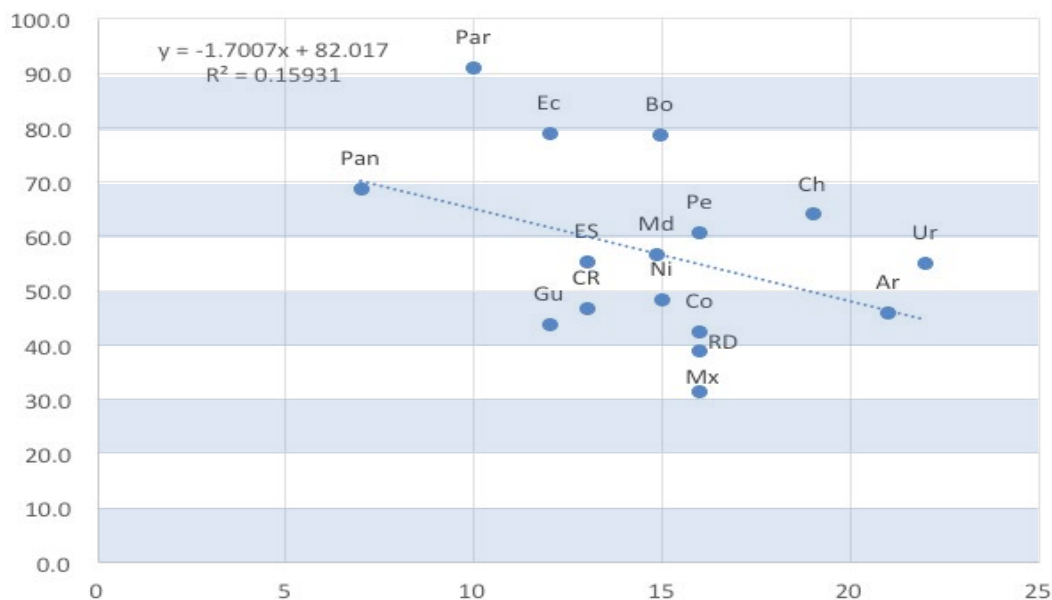
Graph 15.   Productivity and rates
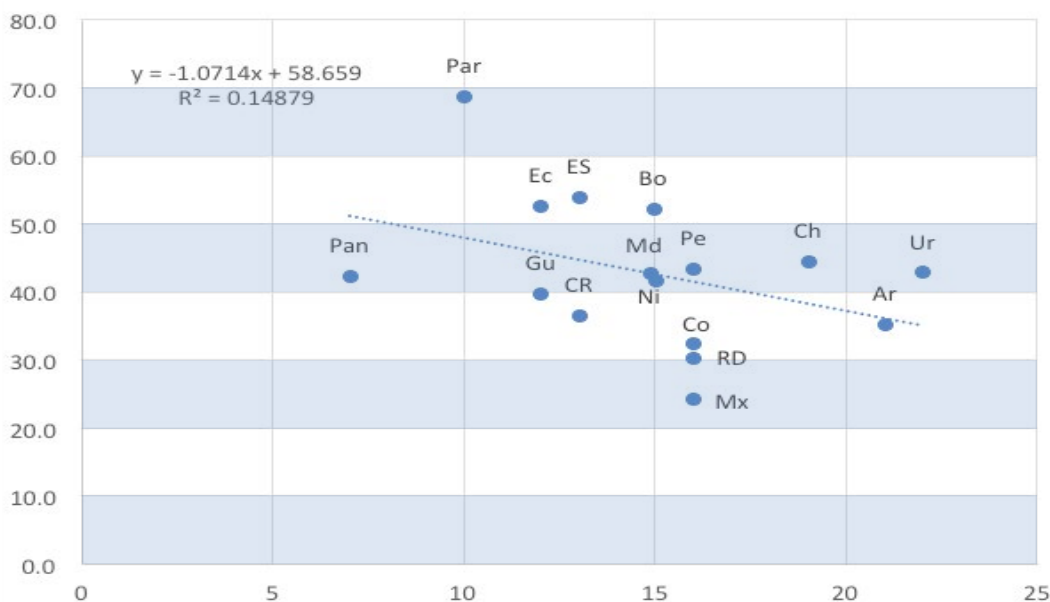
Source: own elaboration from data in tables 1 and 2.

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13   See Keen (2013) in relation to these conceptual aspects of the indicator and Barreix et al (2013) regarding the fair taxation options in VAT without the use of reduced rates and exemptions.
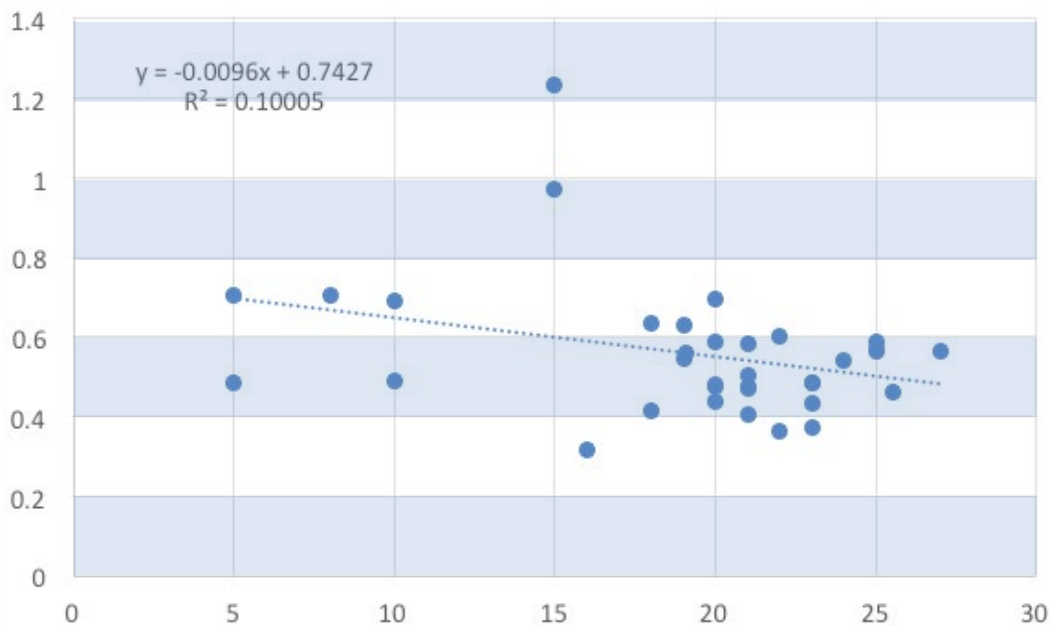
Graph 16.   C-Efficiency and rates

$$y = -1.7007x + 82.017$$
$$R^2 = 0.15931$$

Source: own elaboration from data in tables 1 and 2.
*Note:* The elimination of Paraguay, extreme case, leaves the R^2 in 0.0

Graph 17.   C-Efficiency and tax rates. OECD 2014

$$y = -0.0096x + 0.7427$$
$$R^2 = 0.10005$$

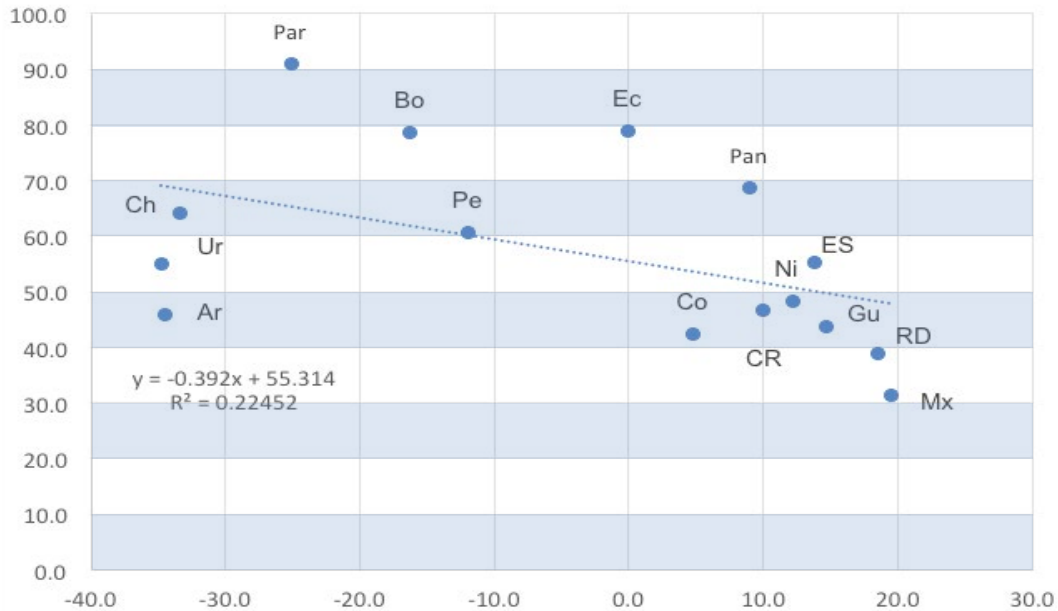*Source:* OECD (2016B) consumption tax trends.

Moreover, in this case, contrary to the observed in relation to the collection, the latitude is not so clearly related to Productivity or -C efficiency (graphs 18 and 19).

Graph 18.   VAT Productivity and Latitude
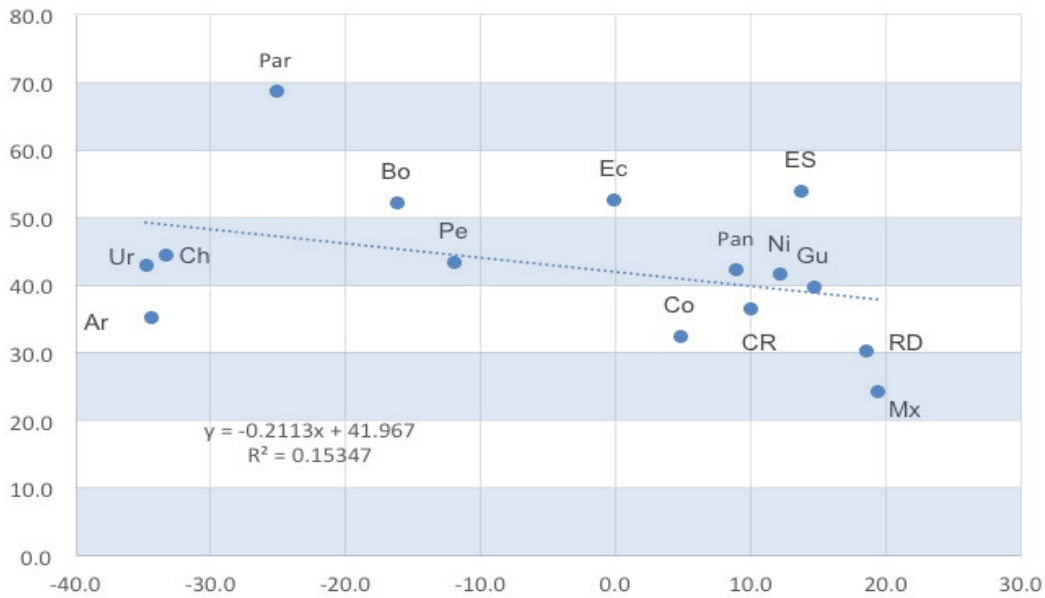
Source: own elaboration from data in tables 1 and 2.

Graph 19.   C-Efficiency and Latitude

Source: own elaboration from data in tables 1 and 2.

4. A COMPLETE VIEW OF COLLECTION, TAX EXPENDITURE AND EFFICIENCY IN THE ADMINISTRATION: C-EFFICIENCY + G-INEFFICIENCY + X-INEFFICIENCY = 100%

Normally, the analysis of VAT collection ends at this point, abandoning the use of these indicators and passing to consider other possible explanatory factors separately. However, we consider interesting to use the methodology developed in Barreix et al (2012) to continue the analysis of the collection obtained with respect to its maximum potential, taking advantage of the available data of the Tax Expenditures compiled by CIAT.

It is obvious that productivity losses and revenue efficiency are due, on the one hand, to reduced tax rates and exemptions and, on the other, to deficiencies in management and fraudulent behavior. And to calculate the loss of potential revenues derived from reduced rates and exemptions we can go to calculations of tax expenditure in VAT in different countries. It should be highlighted from the outset that, although almost all countries use a standard methodology, based on the direct calculation of the collection lost by the legal provisions, the specific application in each case can give rise to differences in estimates.

The first three columns in table 3 summarize the information available to selected countries regarding their tax expenditures, measured in percentage of GDP, in relation to the actual VAT collection and in relation to the potential (VATpot) tax collection (built as the sum of the real plus the estimated tax expenditures) (graphs 20, 21 and 22) (GT stands for "Gastos Tributarios", Tax Expenditures, in Spanish).
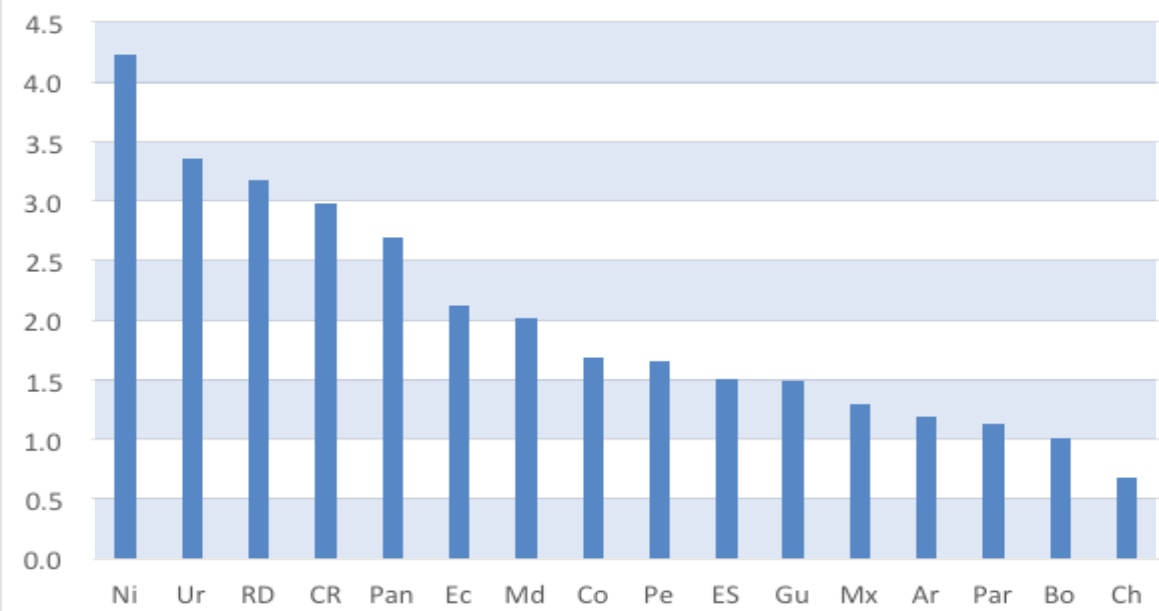
Table 3.

Country	GT/GDP	GT/VAT	GT/VATpot	C-EFFIC	G-INEF	X-INEF
Ar	1,2	16,1	13,9	46,1	7,4	46,5
Bo	1,0	13,0	11,5	78,8	10,2	11,0
Ch	0,7	8,0	7,4	64,1	5,1	30,8
Co	1,7	31,8	24,1	44,4	14,1	41,5
CR	3,0	62,9	38,6	46,7	29,4	23,9
Ec	2,1	33,7	25,2	79,1	26,6	-5,7
ES	1,5	21,5	17,7	55,4	11,9	32,7
Gu	1,5	31,2	23,8	43,9	13,7	42,5
Mx	1,3	33,5	25,1	31,5	10,6	57,9
Ni	4,2	67,8	40,4	48,3	32,7	19,0
Pan	2,7	91,0	47,6	68,7	62,6	-31,3
Par	1,1	16,5	14,1	91,1	15,0	-6,1
Pe	1,6	23,7	19,2	60,7	14,4	24,9
DR	3,2	65,4	39,6	39,0	25,5	35,4
Ur	3,4	35,5	26,2	55,2	19,6	25,2
Md	2,0	36,8	24,5	56,9	19,9	23,2

Source: own elaboration from the tax expenditure database available at CIATData.
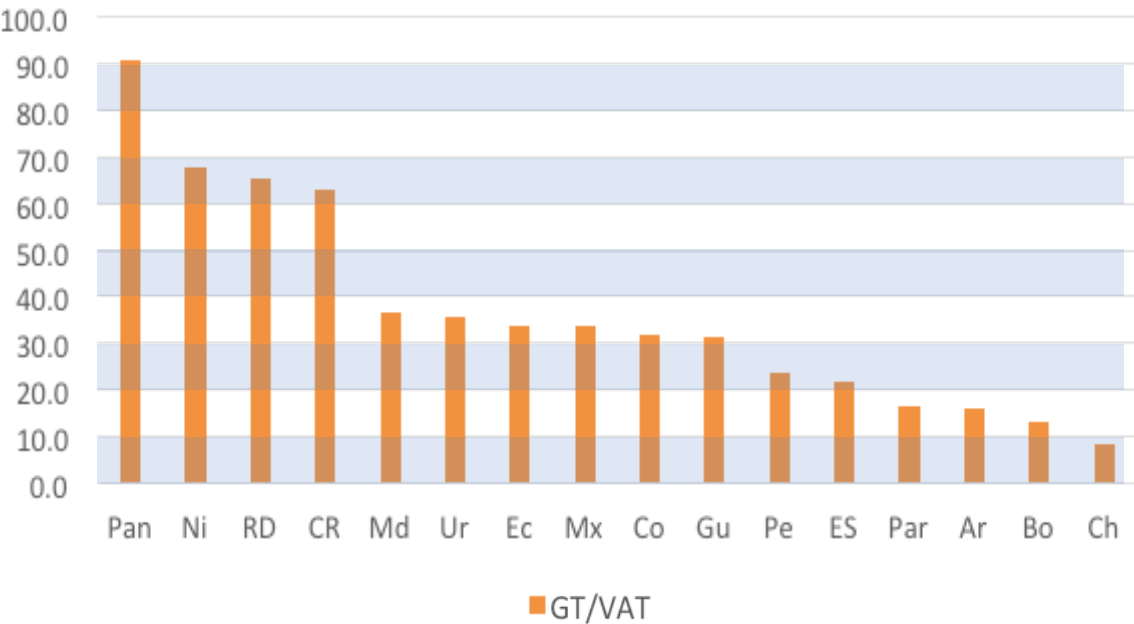*Notes:* TE/GDP: VAT Tax Expenditures with respect to GDP; TE/VAT: VAT Tax Expenditures with respect to actual VAT collection; TE/VATpot: VAT Tax Expenditures with respect to potential VAT collection.
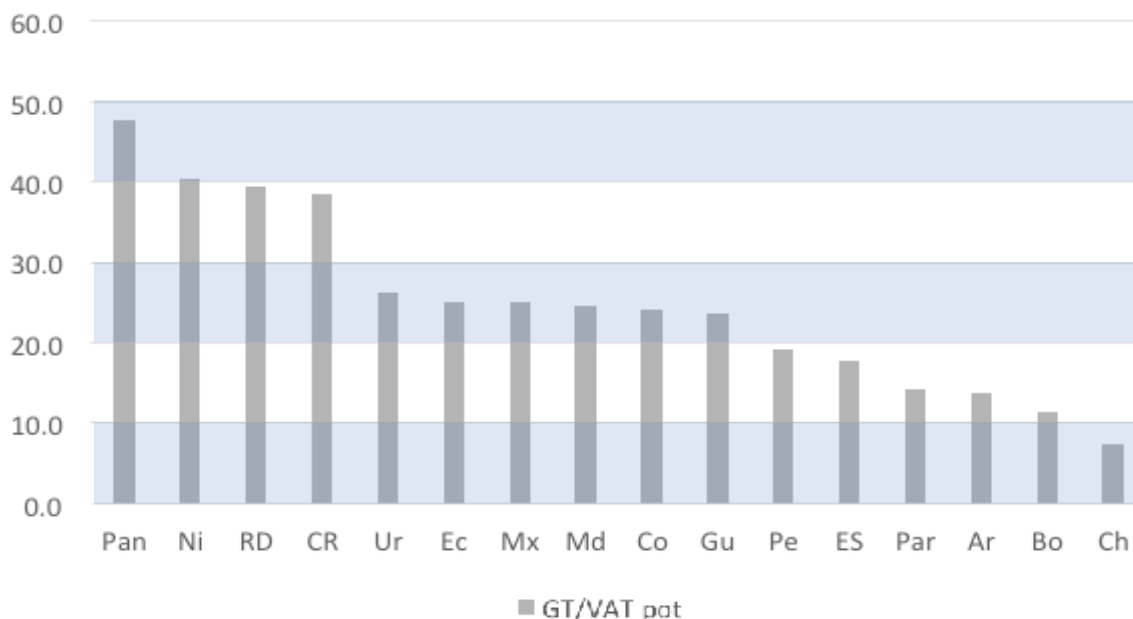
Graph 20.   GT/GDP

Graph 21.   GT/VAT

Graph 22.   GT/VAT pot

Source: own elaboration from data in table 3.

According to this data, in Argentina, Bolivia, Chile or Paraguay, the erosion of the collection would be relatively low, less than 15% of the potential collection as we have defined it for these purposes. In contrast, in Panama, Nicaragua, the Dominican Republic or Costa Rica tax expenditures cause a considerable decrease (around 40% of the potential, implying more than 60 percent of the current revenue). The average is approximately 25% of the potential collection, almost 37% of the real one.

The innovation developed in Barreix et al (2012) implies linking these data with those used in the construction of the C-efficiency, developing the concept of G-inefficiency (inefficiency due to tax expenditure -G stands for "Gasto Tributario"-) understood as the quotient between the estimated tax expenditure (GT) and the potential collection (RP, "Recaudación Potencial"), calculated in the same way as in obtaining the C-efficiency (consumption, C, by the general rate, TG, "Tasa General"):

$$G\text{-}Inefficiency = \frac{GT}{RP} = \frac{GT}{C \times TG}$$

In this way, we already have two measurable components of the VAT potential collection, the percentage that is collected (C-efficiency) and the one that is not raised consciously due to the tax benefits granted, measured through the Tax Expenditures (G-inefficiency). But what if they do not add up to 100% of the potential revenue calculated as the final consumption for the overall rate? If the C-efficiency and G-inefficiency measurements were perfect (this is: the potential basis of assessment -the figure of final consumption obtained by National Accounting- would corresponds precisely to the VAT "ideal" amount and time with the tax base, the actual collection obtained would follow the criterion of contemporary accrual of the base and the estimation of the tax

27

expenditure would be perfect and homogeneous in time and between countries) the resulting "remainder" would correspond with the loss of potential revenue due to the existence of fraud, circumvention and failures -or exceptions- of management (administrative delays in the collection of debts, unpaid or postponements), that is, the shortcomings derived from "inefficiency in the compliance", largely attributable to the tax administration.

However, since we are aware of the failures, among others, in the definition of the potential basis, the homogeneous estimation of the tax expenditure and the temporal correspondence of the income data (with case criterion) compared to the consumption (in principle as accrual), already in the introductory study of this methodology in 2012 we consider more appropriate to qualify this residual component as X-Inefficiency. [14][15][16]

$$C\text{-}Efficiency + G\text{-}Inefficiency + X\text{-}Inefficiency = \frac{RIVA}{RP} + \frac{GT}{RP} + \frac{X}{RP} = \frac{RIVA+GT+X}{C\times TG} = 100\%$$

The results obtained appear (in %) in table 3 and graph 23.

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14   Barreix al (2012). In Keen (2013) a very similar breakdown is developed and it is noted as antecedent the one made in Barreix et al (2012), however, they choose to give different names to the components, called "policy gap" the inefficiency derived from the use of tax expenditures and "compliance gap" the one that we call X-inefficiency.

15   The term makes analogy to the "X-inefficiency" concept used to describe non-explicitly defined explanatory components that account for the losses of internal efficiency in a firm.

16   RP = Potential collection, obtained by multiplying the theoretical basis-Final Consumption (C) obtained from the National Accounting-by the general VAT rate (TG). RIVA = VAT Collection. GT = Tax expenditure estimation. X the collection lost by other causes (basically fraud and lack of administration) plus/minus the errors of calculation with respect to the ideal definition of the previous variables.

Graph 23.   VAT: descomposition efficiency
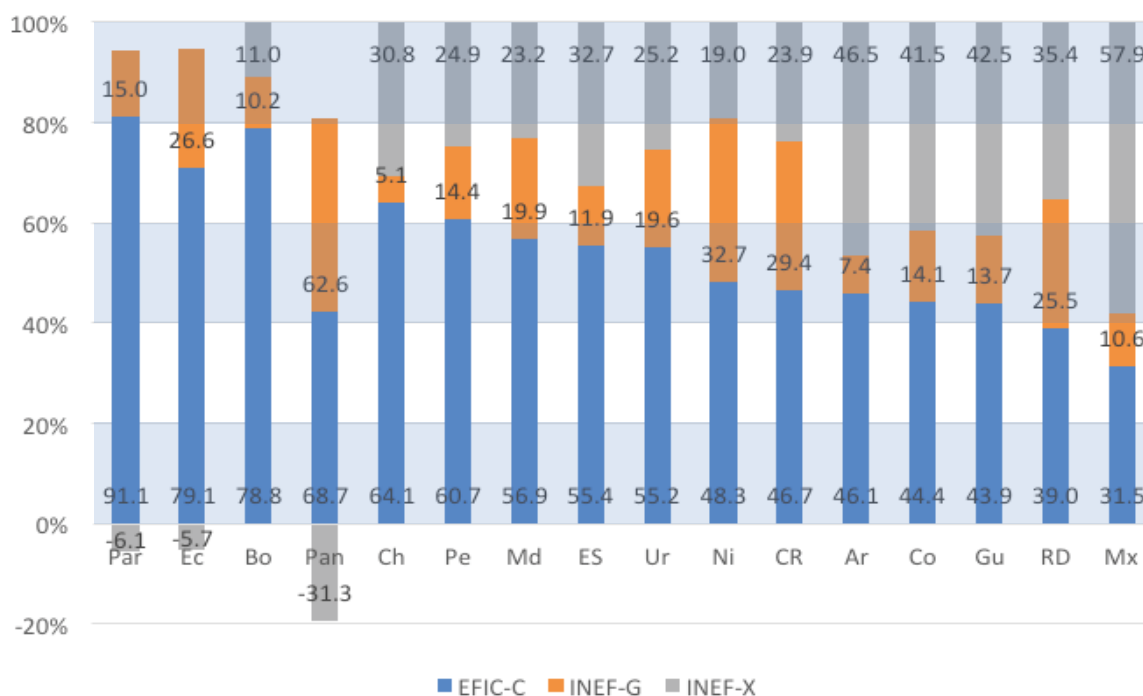
Source: own elaboration from data in table 3.

On average, in the selected countries:

- 56.9% of the potential VAT is collected (the C-efficiency already commented, with maximum values in Paraguay-91.1-and minimums in Mexico-31.5-),
- Due to tax expenditures, 19.9% of the potential collection is sacrificed (the so-called "G-inefficiency", with maximums in Panama-62.6-and minimum in Chile-5.1-),
- The remainder of this lost potential collection, 23.2%, we call it X-inefficiency-Maximum value in Mexico with 57.9 and minimum in Bolivia with 11%, although three other countries (Paraguay, Ecuador and Panama) even reach negative values of this parameter[17], attributable to tax fraud[18], management distortions and errors of quantification of the components directly measured (C-efficiency and G-inefficiency).

In summary, according to this methodology, in the region of every 10 dollars of possible collection possible, 5.7 are collected, 2 are "forgiven" (tax expenditure) and the remainder, $2.3, is lost, mainly by evasion and mismanagement.

---

17   Another factor that justifies its denomination as inefficiency-X, because in these cases it is more likely that its value reflects imperfections in the measurement of the other components.

18   The comparison with the estimates of direct non-compliance in VAT is difficult because of the absence of recent data (ECLAC (2017), page 345), although it seems that generally estimated levels of fraud are less than those of inefficiency-X, which is logical because even if the other two components, efficiency-C and inefficiency-G were well measured in their numerators -collection and tax expense-the calculation of the denominator, the potential basis of VAT, could be overestimated by using the final consumption according to national accounting.

Graph 24.   G-INEF
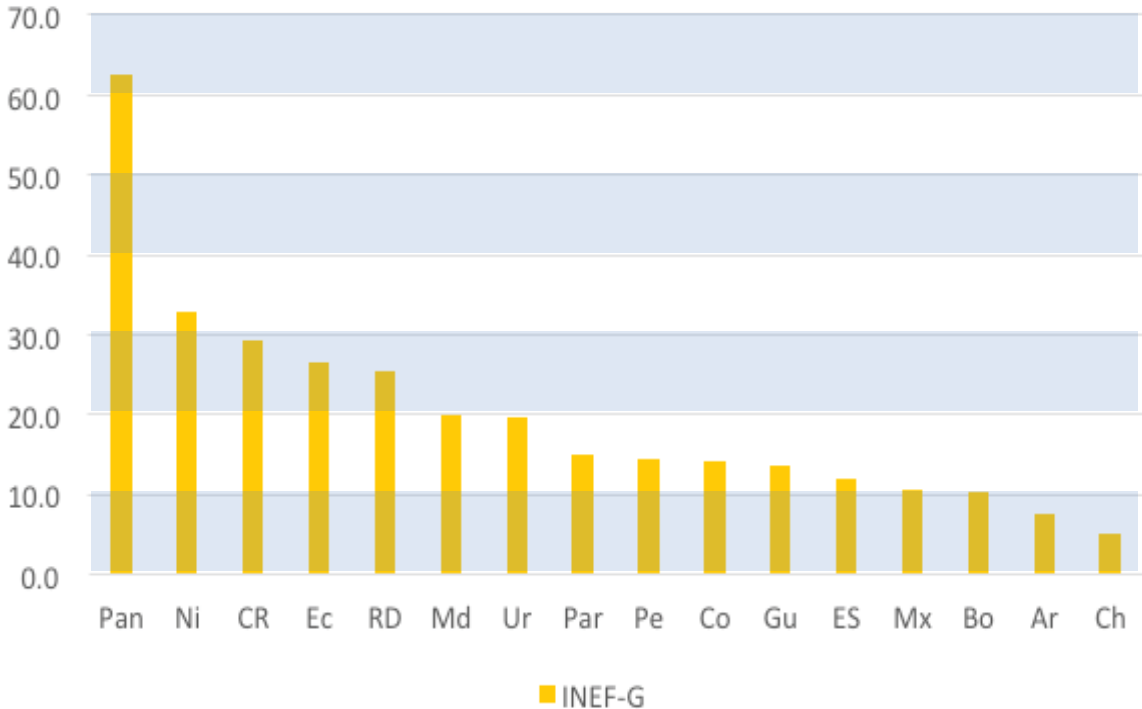
Source: own elaboration from data in table 3.

Graph 25.   X-INEF
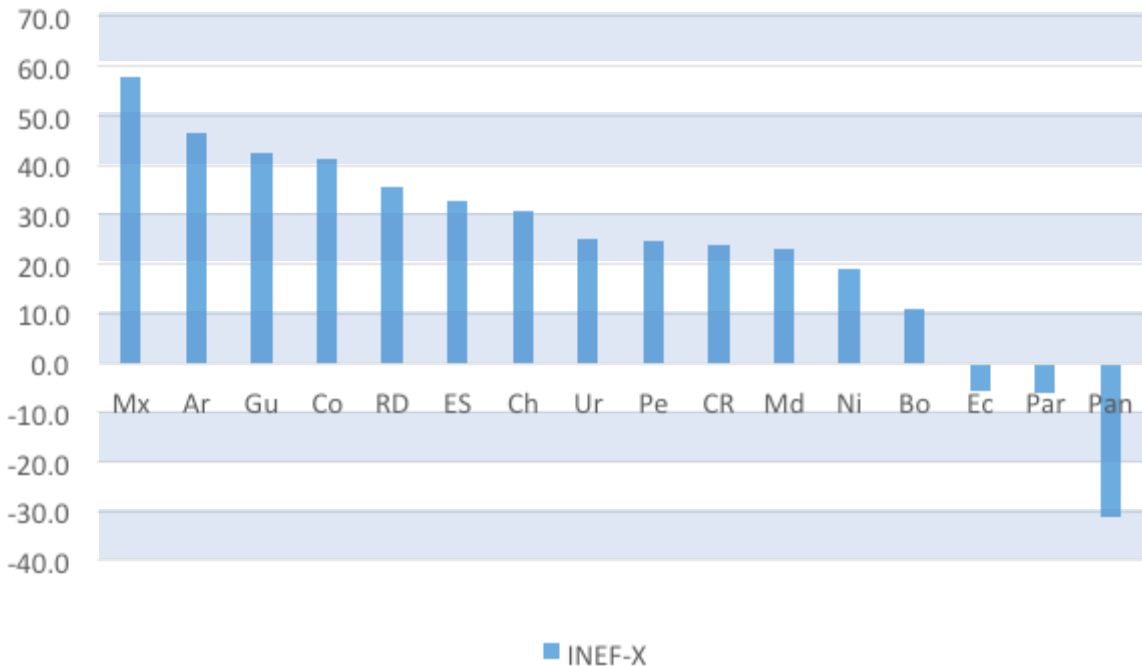
Source: own elaboration from data in table 3.

Again, we must insist that concrete results by countries should be interpreted cautiously, as multiple factors intervene in their estimation, such as tax expenditures or the existence of differential rates, can distort the comparison between countries. Its usefulness lies in identifying the relative importance of the problems, the coherence of the quantification of the tax variables and of National Accounting and the large areas of potential improvement of taxation at the level of each jurisdiction.

With regard to the relations between these measures and other characteristic variables of the countries, starting with the Tax Expenditures, Graph 26 shows its independence concerning the level of GDP per capita, as in the case of the collection and the C-efficiency. Similarly, the inverse relationship of the level of tax expenditure relative to the collection with the rates is very weak (Graph 27). However, its relation -inverse- with the collection level on the GDP[19] (Figure 28), is higher, giving evidence that the countries that collect the most also tends to introduce lower tax expenditures. However, the result pointing (R^2 of 0.35) towards an inverse relationship between the G-inefficiency (Graph 29) and the level of the rates (the lowest the rate, the highest the inefficiency) could almost certainly be ruled out by its extreme sensitivity to certain atypical observations (the removal of Panama from the sample, whose G-inefficiency triples the average estimate, completely cancels the correlation).
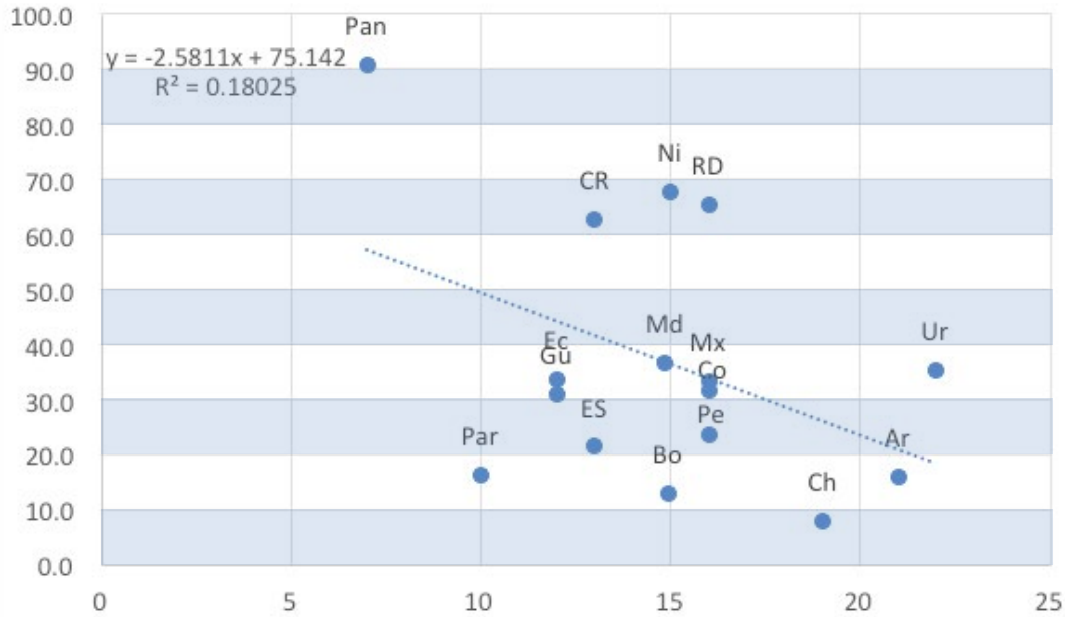
Graph 26.   Tax Expenditure/Collection and GDP pc
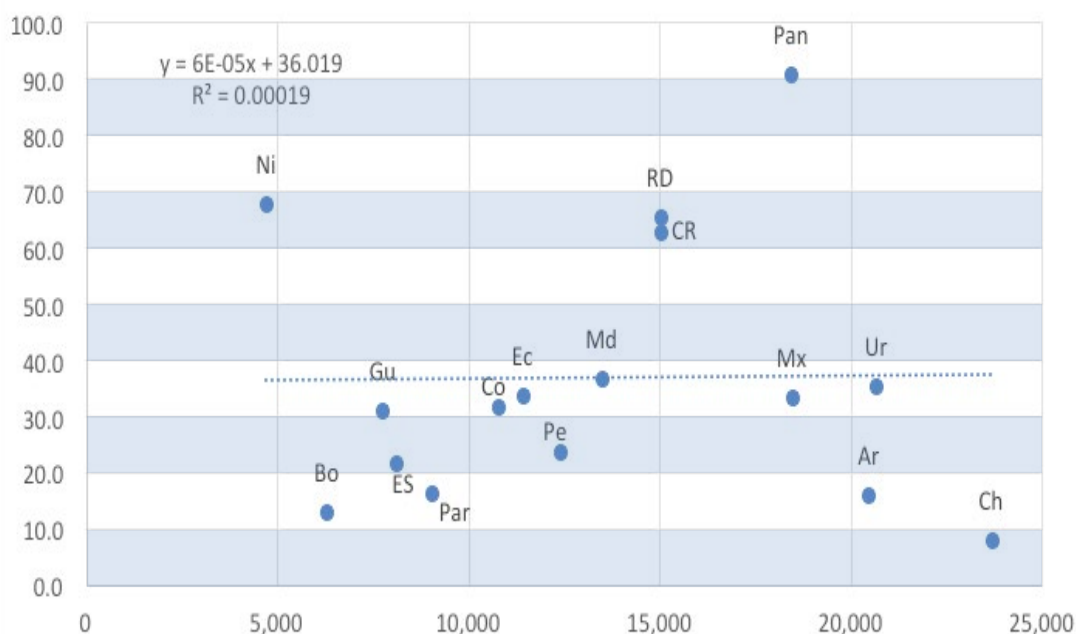
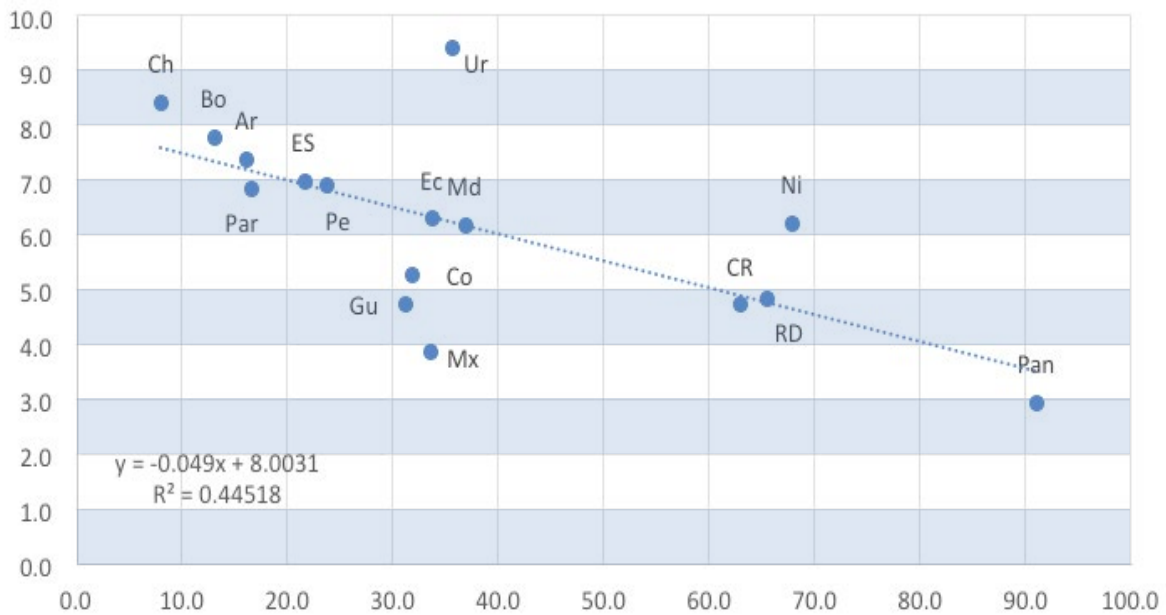Source: own elaboration from data in tables 1 and 3.

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19   This result is not trivial, countries could register in parallel-direct relation-high levels of tax expense and high-rate collection.

Graph 27.   **Tax Expenditure / Collection and VAT rates**

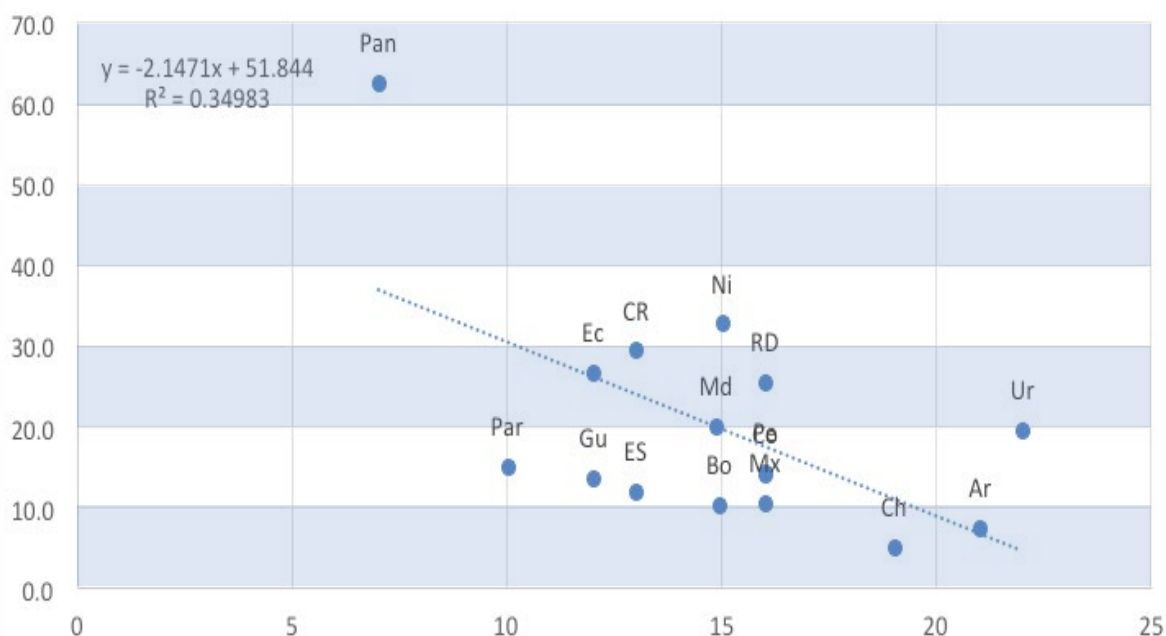*Source:* own elaboration from data in tables 1 and 3.

Graph 28.   **VAT: Collection/GDP and Tax expenditures/Collection**

Source: own elaboration from data in tables 1 and 3.

Graph 29.   G–Inefficiency and VAT rates


$$y = -2.1471x + 51.844$$
$$R^2 = 0.34983$$

Source: own elaboration from data in tables 1 and 3.
Note: The removal of the data from Panama would make the correlation disappear

Regarding X-inefficiency, figure 30 appears to indicate a clear direct relationship with the level of the rates, an intuitively attractive result.[20] However, we should be very cautious, because if we remove the three countries whose X-inefficiency indicator yields negative values (giving evidence of other failures in the construction of the measurement of the potential assessment basis,) the collection or the tax expenditures) the possible correlation disappears completely (moving from a R^2 of 0.4 to 0.0 in Graph 31).
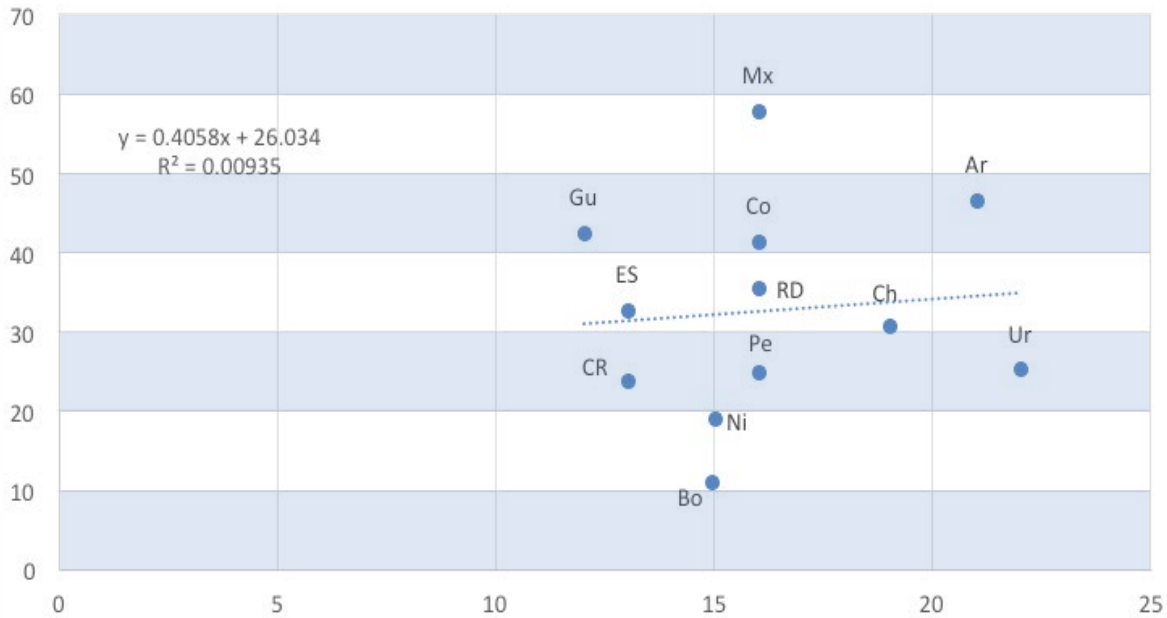
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20   And obviously, given the construction of the indicator, this same relationship, but in the opposite direction, would be the sum of the C-efficiency and the G- inefficiency (complementary of the X-inefficiency).

Graph 30.   X-Inefficiency and VAT Rates

$y = 3.8377x - 33.841$
$R^2 = 0.42644$
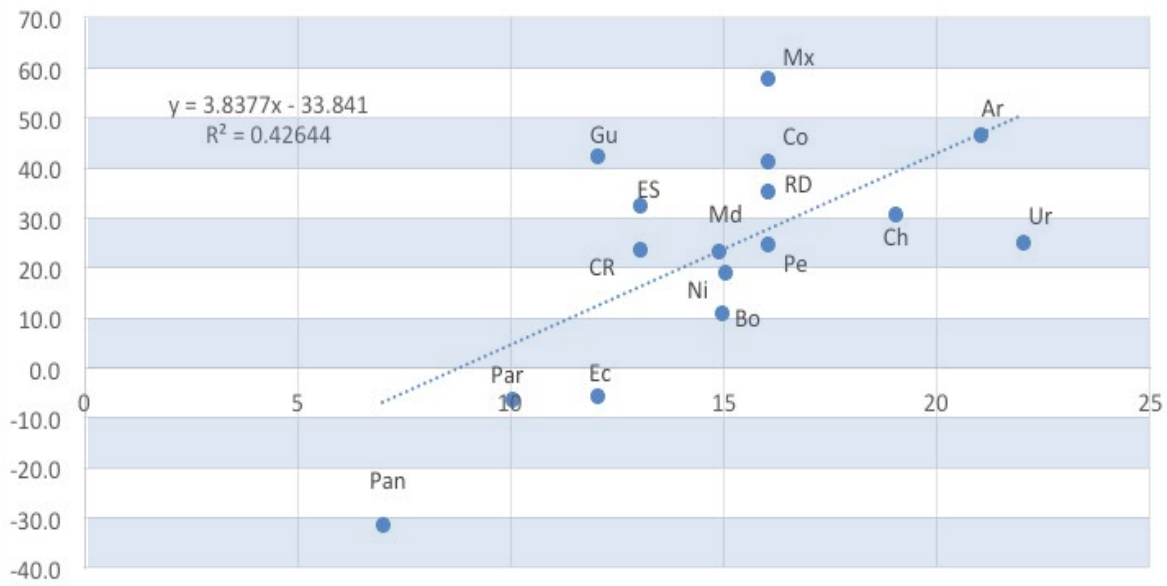
Graph 31.   X-Inefficiency and VAT rates (without extreme cases)

$y = 0.4058x + 26.034$
$R^2 = 0.00935$

X-inefficiency could also be related to the level of informality of the economy, however, as shown in Figure 32, this relationship does not appear in the sample used.

Graph 32.   X-Inefficiency and Informality
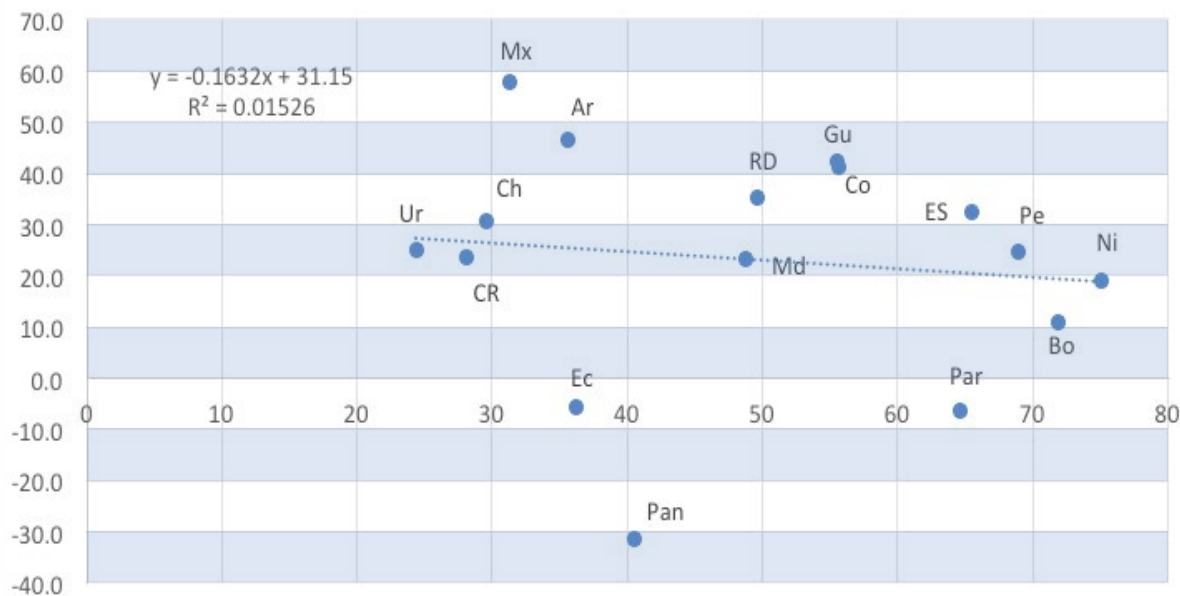
Source: Informality measured in percentage of total employment in the non-agricultural labor market (last available year). ILO International Labor Organization. ILOSTAT

Finally, as we have seen in the case of the collection and the rates, a certain correlation between the latitude and the magnitude of use of the tax expenditures appears, greater the farther north (Graph 33). However, the relationship with the G-inefficiency and X-inefficiency (Graphics 34 and 35) is reduced or null.

Graph 33.　　　　Tax Expenditures/Collection and Latitude

Source: own elaboration from data in tables 1 and 3.

Graph 34.　　　　G-Inefficiency and Latitude
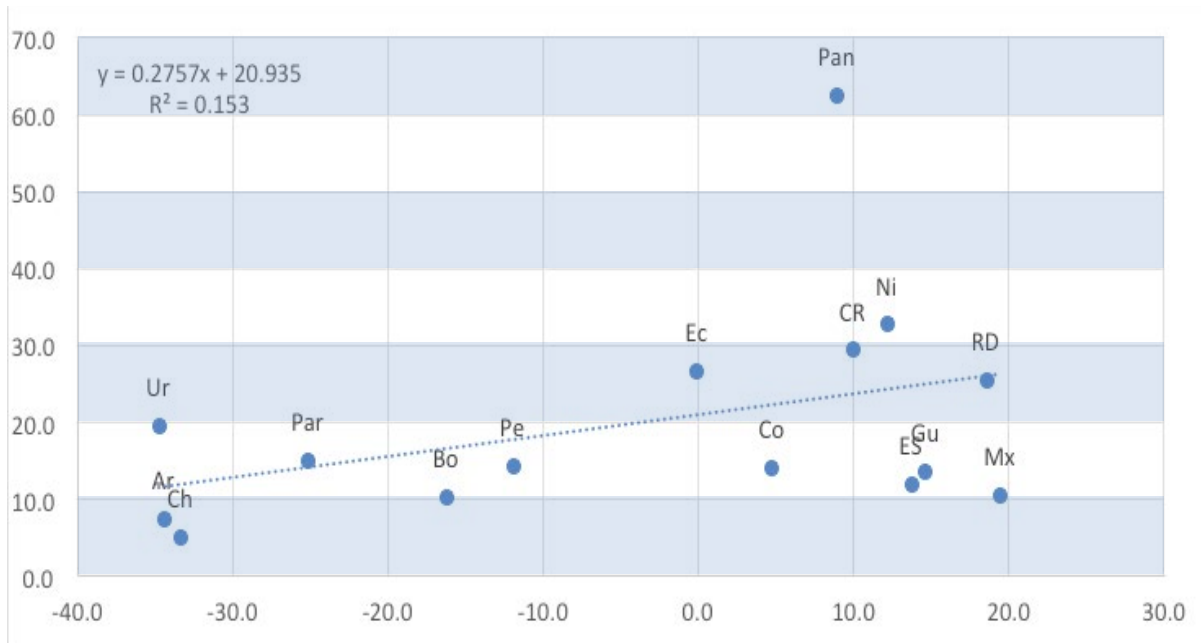
Source: own elaboration from data in tables 1 and 3.
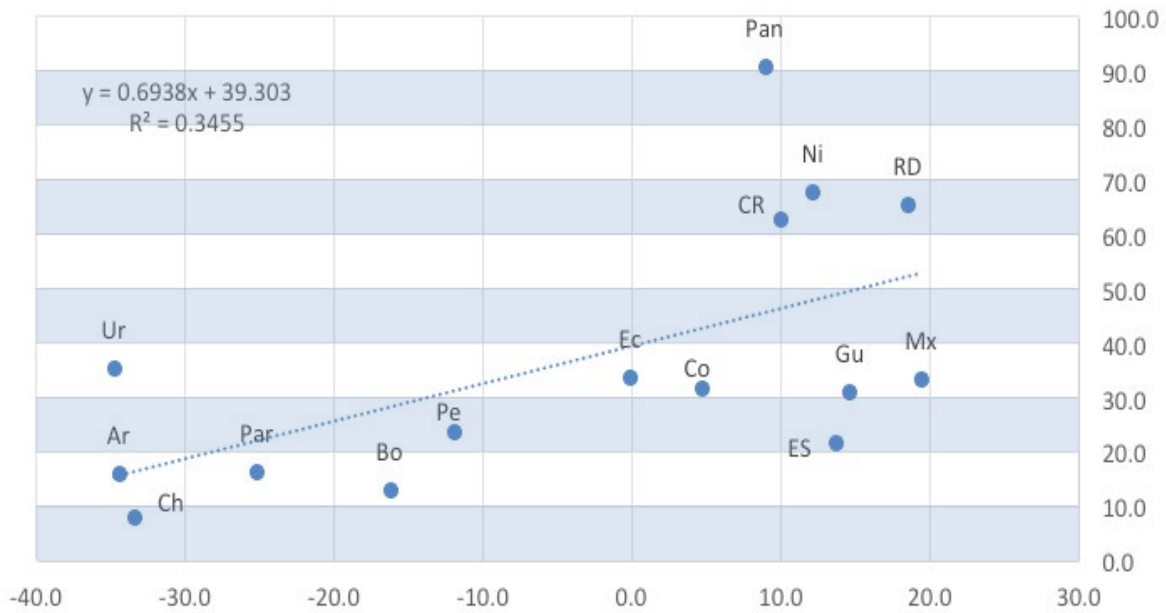
Graph 35.   X-Inefficiency and Latitude

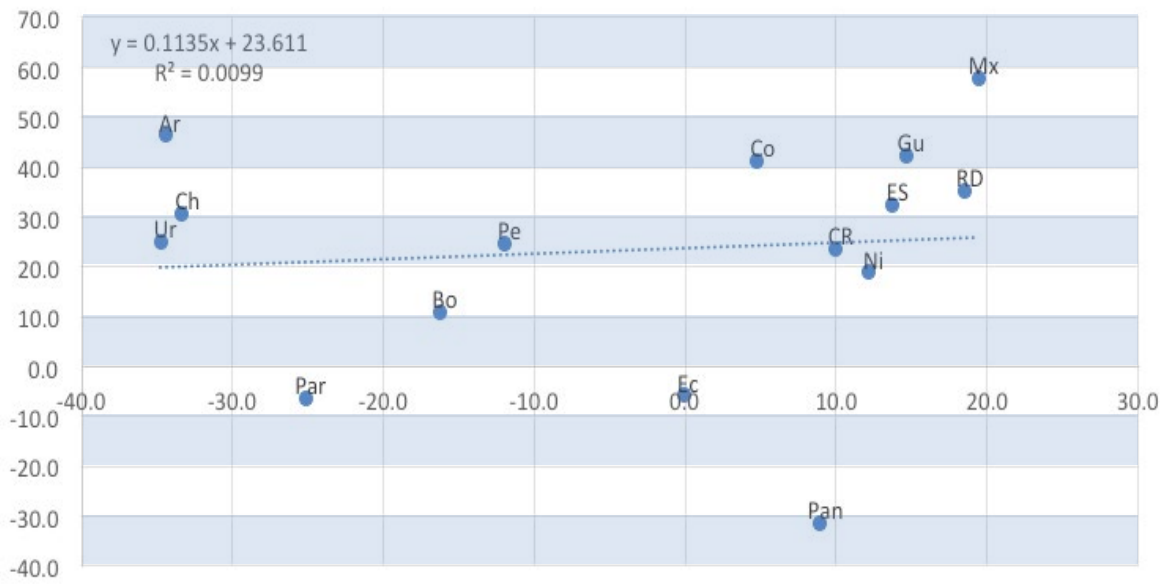$y = 0.1135x + 23.611$
$R^2 = 0.0099$

Source: own elaboration from data in tables 1 and 3.

5. WHAT DO WE KNOW, WHAT DO WE IGNORE, AND WHAT CAN WE LEARN?

Increasingly we have more and better data sources to analyze the tax reality of Latin America. In this paper, our intention is to illustrate the possible benefits of the joint use of the new information provided through CIATData regarding the Collection, Tax Rates and Tax Expenditures of the countries of the region. For this we have been analyzing the tax collection and its possible determinants. Later we analyzed the efficiency in this collection by means of the indicators of productivity and C-efficiency and, finally, we have introduced a new methodology that completes this analysis with the use of the information regarding the tax expenditures. The joint consideration of: C-efficiency (the collected) + G-inefficiency (what is not collected by Tax Expenditures) + X-inefficiency (loss of collection for fraud and management, plus the net result of errors in the measurement of the previous components), provides us with a holistic framework for the analysis of taxation that can contribute to the improvement of our understanding of the collection figures.

If the figures obtained demonstrate something, it is the diversity of VAT situations in Latin America. Whatever the indicator we analyze (collection from GDP, rates, efficiency, tax expenditure, inefficiencies ...) the most extreme differences between countries will reach 300 or 400 per cent. On the other hand, it is important to note that the relative wealth level of each country (measured by its per capita GDP corrected by price differences) is not significant in explaining the regulatory tax options adopted (tax rates, tax expenditures), the levels of collection reached, or the varying degrees of efficiency/inefficiency.

The collection obtained by VAT (in relation to the GDP of each country) is mainly explained by the political will specified in the choice of higher rates and lower tax costs, independent of the per capita income level and consistent with the overall election of a higher level of fiscal pressure on the whole of the taxes. And a curious result is the high correlation of this election with latitude. The further south, the higher the revenue collected, the higher the tax rates and the lower the tax expenditures (although it does not exist, and it is worth reiterating it, a significant relationship in the same sense with GDP per capita).

In terms of efficiency/inefficiency in VAT collection, C-efficiency figures, G-inefficiency and X-inefficiency are not explained, again, by the level of GDP per capita or by the level of rates. With respect to latitude, although the correlation is never as significant as in the case of the collection, the data -once we isolate the extreme cases- point in the same direction in terms of the sign of the estimated coefficients: the farther south the greater efficiency in the collection (C-efficiency) and the lesser the loss of resources by tax expenditure (G-inefficiency); while X-inefficiency does not keep any relation to this dimension (nor, apparently, with labor market informality).

With respect to the results, in average, in the selected countries:
- 56.9% of the potential VAT is collected (C-efficiency, with maximum values in Paraguay -91.1- and minimum in Mexico -31.5-),

- Due to tax expenditures, reduced rates or special regimes granting exemptions, 19.9% of the potential collection is sacrificed (the so-called "G-inefficiency", with maximums in Panama -62.6- and minimum in Chile -5.1-),

- The remainder of this lost potential collection, 23.2%, we call it X-inefficiency -its maximum value in Mexico with 57.9 and minimum in Bolivia with 11%, although three other countries (Paraguay, Ecuador and Panama) even reach negative values of this parameter-, attributable to tax fraud, management distortions and errors of quantification of the components directly measured (C-efficiency and G-inefficiency)

In summary, according to this methodology, for every 10 dollars of possible collection in the region, 5.7 are collected, 2 are "forgiven" (tax expenditure) and the remainder, $2.3, is lost, mainly by evasion and mismanagement.

Annex 1 offers the Graphs of evolution of these indicators in recent years, selected for each country according to the availability of the data (accessible through CIATData). The individual analysis of each of these experiences is beyond the objective of this work, however, we believe that it can shed a lot of complementary and valuable information for the knowledge of the different national realities. The proposed methodology (C-efficiency + G-inefficiency + X-inefficiency) is theoretically consistent and easy to apply, both to identify possible areas of improvement in VAT collection and to improve, where appropriate, the sources of information regarding collection, tax expenditure or National Accounting figures.

In short, as we have seen, it is not easy to generalize simple explanatory answers to the differences in collection, choice of tax rates and tax expenditures and levels of efficiency in the management. This is an evidence of our ignorance, but perhaps also of an incipient process to overcome it by rejecting simplistic responses without empirical support. Much remains to be learned as to the specific details of the management and the regulations of each country, the improvement of the databases and the influence of factors not strictly economic but political, cultural and social in the tax policy decisions. We hope that the new CIAT databases would contribute to keep progressing in this direction.

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CEPAL (2017) "Consensos y conflictos en la política tributaria de América Latina"

Keen, M. (2013) "The Anatomy of VAT", IMF Working Paper 13/11.

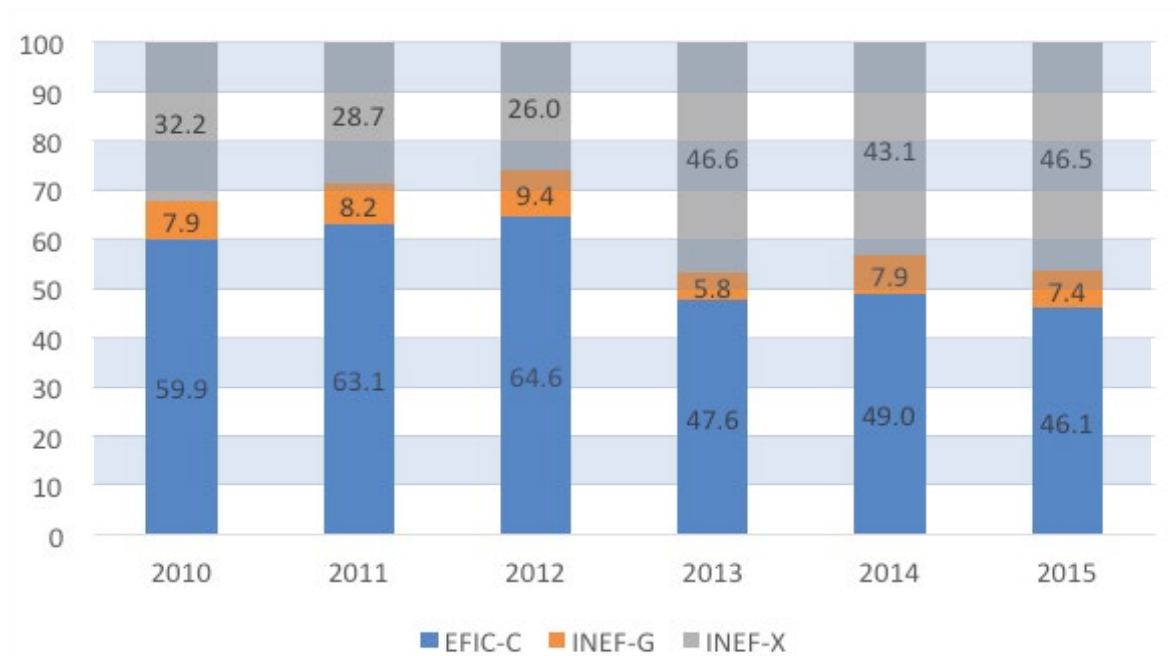**OCDE, CIAT, BID, CEPAL (2017)** Estadísticas Tributarias en América Latina y el Caribe

OCDE (2016a) Revenue Statistics
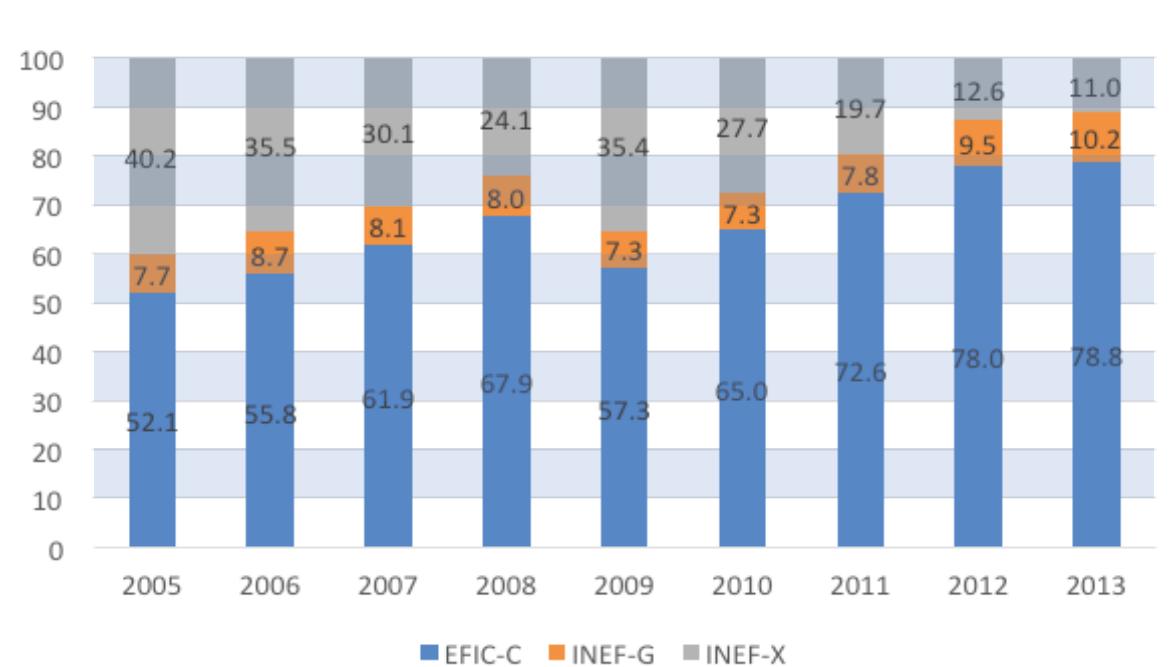
OCDE (2016b) Consumption Tax Trends

ANNEX 1. C-efficiency, G-inefficiency and X-inefficiency. Results by country.

Argentina

Bolivia

Chile

2014
- EFIC-C: 63.0
- INEF-G: 5.0
- INEF-X: 32.1

2015
- EFIC-C: 64.1
- INEF-G: 5.1
- INEF-X: 30.8

Legend: ■ EFIC-C ■ INEF-G ■ INEF-X

Colombia

2010
- EFIC-C: 44.4
- INEF-G: 14.1
- INEF-X: 41.5

2014
- EFIC-C: 43.2
- INEF-G: 51.6
- INEF-X: 5.2

2015
- EFIC-C: 42.5
- INEF-G: 53.2
- INEF-X: 4.4

Legend: ■ EFIC-C ■ INEF-G ■ INEF-X

Ecuador

	2012	2013	2014
INEF-G	24.8	24.5	26.6
EFIC-C	76.1	79.2	79.1
INEF-X	-0.9	-3.8	-5.7

■ EFIC-C ■ INEF-G ■ INEF-X

El Salvador

	2011	2012	2013
INEF-X	33.8	32.5	32.7
INEF-G	12.5	11.8	11.9
EFIC-C	53.7	55.7	55.4

■ EFIC-C ■ INEF-G ■ INEF-X

Guatemala

	2013	2014	2015
INEF-X	38.9	38.9	42.5
INEF-G	14.2	14.7	13.7
EFIC-C	46.9	46.4	43.9

■ EFIC-C ■ INEF-G ■ INEF-X

Mexico

	2013	2014	2015
INEF-X	59.4	55.5	57.9
INEF-G	12.6	12.9	10.6
EFIC-C	27.9	31.7	31.5

■ EFIC-C ■ INEF-G ■ INEF-X

Nicaragua

Legend: ■ EFIC-C ■ INEF-G ■ INEF-X

Year	EFIC-C	INEF-G	INEF-X
2010	41.4	22.5	36.2
2011	46.1	27.4	26.5
2012	47.9	29.4	22.7
2013	48.3	32.7	19.0

Panama

Legend: ■ EFIC-C ■ INEF-G ■ INEF-X

Year	EFIC-C	INEF-G	INEF-X
2012	68.7	62.6	-31.3

Paraguay

Chart showing stacked bars for EFIC-C, INEF-G, and INEF-X across years 2013–2015.

Year	EFIC-C	INEF-G	INEF-X
2013	85.2	15.3	-0.5
2014	91.1	18.3	-9.4
2015	91.1	15.0	-6.1

Legend: ■ EFIC-C ■ INEF-G ■ INEF-X

Peru

Chart showing stacked bars for EFIC-C, INEF-G, and INEF-X across years 2012–2015.

Year	EFIC-C	INEF-G	INEF-X
2012	66.4	13.0	20.6
2013	66.0	13.4	20.5
2014	67.1	14.2	18.7
2015	60.7	14.4	24.9

Legend: ■ EFIC-C ■ INEF-G ■ INEF-X

Dominican Republic

Stacked bar chart for 2015:
- EFIC-C: 39.0
- INEF-G: 25.5
- INEF-X: 35.4

Legend: ■ EFIC-C ■ INEF-G ■ INEF-X

Uruguay

Stacked bar chart:

	2012	2013	2014
INEF-X	23.9	24.3	25.2
INEF-G	18.7	19.3	19.6
EFIC-C	57.3	56.4	55.2

Legend: ■ EFIC-C ■ INEF-G ■ INEF-X

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