The Distribution of Top Incomes in Mexico: How rich are the richest?[1]

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Table of Contents

Introduction

1. The study of the *top incomes* came as a new perspective for studying income inequality by making an emphasis in the top of the income distribution, and offering an alternative to the Gini coefficient and other inequality metrics. In Mexico, when using Household Surveys, Campos et al. (2013) found that income growth for the richest was considerably higher than the one of the rest of the income distribution. However, as Alvaredo (2011), Alvaredo et al. (2013) and Burkhauser et al. (2011) express, Household Surveys are all but ideal for studying top shares because the rich are usually missing from household surveys for (*i*) sampling reasons, (*ii*) low response rates (e.g. refusing to cooperate with the time-consuming task of completing a long form), or (*iii*) ex-post elimination of extreme values to minimize bias Alvaredo et al. (2013), leading to a severe under-reporting at the top of the distribution and creating artificially low inequality within a country.

2. As Atkinson et al. (2011) explain, there has been a marked revival of interest in the study of the distribution of top incomes using income tax data. Beginning with the research conducted by Piketty (2011) and Piketty (2003) on the long run distribution of top incomes in France, there has been a succession of studies constructing top income share time series over the long run for more than thirty countries. The difficulty in calculating top incomes comes from the misrepresentation or sub-representation of their income. Tax data typically allows decomposing income inequality into labor income and capital income components. Economic mechanisms can be very different for the distribution of labor income (*demand and supply of skills, labor market institutions, etc.*) and the distribution of capital income (*capital accumulation, credit constraints, inheritance law and taxation, etc.*), so that it is difficult to test these mechanisms using data on total incomes (Atkinson et al., 2011).

3. The objective of this work is to analyze the evolution of top incomes in Mexico using tax data and complementing it with Economic Census data, Household Surveys and National Accounts. This complementarity is needed since as Atkinson et al. (2011); Atkinson and Piketty (2007, 2014); Alvaredo and Londoño (2013) explain it, tax noncompliance in developing countries represents challenges when building top incomes with tax files. Following the assumption that an income receiver who decides to evade tax payment will underreport its taxable income to tax authorities but declare the true income, or at least a closer approximation to the true income, expenses and investments, to an interviewer who grants anonymity, the Economic Census data was used to adjust authorized deductions reported in tax files. Previous efforts to estimate top incomes in Mexico have been done, for example by Campos et al. (2014, 2015); however, these studies use household survey data, which could significantly underestimate or overestimate income concentration.

The use of tax records and census data to analyze income inequality in Mexico

How unequal is income distribution in Mexico, and how much does fiscal evasion matters when measuring it?

Service tax administration (*SAT*) *tax data*

4. The *SAT* collects taxes and duties to the Mexican State, and the main source to estimate top percent shares come from their tax files. The Mexican government provided the tax files, containing the micro-data universe of personal income taxpayers from 2009 to 2012. The files have to types of income declarations: (*a*) personal tax returns (2–2.5 million observations per year), and (*b*) employer-reported information on wages in the formal sector (20-25 million observations per year). Data source (*a*) offers detailed information on wages, rents, interest, dividends, self-employed income, business income, exempt income, allowances, deductions, and tax paid for the top 1-2% of the population, whereas data source (*b*) offers information on employer-reported gross and exempt wages for those employees earning less than 400,000MX on a yearly basis.

Economic census data, household survey and national accounts

5. In order to adjust authorized deductions reported in the tax files, the 2009 Economic Census Data was used, which provides economic information of virtually all-economic activities that take place in Mexico[3] It contains information of employed personnel, expenses, revenues, among others. However, the Mexican National Institute of Statistics and Geography (*INEGI*) limits the information provided to a subset of variables. In order to make a comparison between the tax data and the one used to build inequality metrics, one used the new construction of the Mexican National Household Income and Expenditure Survey (*ENIGH*). Among other variables, it provides information on income of individuals, expenditure of households, among others. Finally, with respect to the national accounts, these come from *INEGI*'s National Accounts by institutional sectors for years 2009–2012.

Methodology

6. In order to calculate top incomes, one needs to know: (*i*) the number or persons in the tax data to a control, (*ii*) the relation to an income control total and (*iii*) the definition of income. The control for total population will be approximated as the number of adults' aged 20 and above.[4] For total income, an external control total was used, derived from the national accounts, where the income of "*non-filers*" appears as a residual; our control lies between 59-60% of GDP.

7. The standard objection to the use of income tax data to study the distribution of income is that tax returns are largely works of fiction, as taxpayers seek to avoid and evade being taxed (Atkinson et al., 2011).

[3] Micro-enterprises aren't part of the Census's coverage for not complying with the requirements of the observation unit definition. For our analyses, our tax data doesn't cover this type of businesses.

[4] The data is taken from *INEGI*'s Censuses and Population Surveys for years 2005 and 2010, while using linear interpolation for the missing years.

In Mexico, Jimenez et al. (2010), Fuentes (2011, 2013), Perez del Peral (2013) and ITAM (2006) use aggregate data-sources in order to quantify income tax evasion. Overall, the estimates differ due to different methodologies, data sources or years; however, they find that individuals underreport between 1.7-21.7% of the wages and between 74.1-94.0% of their income from business and professional activities.

8. In order to partially correct tax reported incomes from tax erosion arising from exempted income and authorized deductions; the Mexican Economic Census Data was used to adjust expenditures and investments for individuals that own a business and for the self-employed, as well.[5] For the tax and census data, the following proportions were calculated:

$$\beta_{ilm} = \frac{\bar{c}_{lm}}{\bar{y}_{im}} \qquad m = \text{tax, census} \qquad i = 1, \dots, t \qquad l = 1, \dots, e$$

Where $\bar{c}_{lm}$ denotes the average expenses or investment l from data-source m, whereas $\bar{y}_{lm}$ denotes the average income or earning i from data-source m. Finally, β_{ilm} represents the proportion of expenses or investments, "l", over income, "i", from data-source m. Afterwards, tax evasion $(\hat{\lambda}_{il})$ was calculated as one minus the proportion of β_{iln} over β_{ilm}:

$$\hat{\lambda}_{il} = 1 - \frac{\beta_{iln}}{\beta_{ilm}} \qquad m \neq n \qquad i = 1, \dots, t$$

In the case where $m =$ tax and $n =$ census, if $\hat{\lambda}_{il} > 0$, , one would suspect that individuals over-report their expenses to the tax authorities. If this is the case, taxable income would be underreported, and expenses or investments, l, will be adjusted in the tax data by a weight of $\hat{\lambda}_{il}$.[6]

Tax evasion results

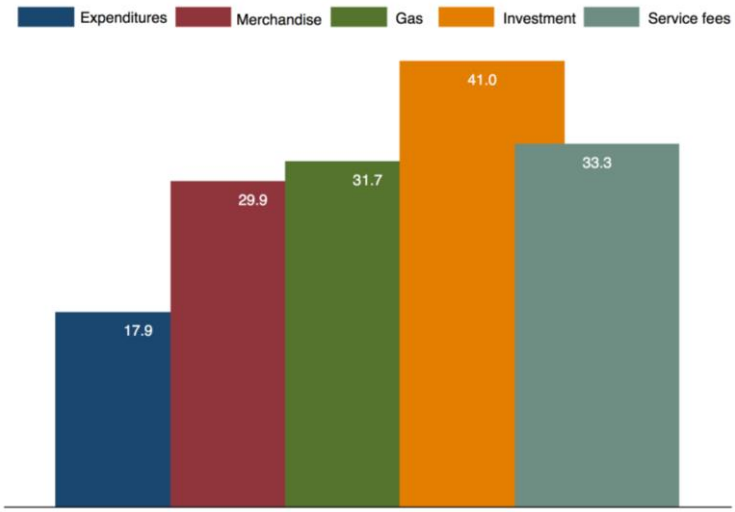
9. Figure 1 summarizes the results of tax evasion for different categories of expenditures and investment. Overall, all available authorized deductions were over-reported in the tax data, ranging from 17.9% for total expenditures to 41% in investment. To test the hypothesis whether individuals evade over-report taxes heterogeneously throughout the revenue distribution, tax evasion rates were calculated for different brackets of revenue (as seen in Figure 2). Some evasion patterns resulted from this exercise. First, evasion rates tend to be smaller at the higher income ranges. Second, total investments represent the authorized deduction that

[5] The main assumption with this methodology is that an income receiver who decides to evade tax payment will underreport her taxable income, expenses and investments to tax authorities but declare the true income, or at least a closer approximation to the true income, to an interviewer who grants anonymity.

[6] In the tax data, one was only able to see if an individual reported income from Self-employment, intermediate scheme and business scheme; therefore, if an individual reported an income greater than zero coming from one these sources, it was considered as a business. For example, if an individual reported incomes greater than zero for Self-employment, intermediate scheme and business scheme, it was considered as three different business, i.e., one business in self-employment, one in the intermediate scheme and one in the business scheme. Moreover, in the tax files, each business scheme wasn't required to fill each of the rows presented in this table. Expenses on goods and services and the number of observations were calculated for the three types of business. Goods purchased for resale, expenses on rental of property, expenses on service fees, machinery and equipment, property, transport equipment and furniture and office equipment was calculated for the business scheme only. Expenses on gas and "other" expenses was calculated for self-employment and business scheme. Finally, total of investments was calculated for the intermediate scheme and the business scheme. For the Economic census, a business was taken into account if it had an income greater than zero.

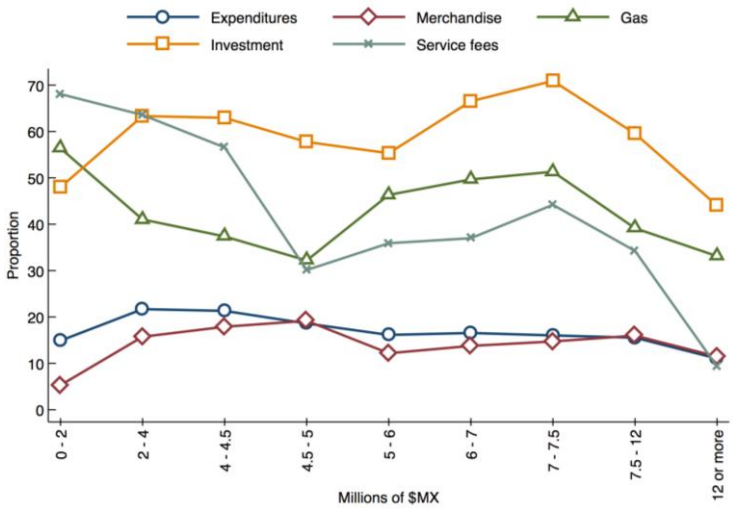
is exaggerated the most at almost every revenue range level. Third, merchandise and total expenditures present an almost constant evasion rate throughout the revenue distribution; this situation was expected since these types of expenditures must be tracked with bills. Fourth, gas expenditures and total investment present an inverted U-shaped pattern reaching its maximum at the 7-7.5 million thresholds. Lastly, service fees behave heterogeneously across the revenue distribution, which suggests a behavioral strategy from individuals.

Figure 1. Evasion rate ($\hat{\lambda}_{il}$)
Percentage



Source: Authors' calculations based on tax data for year 2009 and adjusted with 2009 Economic Census data.
Note: Income is referred as revenue in both tax and economic census data. Income is referred as revenue in both tax and economic census data.

Figure 2. Evasion rate ($\hat{\lambda}_{il}$) by revenue brackets
Percentage



Source: Authors' calculations based on tax data for year 2009 and adjusted with 2009 Economic Census data.
Note: Income is referred as revenue in both tax and economic census data. Income is referred as revenue in both tax and economic census data.

Top income results

10. Top incomes series were constructed for a number of higher fractiles within the top decile for the income adjusted for tax evasion, i.e., the top 5 percent (P95 – 100), the top 1 percent (P99 – 100), the top 0.5 percent (P99.5 – 100), the top 0.1 percent (P99.9 – 100), and the top 0.01 percent (P99.99 – 100). Each fractile is defined relative to the total number of potential tax units (aged 20 or more) in the Mexican population.

11. The top 1% accounted for 13.2% of total income in 2009. After the financial crisis, the top 1% accounted for 12.4% of total income, falling down from the previous year. After 2010, it started recovering in order to account for 13.0% and 13.6% of total income during 2011 and 2012, respectively. As seen in Table 1, the financial crisis affected almost all the top shares except for the super wealthy, i.e., the top 0.01% and over. To these individuals, its share with respect to total income didn't decrease during 2010.

Table 1. Top income shares in Mexico, 2009-2012.

Percentage

	5%	1%	0.5%	0.1%	0.05%	0.01%	0.005%	0.001%
2009	24.6	13.2	10.1	5.8	4.6	2.7	2.2	1.3
2010	23.1	12.4	9.6	5.5	4.4	2.7	2.2	1.3
2011	23.8	13	10.2	6.1	5	3.3	2.7	1.9
2012	25.2	13.6	10.6	6.3	5.1	3.2	2.6	1.7

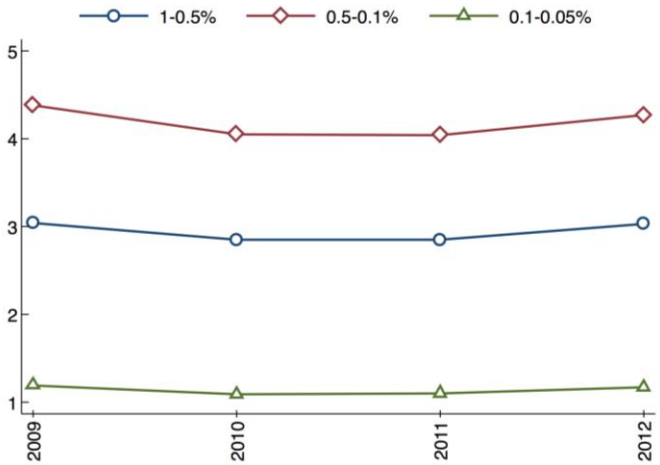
Source: Author's calculations based on tax data for year 2009-2012 and adjusted with 2009 Economic Census data.
Note: Estimates before Income Tax and excluding capital gains.

12. Figure 3 presents the decomposition of the top 1% into three sub-groups: 1) the top 1-0.5%, 2) the top 0.5-0.1% and 3) the top 0.1-0.05%. Each point represents the total income accrued to the mentioned income range, and it allows us to explore how the income is distributed among the wealthy. The three sub-groups decreased its share during 2010, while recovering it afterwards; in 2010, the top 1-0.5%, 0.5-0.1% and 0.1-0.05% accounted for 2.85%, 4.05% and 1.09% of total income, respectively, whereas in 2012, they accounted for 3.03%, 4.27% and 1.17%. These results are interesting since the top 1-0.5% has 71,224 more individuals than the top 0.5-0.1%52, but it consistently controls a lower share compared to the one of the top 0.5-0.1%.

13. Extending the analysis to higher fractiles, Figure 4 presents a decomposition of the richest 0.05% into three sub-groups, i.e., 1) the 0.05-0.01%, 2) the top 0.01-0.001% and 3) the top 0.001%. On one side, the top 0.05-0.01% and 0.01-0.001% felt the shock of the financial crisis, but recovered afterwards. On the other side, the top 0.001% wasn't affected by the financial crisis, and it even surpassed the top 0.05-0.01% in 2011. Astonishingly, the top 0.001% of the individuals, nearly 709 individuals, controlled around 1.33% to 1.85% of total income in Mexico. In other words, during 2012, the richest of the rich, the top 0.001%, earned an average income of $US PPP 26,408,010 or $MX 211,000,000, and controlled a total of $US PPP 18,723,279,090 or $MX 149,599,000,000.

Figure 3. Top 1% income shares decomposition

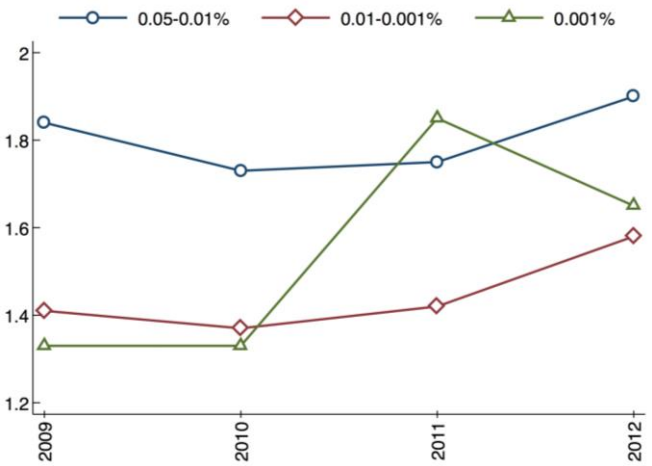
Percentage



Source: Authors' calculations based on tax data for years 2009 - 2012 and adjusted with 2009 Economic Census data.
Note: Estimates before Income Tax and excluding capital gains.

Figure 4. Top 0.05% income shares decomposition

Percentage

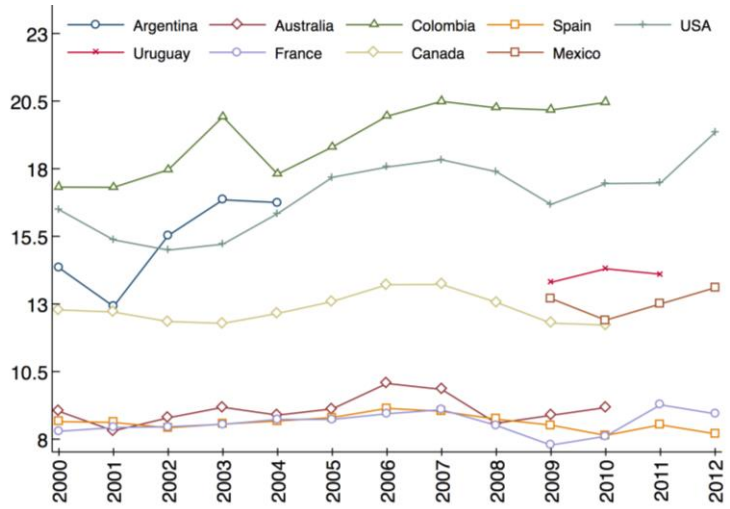


Source: Authors' calculations based on tax data for years 2009 - 2012 and adjusted with 2009 Economic Census data.
Note: Estimates before Income Tax and excluding capital gains.

14. On an international comparison, Mexico's top 1% is higher than most countries in The World Wealth and Income Database, but lower than Colombia, Argentina and USA (*Figure 5*). In here, a caveat must be emphasized, since other countries do not adjust their income for possible tax evasion, whereas in Mexico one does it. Nevertheless, the Mexican top 1% is between 1.5-1.7 times bigger than the one of Spain, 1.4-1.7 times bigger than the one of France, 1.01-1.07 times bigger than the one in Canada and 1.35-1.5 times bigger than the one in Australia.

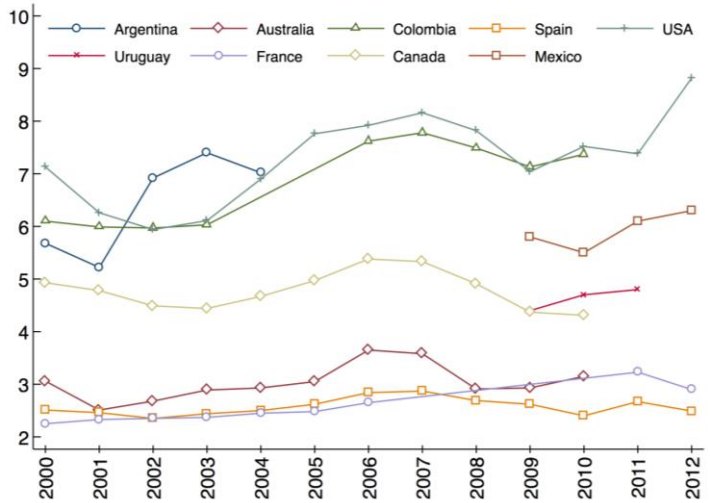
15. Despite being the lowest top 1% in Latin-America, Mexico remains highly unequal among higher fractiles. Figure 6 compares Mexico's top .01% with the same countries as before. In this case, the top .01% income concentration is very high compared to the other countries. In 2011, the top .01% was the biggest one among the countries selected. During this year, it was 3.5, 1.04, 1.73, and 2.70 times bigger than the one in Spain, USA, Uruguay and France, respectively.

Figure 5. Top 1% in selected countries
Percentage



Source: Author's calculations based on tax data of (2009 - 2012) and adjusted with 2009 Economic Census data for Mexico. The World Wealth and Income Database
Note: Incomes excluding capital gains and estimates before income tax.

Figure 6. Top 0.01% in selected countries
Percentage

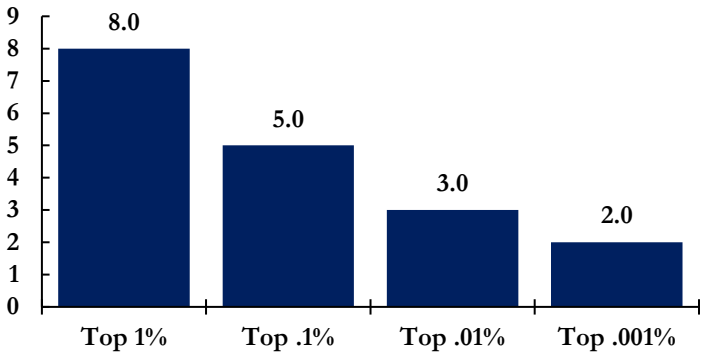


Source: Author's calculations based on tax data of (2009 - 2012) and adjusted with 2009 Economic Census data for Mexico. The World Wealth and Income Database
Note: Incomes excluding capital gains and estimates before income tax.

Real income growth captured by the rich

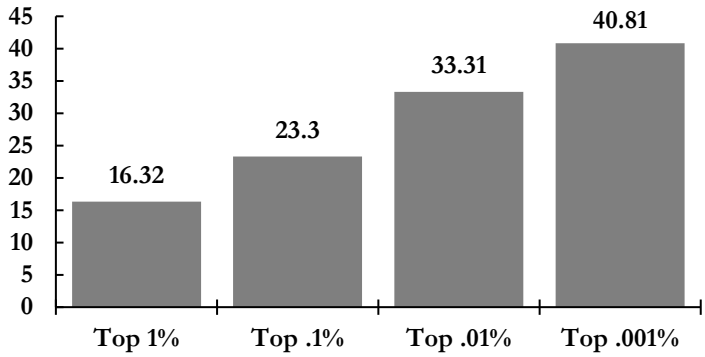
16. In a perfect egalitarian society, the top 10% would capture 10% of real income growth, the top 5% would capture 5% of real income growth, and so on. To cast further light in this subject, Figure 7 and 8 graphs the real average growth (υ) and the fraction of total real growth (θ) captured by the top "i" percent between $t = 2012$ and $t - 4 = 2009$, respectively. For the period 2009 - 2012, on one side, the fraction of total real growth (θ) captured by the top 1%, .1%, .01% and .001% was of 8%, 5%, 3% and 2%, respectively. One needs to remember that the top .001% represents around 650 individuals and they capture 2% of the total real income growth in Mexico. On the other side, the income real average growth (υ) of the top 1%, .1%, .01% and .001% was of 16.32%, 23.30%, 33.31% and 40.81%, respectively.

Figure 7. Fraction of total real growth (θ), 2009-2012
Percentage of total growth



Source: Author's calculations based on tax data of (2009 - 2012).
Note: Incomes excluding capital gains and estimates before income tax.

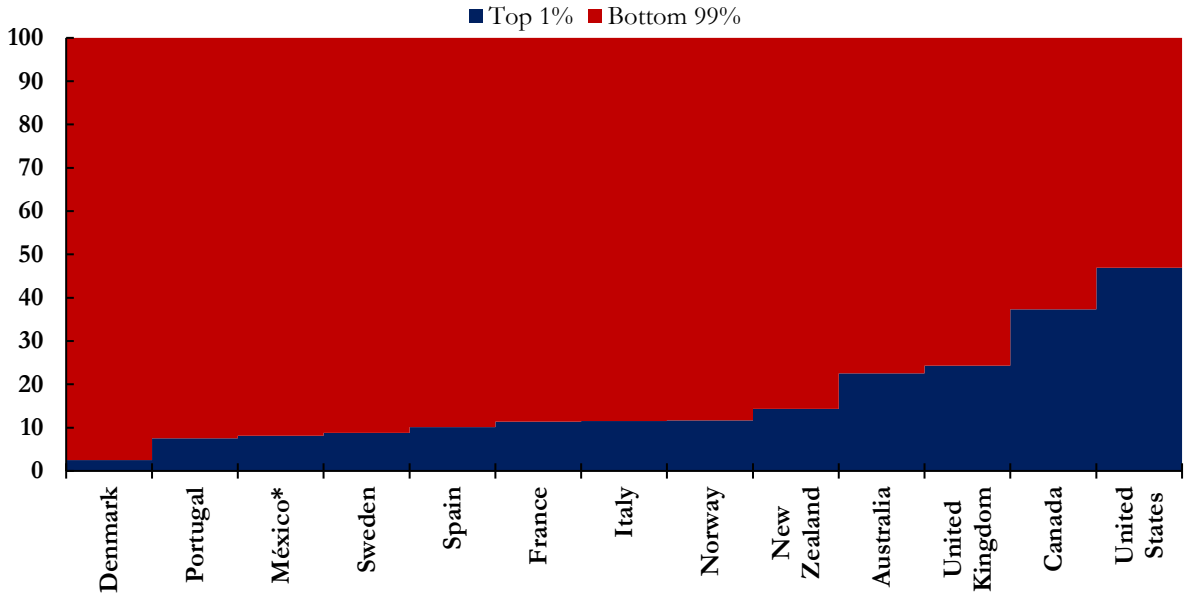
Figure 8. Real average growth (v), 2009-2012
Percentage



Source: Author's calculations based on tax data of (2009 - 2012).
Note: Incomes excluding capital gains and estimates before income tax.

17. When comparing the fraction of total real growth (θ) captured by the top 1 percent in Mexico to other available countries, the Mexican economy behaves more egalitarian than other countries. Figure 9 graphs the share of income growth going to the top 1% and the bottom 99% on available countries. On average, the top 1% captures 16.7% of total growth, whereas the bottom 99% captures 83.3% of total growth.[7] The United States and the United Kingdom represent the countries with the highest shares of income growth captured by the top 1% with 46.9% and 24.3%, respectively; this situation might partially explain the recent political backlashes in both countries.

Figure 9. Share of income growth going to income groups
Percentage



Source: Author's calculations based on tax data of 2012 and adjusted with 2009 Economic Census data for Mexico and OECD (2014) calculations based on the World Wealth and Income Database.
Note: Incomes refer to pre-tax incomes, excluding capital gains. For Mexico*, growth refers to the years 2008 and 2012, for other countries growth refers to the years 1975 to 2007.

[7] A strong caveat must be explained, since Mexico's results refer to the growth between 2009 and 2012, whereas for the other countries it is from 1975 to 2007.

Pareto coefficients

18. As Alvaredo and Piketty (2014) explain, in countries where tax evasion is pervasive, the top income levels reported in fiscal declarations should certainly be considered as a lower bound for the true economic levels. In these situations, one can make use of the Pareto distributions, since the top tail of the income distribution is very closely approximated by a Pareto distribution. The Pareto law is usually considered as a good approximation of the top segment - say, the top 10% - of the observed income distribution. In its simplest form, the Pareto law applies with a constant coefficient to the top μ% of the distribution. A Pareto distribution has the following cumulative distribution function:

$$F(y) = 1 - (k/y)^a, k > 0\ a > 1$$

Where *k* and *a* are constants, and *a* is the Pareto coefficient. Its density function is given by:

$$f(y) = \frac{ak^a}{y^{1+a}}$$

The Pareto distribution has the property that the ratio of average income *y*(y)* of individuals with income above a given threshold *y* is exactly proportional to *y*:

$$y^*(y) = \left(\int_{z>y} zf(z)dz\right)/\left(\int_{z>y} f(z)dz\right) = \left(\int_{z>y} dz/z^a\right) / \left(\int_{z>y} dz/z^{1+a}\right) = a/(a-1)y$$

One sees that the ratio *b(y)* between the average income above *y*(y)* and *y* does not depend on the income threshold *y*. That is:

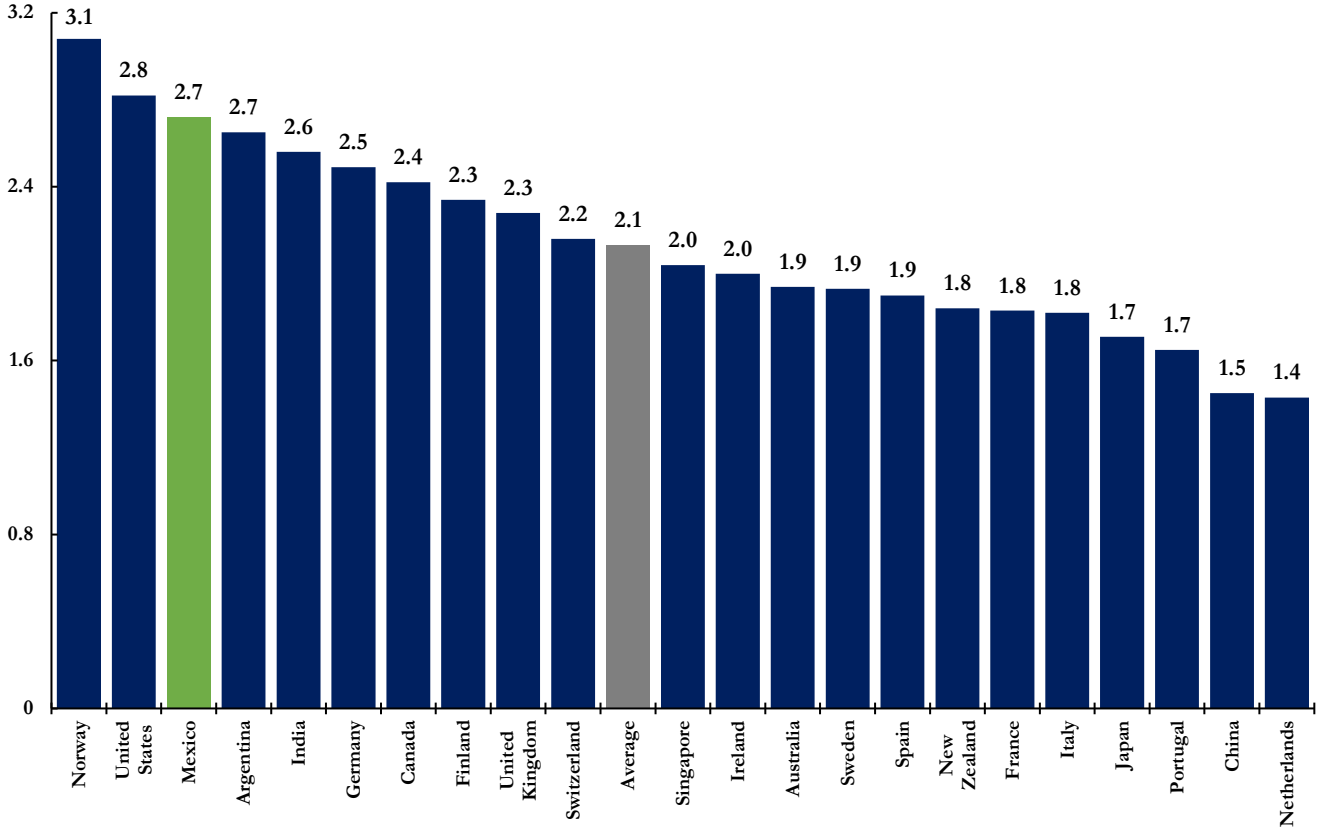
$$b(y) = \mathrm{E}\,(z|z \geq y)/y = b = \frac{a}{a-1}$$

Intuitively, the constant *b*, can viewed as the "inverted Pareto coefficient", measures the fatness of the upper tail of the income distribution. As an example, if *b* = 2, average income above 1,000,000 is 2,000,000 and so on. Therefore, if one could approximate the population parameter of the inverted Pareto coefficient, one could have a clearer picture of the fatness of the upper tail, despite the pervasiveness of tax evasion.

19. Inverted Pareto coefficients vary widely over country and time period. In The World Wealth and Incomes Database and in Atkinson and Piketty (2010), one can find Pareto coefficients ranging from 1.43 to 3.1. For Mexico, inverted Pareto coefficients were calculated for the top $\mu = 1\%$ going from 2.6 to 2.72. Figure 10 graphs an international comparison of the Pareto coefficients for the top $\mu = 1\%$. As expected, the United States has the second highest (*b* = 2.8) coefficients in the sample, whereas the Netherlands has the lowest one (*b* = 1.4). Not surprisingly, Mexico has the third highest coefficient in the sample; this result emphasizes the role of tax evasion in our data, and one should consider our adjusted top 1% results as a lower bound, rather than an unbiased estimate. If one could perfectly observe the income of each individual, Mexico's top 1% should be closer to the one of the United States.

Figure 10. Inverted Pareto Lorenz coefficients b of the top μ = 1%

Units

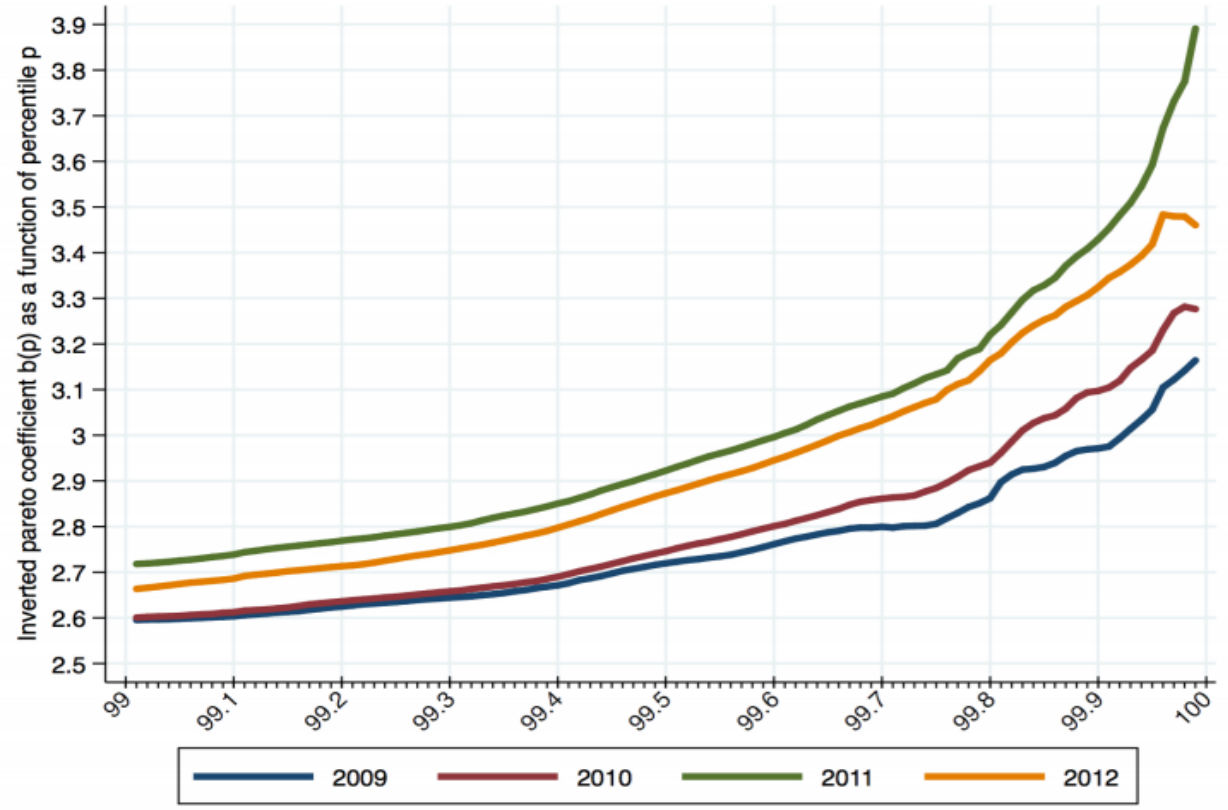


Source: Atkinson and Piketty (2010). *See table 13A.24.* For Mexico, author's calculations based on tax data of 2011 and adjusted with 2009 Economic Census data.
Note: Estimates before Income Tax.

20. For a given country and year, the inverted Pareto coefficient *b(y)* is not constant, and it can be expressed as a function of the percentile p at which it is computed. With observed distributions, one finds that *b(p)* is only approximately constant within the top 10% of the distribution, and generally rises quite substantially between $p = 0.01$ and $p = 0.001$. Figure 11 depicts the inverted Pareto coefficient b as a function of percentile p for Mexico between years 2009 and 2012. In all years, they rise substantially, especially after $p = 0.93$. Year 2011 shows the biggest inverted Pareto coefficients from all years, increasing steeply after $p = 0.97$. During the same year, the average income within the top percentile is 2.72 times larger than the income threshold that one needs to pass in order to enter the top decile. That is, $b(p) = E(y \mid y > yp)/yp = 2.72$ if $p = 0.9$. Moreover, the average income for the fractile $p = 0.95$ is 2.92 times larger than the income threshold. Finally, for the last fractile, $p = 0.99$, the average income is 3.16, 3.28, 3.89 and 3.46 times larger than the income threshold for years 2009, 2010, 2011 and 2012, respectively.

Figure 11. Inverted Pareto coefficient *b* as a function of percentile *p* for Mexico

Units



Source: Author's calculations based on tax data of 2009-2012 and adjusted with 2009 Economic Census data.
Note: Estimates before Income Tax and based on adjusted income. This figure describes the profile *b(p)* of empirical "inverted" Pareto coefficients as a function of percentile *p*. For example, in 2011, the average income within the top percentile is 2.72 times larger than the income threshold that one needs to pass in order to enter the top percentile. That is, $b(p) = E(y \mid y > yp)/yp = 2.72$ if p = 0.9. In 2011, $b(p) = 2.92$ if p = 0.95 and $b(p) = 3.89$ if $p = 0.99$.

Pareto distributions

21. If income tails distributions follow a Pareto distribution, one can derive an expression for the top p^{th} fractile's share of total income by knowing the Pareto coefficient *a*. As previously explained, the Pareto's density function is given by:

$$f(y) = \frac{ak^a}{y^{1+a}}$$

The income of people with income greater than some level y' is:

$$\int_{y'}^{\infty} y(aky^{-a-1})\,dy$$

Then, the share of total income accruing to those above the p^{th} fractile can be written as:

$$\frac{\int_{y_p}^{\infty} aky^{-a}\,dy}{\int_{y_{min}}^{\infty} aky^{-a}\,dy} = \frac{-\frac{a}{a-1}ky^{-(a-1)}\Big|_{y_p}^{\infty}}{-\frac{a}{a-1}ky^{-(a-1)}\Big|_{y_{min}}^{\infty}} = \left(\frac{y_q}{y_{min}}\right)^{-(a-1)}$$

The p^{th} fractile satisfies $ky_p^{-a} = p/100$, i.e., $y_p = (100k/p)^{1/a}$, and the lower support of the distribution satisfies $y_{min} = k^{1/a}$. Substituting these in the last result, one obtains an expression, $(\mathcal{F}(p,a))$, for the top p^{th} fractile's share of total income:

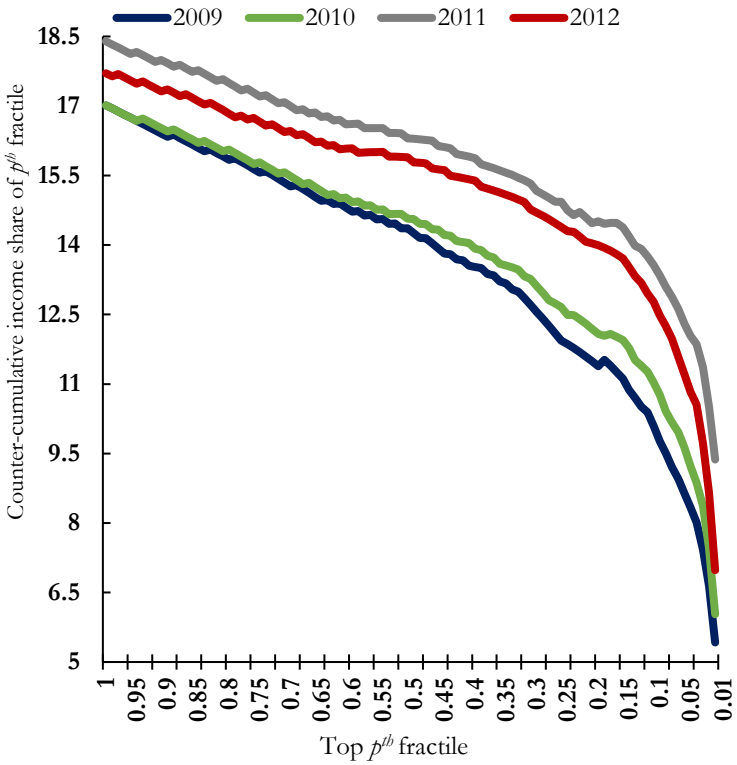
$$\mathcal{F}(p,a) \equiv 1 - \Pr[\tilde{y} \leq y] = \left(\frac{p}{100}\right)^{\frac{a-1}{a}}$$

In order to calculate the Pareto distributions, the previous expression was used as a function of the desired fractile and its respective Inverted Pareto coefficient (*b*) calculated in Figure 11. As seen in Figure 12, the distributions present higher top income shares than the ones one calculated with the adjustment of the Economic Census (see Table 1). For 2009, the top 1% captures 17.0% of total income, whereas one calculated 13.2%.

22. The difference between the top incomes calculated with the Pareto distributions and the ones calculated with an adjustment is graphed in Figure 13. For all available years, the difference follows an inverted U-shape; this means that one is able to better correct incomes at the top 1% or at the top 0.01%. Another way of reading this difference is the amount of fiscal evasion that we're not able to calculate with our proposed adjustment.

Figure 12. Pareto distributions as a function of fractile *p(a)*, Mexico.

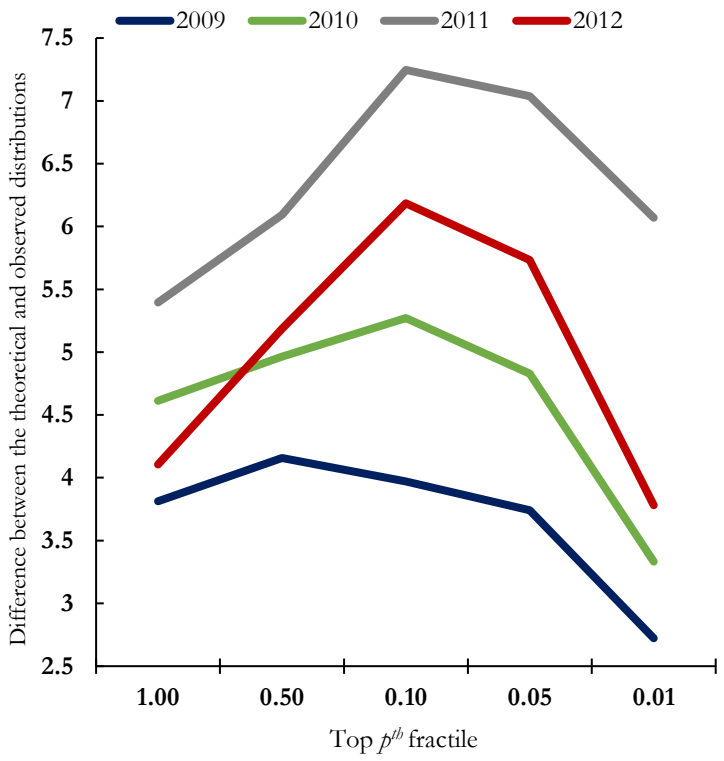
Counter-cumulative percentage of total income



Source: Author's calculations based on tax data of 2009-2012 and adjusted with 2009 Economic Census data.
Note: Estimates before Income Tax and based on adjusted income.

Figure 13. Difference between the top income shares calculated with the distribution and observed data, Mexico.

Difference

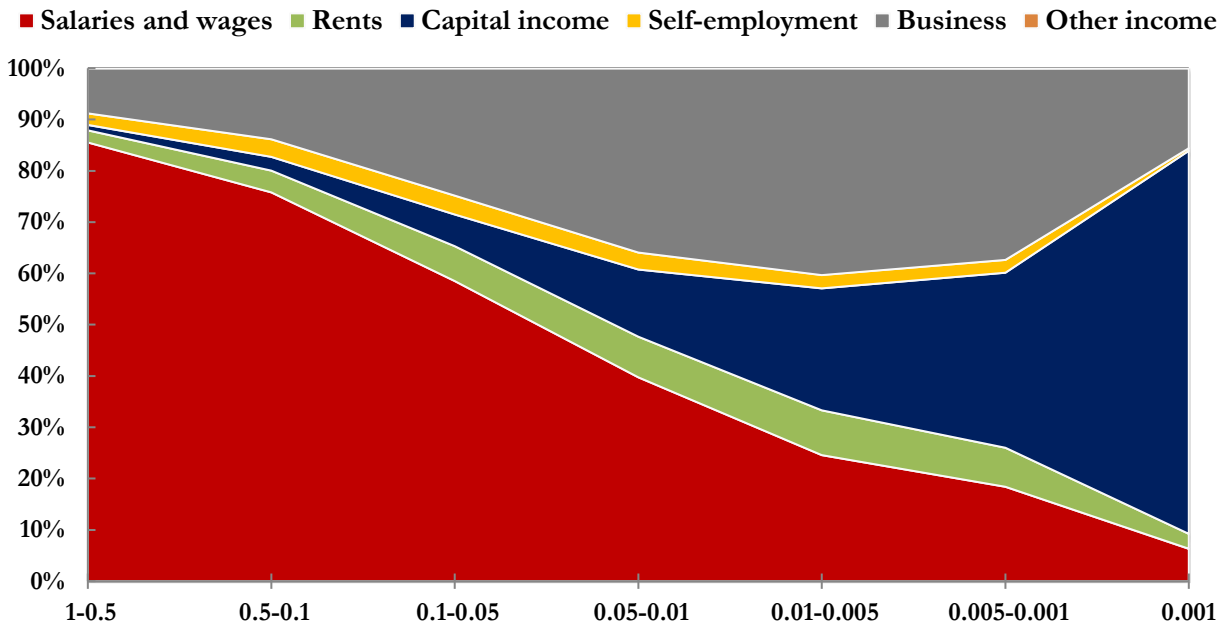


Source: Author's calculations based on tax data of (2009 - 2012) and adjusted with 2009 Economic Census data for Mexico. See *Table 1* for calculated top income shares.
Note: Incomes excluding capital gains and estimates before income tax.

Decomposition of top incomes

23. Examining the composition of top incomes offers important hints to the understanding of the development of top income shares. Figure 14 decomposes the top 1% income fractile during 2012 in 5 different sources; four elements should be noted. First, the share of salaries and wages plays an important role at the beginning of the income fractile, and it steeply decreases its importance while one starts moving to the right of the distribution. Second, an interesting situation is the inverted u-shape pattern that income business shows and its importance throughout the top fractile distribution. It represents 8.8% of the income of the 1-0.5% group, 40.3% for the 0.01-0.005% group and 15.6% for the 0.001% group. Third, capital income starts increasing its importance while one starts moving to the right of the distribution representing 75% for the richest fractile of the distribution. Finally, the remaining two sources, rents and self-employment income, remain fairly constant throughout the upper-fractile.

Figure 14. Decomposition of the top 1% by income source, 2012.
Percentage



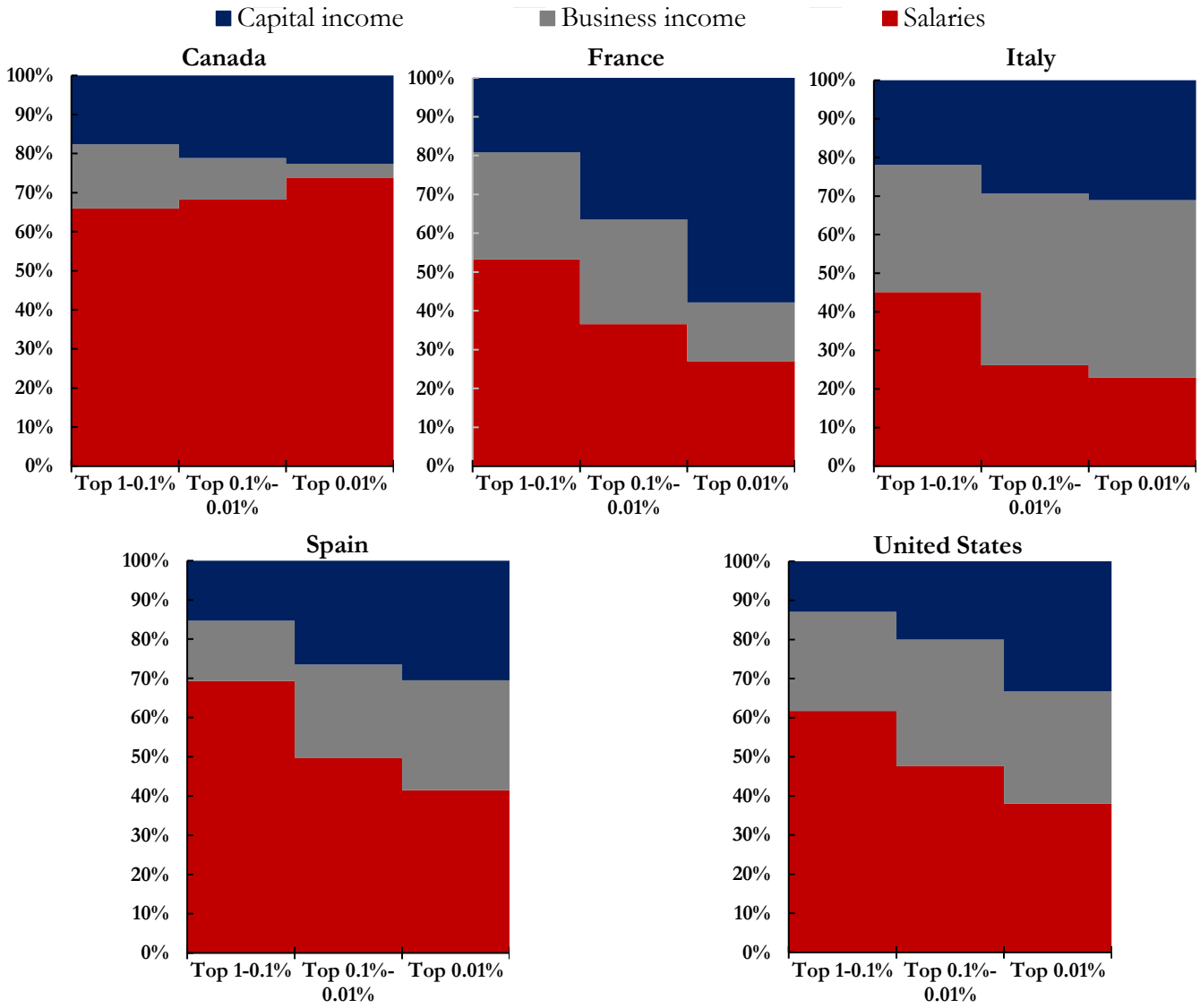
Source: Author's calculations based on tax data of 2012 and adjusted with 2009 Economic Census data.
Note: The figure displays how the top 1% (adjusted income) is divided into six income components: salaries and wages, rents, capital income, self-employment, business and other income. It decomposes the income sources by fractile ranges; for example, for the 1-0.5% top percent, salaries and wages represented, on average, 86% of the total share, whereas for the 0.005-0.001%, it represented 18%. Capital income is define as the sum of interests, dividends and other income; Business income is defined as the sum of intermediate business scheme and general business scheme; other income is defined as total prizes obtained.

24. As seen in Figure 15, the decomposition of top incomes in Mexico follows a similar trajectory as other available countries. As in Mexico, France, Italy, Spain and the United States, the weight of salaries and wages falls higher up the income ladder. Mexico, Spain and the United States present the highest weights of salaries and wages at the top 1%, with the exception of Canada where the weight of salaries increases higher up in the income ladder. For Canada, Saez and Veall (2005) suggest that general inequality is driven by the compensation practice for highly ranked officers and executives. In all six countries, the share of capital income increases as one moves up the income ladder. The highest share of capital income at the top .01% appears in France,

where it represents 58% of their total income. Finally, the weight of business income plays, on average, a similar as the one of capital income, since it increases its importance as one moves up.

Figure 15. Decomposition of the top 1% by income source, international comparison.

Percentage of total income



Source: OECD (2014) calculations based on the World Wealth and Income Database.
Note: Incomes refer to pre-tax incomes, excluding capital gains. Data refer to 2007 (Italy 2005).

How are tax deductions concentrated across the top income groups?

25. As seen in Table 2 the deductions' distribution follows a regressive tendency. The Top 5% deduct almost five times more than a situation of a perfect egalitarian fiscal policy design. As one approaches the upper limit, deductions become more concentrated, since they receive six, eight, twenty, thirty, ninety, a hundred and even four hundred times more than the egalitarian situation, without changing its trajectory through time.

Table 2. Total tax deductions made by top income groups

Cumulative percentage owned by each centile

	2009	2010	2011	2012
Top 5	23.76	22.20	23.53	22.78
Top 1	6.62	5.68	6.23	5.73
Top .5	4.21	3.44	3.80	3.36
Top .1	2.16	1.48	1.73	1.32
Top .05	1.75	1.12	1.41	1.01
Top .01	0.90	0.65	0.93	0.60
Top .005	0.68	0.53	0.79	0.54
Top .001	0.42	0.37	0.56	0.35

Source: Authors' calculations based on tax data (09 – 12)

Note: Individuals ordered by revenue. Excluding capital gains.

26. Table 3 presents total deductions on health expenses, where the top 5% controlled more than a third of them. Mexico has a private and public health sector, where the allowed deductions on medical, dental and hospital expenses are spent on the private health sector, and they added up to a total of $MX 11,577,075,972 during 2012. With respect to funeral expenses, the distribution doesn't seem quite concentrated as other deductions, since the top 1 percent concentrates 2.2-2.7%.

Table 3. Tax deductions made by top income groups

Cumulative percentage owned by each centile

	Medical, dental and hospital expenses				**Funeral Expenses**			
	2009	2010	2011	2012	2009	2010	2011	2012
Top 5	27.31	27.53	27.93	28.01	16.41	15.63	16.90	15.91
Top 1	6.50	6.54	7.00	6.62	2.34	2.20	2.73	2.44
Top .5	3.35	3.37	3.57	3.39	1.06	1.02	1.29	1.13
Top .1	0.73	0.73	0.89	0.71	0.24	0.21	0.21	0.30
Top .05	0.38	0.39	0.54	0.39	0.12	0.09	0.09	0.16
Top .01	0.10	0.10	0.22	0.10	0.04	0.00	0.01	0.05
Top .005	0.05	0.05	0.17	0.07	0.01	0.00	0.01	0.03
Top .001	0.02	0.01	0.01	0.02	0.00	0.00	0.01	0.01

Source: Authors' calculations based on tax data (09 – 12)

Note: Individuals ordered by revenue. Excluding capital gains.

27. The distribution of charitable donation behaves in an extreme way, since the top 5 and 1 percent concentrated around 83 and 61 percent of total charitable donation in 2011 (see Table 4). During 2011, total charitable donations were around $MX 1,194,670,287, where the top 1 and .001 percent deducted around $MX 802,460,032 and $MX 228,301,492, respectively. For the latter case, one must remember that the top .001 percent consists of around 700 individuals, or an average deduction of $MX 326,145. With respect to the deductions on interests for mortgage loans, the distribution doesn't seem heavily concentrated on the top 1 percent, since they concentrate between 2.38-2.72% of total deductions from mortgage loans.

Table 4. Tax deductions made by top income groups

Cumulative percentage owned by each centile

	Charitable Donations				Real interest paid for mortgage loans			
	2009	2010	2011	2012	2009	2010	2011	2012
Top 5	81.97	79.89	82.93	82.02	21.31	20.31	19.04	18.13
Top 1	66.73	61.43	67.17	65.86	2.72	2.44	2.52	2.38
Top .5	60.20	54.01	60.53	59.03	1.00	0.87	0.93	0.88
Top .1	46.75	37.53	45.80	40.44	0.13	0.13	0.11	0.09
Top .05	40.81	31.18	40.88	34.95	0.06	0.07	0.06	0.04
Top .01	22.35	20.28	29.63	23.51	0.01	0.01	0.00	0.01
Top .005	17.03	16.72	25.61	21.24	0.00	0.00	0.00	0.00
Top .001	10.72	12.01	19.11	14.26	0.00	0.00	0.00	0.00

Source: Authors' calculations based on tax data (09 – 12)

Note: Individuals ordered by revenue. Excluding capital gains.

28. After 1997, Mexico's private pension system was reformed in order to be financed via private savings and voluntary contributions. Providing voluntary contributions to the pensions systems implies an intertemporal choice between current and future consumption, which depends on the discount and return rate, taxes on contributions, consumption preferences and other exogenous variables. In a situation where income and education positively correlate with consumption preferences and discount rates, it isn't surprising the concentration of the voluntary contributions distribution, where the top 5 and 1 percent had around 53 and 14 percent of total contributions (see Table 5), respectively. The same situation happens with the distribution of premiums for health insurance, where private insurances react as a normal good.

Table 5. Tax deductions made by top income groups

Cumulative percentage owned by each centile

	Voluntary contributions to the system of retirement savings				Premiums for health insurance			
	2009	2010	2011	2012	2009	2010	2011	2012
Top 5	52.52	54.22	53.32	51.15	61.73	61.01	63.56	66.25
Top 1	13.67	14.15	14.21	13.62	16.90	16.21	18.73	20.90
Top .5	5.49	6.05	6.18	5.50	6.61	6.11	7.37	8.53
Top .1	0.59	0.94	0.80	0.73	0.58	0.62	0.74	0.77
Top .05	0.35	0.42	0.56	0.32	0.20	0.26	0.38	0.37
Top .01	0.08	0.15	0.16	0.12	0.04	0.09	0.06	0.17
Top .005	0.08	0.15	0.10	0.07	0.02	0.09	0.03	0.10
Top .001	0.00	0.11	0.03	0.07	0.00	0.00	0.00	0.00

Source: Authors' calculations based on tax data (09 – 12)

Note: Individuals ordered by revenue. Excluding capital gains.

29. Finally, with respect to school transportation, the distribution is concentrated towards the upper fractiles. The top 5 and 1 percent concentrated around 52 and 13 percent (see Table 6), respectively, with an increase in the trajectory through time.

Table 6. Compulsory school transportation tax deductions made by top income groups

Cumulative percentage owned by each centile

	2009	2010	2011	2012
Top 5	52.50	52.76	52.98	53.77
Top 1	13.24	12.90	13.77	15.73
Top .5	5.90	5.71	6.23	7.30
Top .1	1.08	0.75	0.79	1.09
Top .05	0.49	0.26	0.38	0.47
Top .01	0.11	0.08	0.05	0.06
Top .005	0.06	0.04	0.01	0.03
Top .001	0.02	0.00	0.00	0.00

Source: Authors' calculations based on tax data (09 – 12)

Note: Individuals ordered by revenue. Excluding capital gains.

Trends in taxation of top incomes

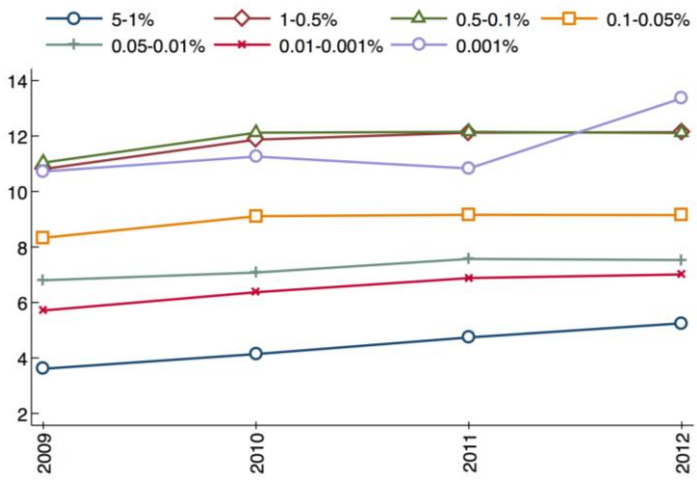
30. In a country where top incomes are high, the role of taxation takes importance for redistribution analyses.[8] As previously explained, legal erosion arising from tax evasion or legal reliefs could shrink the tax burden over top income individuals. To analyze this situation, Figure 16 depicts the average income tax rate in Mexico between 2009 and 2012, separating it by fractiles within the top percentile of the income distribution. Overall, they range from 3.6% to 13.36%. The change in the marginal tax rate during 2010 increased the effective average tax rate for all fractiles, except for the top .001%. An interesting outcome from this graph is that the average tax rates for fractiles 0.1-0.05%, 0.05-0.01% and 0.01-0.001% are lower than the ones of fractiles 1-0.5% and 0.5-0.1%.

31. Figure 17 sheds more light in how legal reliefs follow a regressive tendency, since the percentage of taxable income drops as one moves to the right of the income distribution. One can exemplify the latter with two cases. On one side, the taxable income of fractile 5-1% is almost 80% of their revenue. This is the case since this fractile is mostly comprised by wage earners, which have lower degrees of freedom to file authorized deductions compared to businesses or self-employed. On the other side, the taxable income of fractile 0.01-0.001% oscillates around 20%. Within this fractile, 75% of its income comes from businesses, which report almost null taxable income.

[8] Taxable income was calculated, following the income tax law (2009 - 2012), as the sum of gross income/revenue from all sources (excluding capital gains) net of exempted income, authorized deductions, investments, stimulus, profit sharing, local taxes, losses and personal deductions. Afterwards, the progressive tax scales were used to calculate the tax owed from taxable income. Individuals were ranked with respect to gross income/revenue in order to calculate different tax statistics such as effective average tax rate, average tax rate and the ratio of average taxable income to average revenue of top groups. Effective average tax rates are defined as the ratio of average tax owed to average taxable income within each top group; whereas, average tax rate are defined as the ratio of average tax owed to average revenue within each top group.

Figure 16. Average tax rates of top income groups, 2009-2012.

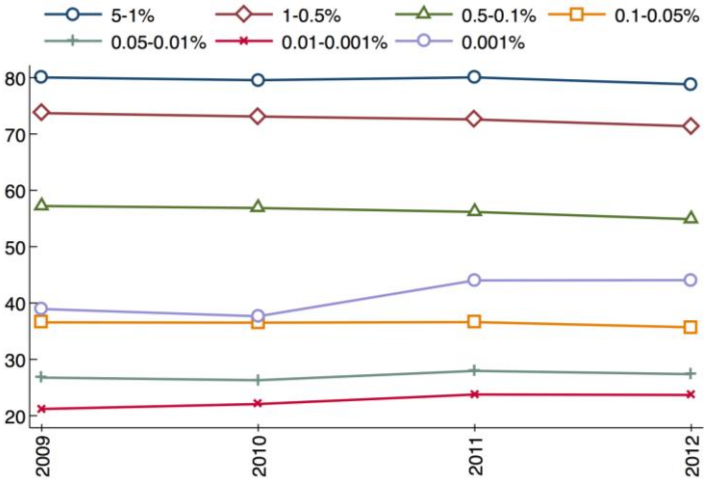
Percentage



Source: Author's calculations based on tax data of (2009 - 2012).
Note: Incomes excluding capital gains and estimates before income tax.

Figure 17. Ratio of average taxable income to revenue of top income groups, 2009-2012.

Percentage



Source: Author's calculations based on tax data of (2009 - 2012).
Note: Incomes excluding capital gains and estimates before income tax.

Household Surveys vs Tax Data

32. As previously explained, in Mexico, Campos et al. (2013) found out the benefits of national growth for the riches are more than for the general population, by using Household Surveys to calculate metrics of inequality. However, as Alvaredo (2011b), Alvaredo et al. (2013) and Burkhauser et al. (2011) express, Household Surveys are all but ideal for studying top shares because the rich are usually missing from household surveys for (*i*) sampling reasons, (*ii*) low response rates (e.g. refusing to cooperate with the time-consuming task of completing a long form), or (*iii*) ex-post elimination of extreme values to minimize bias Alvaredo et al. (2013), leading to a severe under-reporting at the top of the distribution and creating artificially low inequality within a country.

33. To cast further light on this issue, the Socioeconomic Conditions Module of the ENIGH (2010 and 2012) was used to calculate different inequality measures. The data set is nationally representative and contains detailed information about the household's income and expenditure. Our income definition of the Household Survey was built in order to match as closer as possible the one used to calculate top percent.[9] As seen in Table 7, the number of individuals in the top percent is relatively similar in both databases, whereas the total income in the economy is very different between them; total income and average income in national accounts

[9] The following categories were selected from the Household Survey; Salaries and wages: 1) Wages, salaries or hires from the principal and secondary subordinate job, and cooperatives, societies or similar enterprises; 2) Piecework; 3) Commissions and tips; 4) Extra hours; 5) Holidays' primes and other monetary benefits, 6) End of the year bonus, 7) Bonus and additional perceptions or over wage, 8) Indemnifications for work accidents and 9) Indemnifications for dismissal and voluntary retirement. Rents: 1) Leasing from lands and terrains, in or outside the country; 2) Leasing from houses, buildings, locals and other properties, in or outside the country and 3) Other incomes for the leasing of a property. Capital income: 1) Interests from fixed term investments, 2) Interests from saving accounts, 3) Interests from loans to third parties, 4) Returns from bonus and "*cédulas*", 5) Profit sharing form the principal and secondary job, 6) Gains and utilities from the principal and secondary job in cooperatives, societies and similar enterprises and 7) Annual incomes from stocks' returns of a company you did not work in. Business: 1) Incomes from their own businesses. Other income: 1) Incentives, gratifications and prices, 2) Lottery and gambling and 3) Total income not considered previously.

is around three times higher than the ones in the survey. In the same way, the P99 threshold, the top 1% income share and the top 1% average income in tax files are higher than the ones calculated in the survey. These situations highlight the low capabilities of household surveys to calculate top income inequality.

Table 7. Comparison of top 1% income share in household surveys and tax data.
Units in parenthesis

Year	Number of individuals in top 1% (*individuals*)		Total income (*thousand million*)		Average income (*thousand*)		P99 (*thousand*)		Top 1% income share (*percent*)		Top 1% average income (*thousand*)	
	Survey	Census	Survey	National Accounts	Survey	National Accounts	Survey	Tax data	Survey	Tax data	Survey	Tax data
2010	616,133	673,972	3,111.2	7,991.0	49.8	118.5	437.6	625.5	10.9%	12.4%	739.9	765.8
2012	735,181	712,300	3,394.1	9,063.8	44.9	127.2	442.6	714.5	11.6%	13.6%	822.5	871.4

Source: Author's calculations based on tax data for year 2010 and 2012; Socioeconomic Conditions Module of the ENIGH of 2010 and 2012; National Accounts and Population Census.
Note: Estimates before Income Tax and excluding capital gains. Quantities are in nominal terms.

Gini adjustments of Household Surveys using Tax Data

34. As Alvaredo and Londoño (2013) explain, a number of researchers have addressed the differences in the ability of tax data and household survey data to represent income inequality, trying to reconcile the evidence using the two sources (Alvaredo 2011a; Burkhauser et al. 2012). Using the survey-based Gini coefficient for the bottom 99% (G^*), and the tax-based top 1% income share (S), one follows Atkinson (2007), Alvaredo and Londoño (2013) and Alvaredo (2011a), and re-estimate the Gini coefficient (G) as:

$$G = \frac{\beta - 1}{\beta + 1}(P)(S) + (G^*)(1 - P)(1 - S) + (S - P)$$

Where β and P are the tax-based inverted-Pareto coefficient and the top group considered ($P = 0.01$ for the top 1%), respectively. One calculated the survey income shares and Gini coefficients with the Socioeconomic Conditions Module of the ENIGH previously described.

35. As expected, Gini corrected coefficient increased in 2010 from 51.8 to 52.6 and in 2012 from 53.3 to 54.6 (see Table 8). Once corrected by taking into account the higher incomes reported in the tax files, the increase of inequality between 2010 and 2012 appears to be higher than before.

Table 8. Top income shares and Gini coefficient in Mexico, 2010 and 2012.
Percentage; Units for Pareto Coefficient

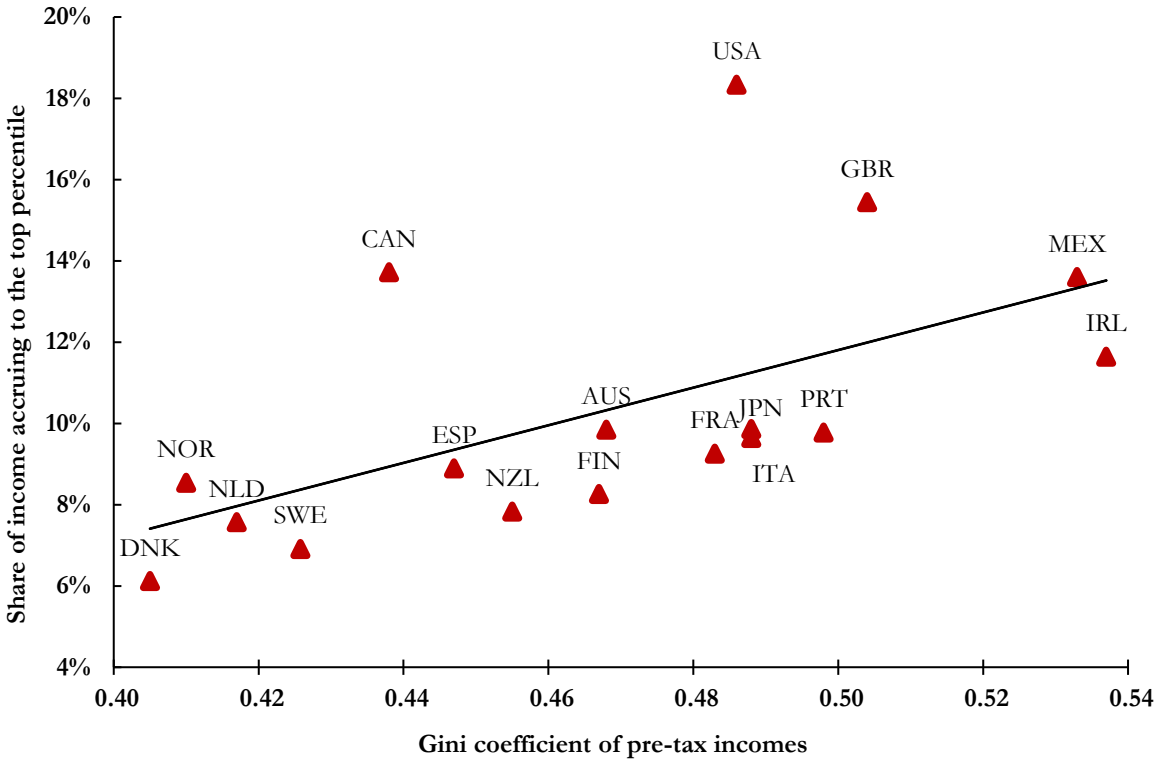
Year	Top 1% share from tax data (%)	Gini coeff (G)	Gini coeff (G*) (bottom 99%)	Inverted Pareto coefficient (ß)	Gini coeff (G) corrected with tax-based top 1% share
2010	12.4%	51.8%	47.0%	2.6	52.6%
2012	13.6%	53.3%	48.6%	2.66	54.6%

Source: Author's calculations based on tax data for year 2010 and 2012; Socioeconomic Conditions Module of the ENIGH of 2010 and 2012.
Note: Estimates before Income Tax and excluding capital gains.

36. Following OECD (2014), Figure 18 presents the top percentile income shares and pre-tax Gini coefficients of income inequality for different countries. The top income shares and the Gini coefficients are positively related, and Mexico lies on the linear trend of the countries sample; Mexico exhibits both big inequalities at the right tail and at the spread of the whole income distribution. The Gini coefficient is more sensitive to income changes at the middle than at the tails of the distribution because it indicates the spread of the income distribution or deviation from the mean - while top income shares do not tell anything about the middle and the bottom of the income distribution. While the two indexes in terms of cross-country levels show only a weak correlation, their trends are more strongly positively associated (e.g. Leigh, 2007), suggesting that to some extent similar factors affect both the top and the other parts of the income distribution (OECD, 2014).

Figure 18. Top percentile income shares and pre-tax Gini coefficients

Percentage; Units



Source: World Wealth and Income Database for top 1% pre-tax income share; author's calculations based on tax data of 2012 and adjusted with 2009 Economic Census data for Mexico, OECD (2014) Income Distribution Database for Gini coefficients and author's calculations based on ENIGH survey data 2012 for Mexico. Data refer to 2007 (Portugal 2005, Mexico 2012).

Historical Income Distributions Using Household Surveys

37. Top income shares measure the concentration of pre-tax income at the top of the distribution, but do not provide any information on the shape of the remaining parts of the income distribution. Despite the previously explained limitations of Household Surveys to explore top incomes, they allow us to provide the shape and behavior of the remaining parts of the income distribution. One exploited the National Household Income and Expenditure Survey (*Traditional-ENIGH*) for years 1984 to 2014. Figures 19 to 22 graph the

average household income per capita from 1984 to 2014 for three different income definitions (*total, monetary and monetary without government subsidies incomes*)[10] and four different sections of the whole income distribution.

38. Figure 19 and 20 graph the bottom half of the income distribution. Figure 19 shows us a 30-years dynamic story of the per capita household income of the poorest households. Between 1984 and 2014, the total income grew 22.7%, whatsoever this growth has been sustained by self-consumption and government subsidies such as *Oportunidades*; much of the growth of monetary income between 2000 and 2006 was thanks to government subsidies. Without government subsidies, their monetary income grew 0.01% between 1994 and 2014. This situation might portray the lack of growth in income received from work, business, retirement, among others, and the possible dynamic-poverty trap that these households experience. For the rest of the bottom income distribution, Figure 20 presents the 30-years average income for the second to the fifth decile. In here, one sees that income reached its peak in 2006 growing 40.3% in 20 years. However, it has been decreasing since it reached its peak. Between 2006 and 2014, it lost 11.1% and 17.41% in total income and monetary income without government subsidies, respectively. The same situation happened to the monetary income without subsidies for the first decile, by losing 19.0% between 2006 and 2014. It appears that bottom households haven't recovered from the hit that the Financial Crisis generated in 2008.

Figure 19. Average household income per capita, first decile.

Constant Mexican Pesos

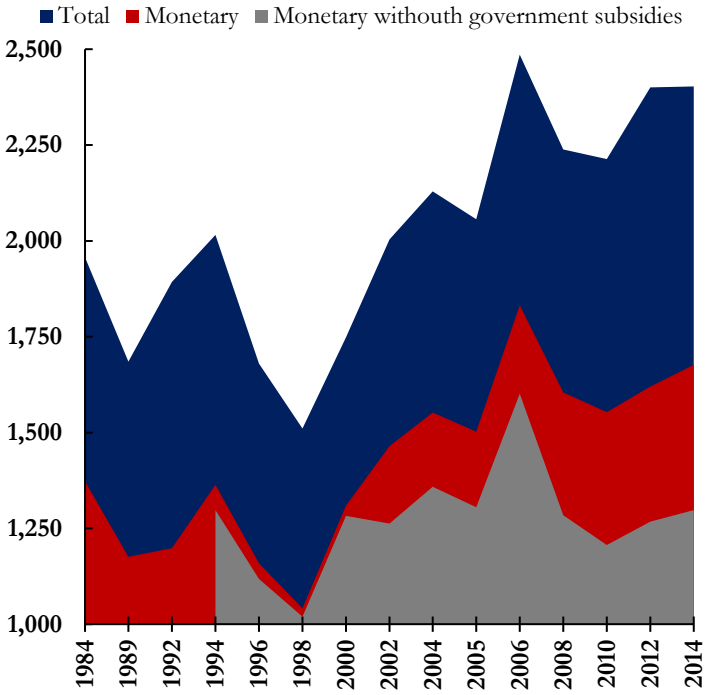
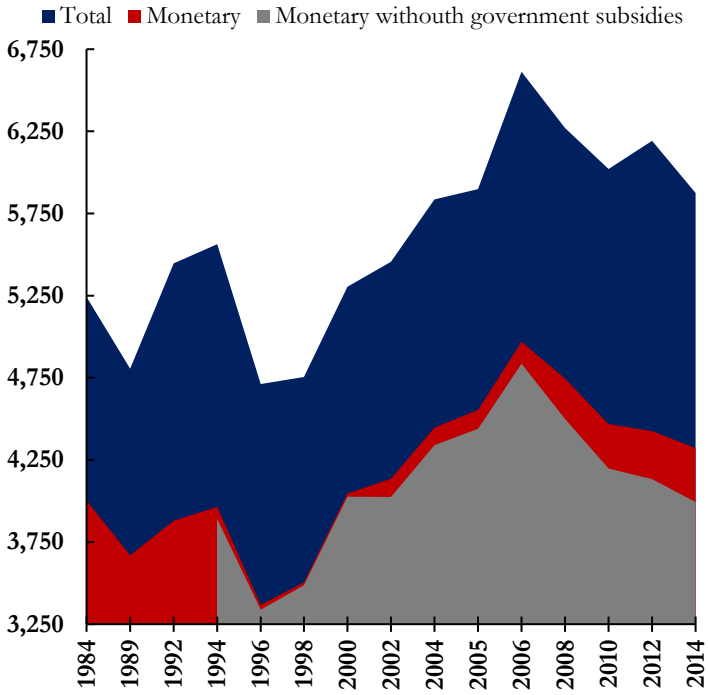


Figure 20. Average household income per capita, second to fifth deciles.

Constant Mexican Pesos



Source: ENIGH (1984 – 2014).

Note: Households ordered by total income. Variables referring to government subsidies available after 1994.

[10] Total income includes: monetary income, self-consumption expenditures, payments and transfers in kind, rent estimation, capital income and financial income; monetary income includes: work income, business income, other work income, renting a property, retirement income, remittances, income coming from donations, scholarships, government subsidies and other income. Monetary income without government subsidies includes: monetary income without government and scholarship subsidies.

39. Figures 21 and 22 present the average household income per capita for the upper half of the income distribution. For both cases, government subsidies don't play an important weight on income. However, as with the bottom part of the distribution, the financial crisis impacted their total income, since the sixth to ninth deciles and the tenth decile lost 14.6% and 14.3% between 2006 and 2014, respectively. Neither of both have arrived to levels achieved previous the financial crisis. As a metric of inequality between the richest and poorest decile, in 2006, the richest decile earned, on average, 28.8 times more the total income of the lowest decile, whereas, in 1984, it earned, on average, 26.1 times more.

Figure 21. Average household income per capita, sixth to ninth deciles.

Constant Mexican Pesos

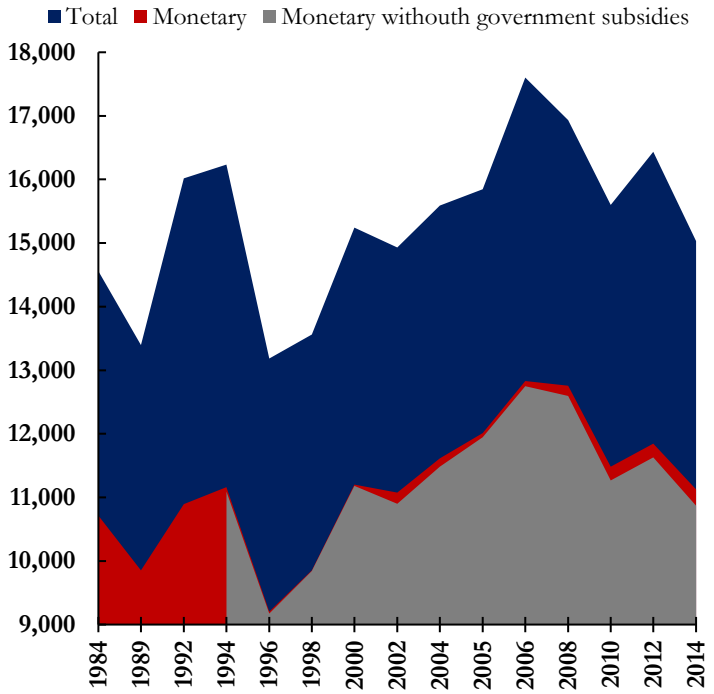
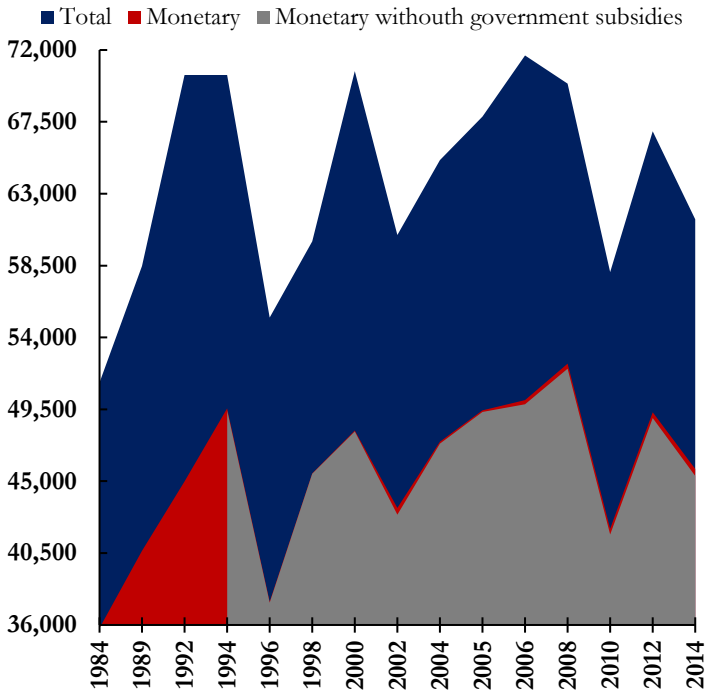


Figure 22. Average household income per capita, tenth decile.

Constant Mexican Pesos



Source: ENIGH (1984 – 2014).
Note: Households ordered by total income. Variables referring to government subsidies available after 1994.

Top Wage Shares

40. A natural extension to the analysis of top incomes is the one of top wage shares. Following Saez and Veall (2005); Piketty and Saez (2001), the microfiles of tax returns and employer-reported information provide detailed information of the wage income distribution, where wage income is taken as the employment income of both wage and salary earners. Wage shares are estimated by computing the share of total employment income accruing to various upper groups of the wage income distribution. Top groups are defined relative to the total number of individuals with positive wages.[11]

[11] The total number of tax units with wage income in the full population is estimated as the number of subordinate and paid wage earners from INEGI's webpage (which is the yearly average of the quarterly reports). On the other side, the control for total wages is taken from National Accounts as Wages and Salaries (D.11) net of effective social contributions

41. Table 9 displays top wage shares from 2009-2012. In the first place, top wage shares are as high as top income shares. Wage shares are highly concentrated at the top 1% representing between 13.04% and 13.58%. In the same way as the top 1% shares, top 20% and top 10% shares are considerably high. The top 20% represents 59.60% at its maximum, whereas the top 10% represents 44.28% at its maximum. The fact that the rise in top wage shares is so concentrated is a problem for the skill-biased technology explanation. As with Saez and Veall (2005), the high concentration of wages in Mexico suggests that general inequality is driven by the compensation practice for highly ranked officers and executives.

Table 9. Top wage shares in Mexico, 2009-2012.

Percentage

	20%	10%	5%	1%	0.5%	0.1%	0.05%	0.01%	0.005%	0.001%
2009	56.59	42.30	30.37	13.23	9.20	3.89	2.67	1.14	0.80	0.35
2010	56.12	41.97	30.16	13.04	9.06	3.87	2.68	1.19	0.85	0.39
2011	58.15	43.49	31.31	13.81	9.76	4.49	3.27	1.70	1.34	0.84
2012	59.60	44.28	31.60	13.58	9.46	4.14	2.91	1.32	0.95	0.44

Source: Author's calculations based on tax data from personal tax returns and employer-reported information on wages for years 2009 to 2012.
Note: Estimates before Income Tax. Wage income includes exempted tax income.

Mobility among the rich

42. Economic mobility implies a movement in the income stratification due to different factors such as: income, education, prestige, wealth, ethnicity, and family background, among others. However, Reeves and Sawhill (2014) find that in the USA rich high school dropouts remain in the top about as much as poor college grads stay stuck in the bottom — 14 versus 16 percent, respectively. In Colombia, Londoño (2012) finds that Colombia is a highly immobile society. Over one-half of individuals in the top 1–0.5 per cent kept their place in the social ladder after a decade, and one-fifth of the 200 richest individuals in 1993 remained in this group. Economic mobility has a direct relation with inequality; whenever it remains rigid, inequality gets worse. In our case, the use of tax return data provides more accurate measures of income and results in less attrition bias compared to most survey data, especially when focusing on the very top of the distribution (Auten & Gee, 2009; Londoño, 2012).

Methodological approach

43. *Relative* and *absolute* income mobility measures are presented. On one side, *relative* income mobility refers to individuals trading relative positions in the income distribution between an initial and a terminal period of time. On the other side, *absolute* income mobility informs about which groups benefited or lost from economic growth and by how much, studying income and not rank movements across the initial income distribution (Londoño, 2012). *Relative* mobility using transition matrices and Spearman's rank correlation coefficient will be reported, whereas *absolute* mobility will be presented by using non-anonymous growth incidence curves and growth incidence curves.

44. A complement analysis for transition matrices would be to study movements across much smaller fractiles, e.g., those movements between P99-99.01, … , P99.99-100, while using the initial ranking as

reference. This leads to consider "non-anonymous" Growth Incidence Curves that plot income growth rates against the various quantiles of the initial distribution, by taking the view that "status quo matters" and that social welfare should logically be defined on both initial and terminal income. As Bourguignon (2010) explains, in non-anonymous Growth Incidence Curves, individuals in the top 1% are ranked in ascending order according to their initial quantile $p(y_t)$, which depends on income y_t, and it basically measures the quantile-specific mean income growth rate from t to $t+1$, $g_{t+1}(p(y_t))$, based on the initial quantile $p(y_t)$, and it's calculated as:

$$g_{t+1}\big((y_t)\big) = \frac{y_{t+1}(p(y_t))}{y_t(p(y_t))} - 1$$

Compared to "non-anonymous" growth incidence curves, Growth Incidence Curves (GIC) compare the income of individuals, which were not necessarily in the same initial position. The cumulative GIC shows the difference between the initial income of those individuals who are initially among the p richest and the income of the p richest individuals in the terminal distribution. They are not necessarily the same individuals. As redistribution analysis when it excludes re-ranking, GICs somehow ignore the issue of income mobility (Bourguignon, 2010). A downward sloping Growth Incidence Curve indicates that growth contributes to equalizing the distribution of income and vice-versa for an upward sloping curve. Formally GICs are defined in the following way:

$$g_{t+1}\big((p)\big) = \frac{y_{t+1}(p)}{y_t(p)} - 1$$

Analyses and results

Relative mobility

45. Transition matrices are particularly useful devices for summarizing the mobility content of distributional transformations. Indeed, they provide a simple picture of the "movement" of the individuals among the specified income classes, and they can thus be quite telling at times (Fields and Ok, 1999).[12] Table 10 considers how the incomes of taxpayers in each upper-fractile in 2009 changed relative to the incomes of all taxpayers in the filing population in 2012. The diagonal of the mobility matrix shows the percentage of those taxpayers remaining in the same income group; the diagonal shows that $P_{3\times3}$ = 41.86, $P_{4\times4}$ = 53.62, $P_{5\times5}$ = 31.68, $P_{6\times6}$ = 43.35 and $P_{7\times7}$ = 52.89 of individuals, relative to the total filing population, remained in the income class i at time t_1 = 2012. Compared to other Latin-American country, such as Colombia, Mexico presents stronger highly immobile society, since $P_{7\times7}$ in Colombia after 6 years oscillated between 33.7 and 26.7, whereas in Mexico it represented 52.89. Table 11 reduces the number of columns and rows, and it presents what is the probability (P_{ij}) of the top income fractiles to remain in the top 1% relative to the total filing population.

[12] Suppose that one specifies (m = 7) income ranges by one criterion or another, and let P be a matrix of $(n \times n) = (7 \times 7)$ transitions, the ij^{th} element of which, P_{ij}, is the percentage in the income class i (percentile) at time t_0 = 2009 of those who at time t_1 = 2012 were in class j.

Table 10. Mobility relative to the total filing population from 2009 to 2012.

Percentage

		2012						
		7.5-5%	5-1%	1-0.5%	0.5-0.1%	0.1-0.05%	0.05-0.01%	0.01% or over
2009	7.5-5%	44.5	5.76	0.67	0.57	0.09	0.08	0.02
	5-1%	6.72	58.78	4.5	1.29	0.06	0.03	0.01
	1-0.5%	2.88	18.85	41.86	16.21	0.43	0.2	0.02
	0.5-0.1%	3.07	8.2	10.27	53.62	4.53	1.38	0.14
	0.1-0.05%	3.52	4.41	2.98	22.74	31.68	13.93	0.84
	0.05-0.01%	3.47	3.63	2.03	10.02	12.8	43.35	5.67
	0.01% or over	2.94	2.07	1.02	4.19	3.52	20.55	52.89

Source: Author's calculations based on tax data for 2009 and 2012, adjusted with Economic Census data
Note: Each cell entry indicates the percentage of total tax filers in sub-group *i* 2009 that are in sub-group *j* in 2012. Due to attrition, rows do not add to 100%. Estimates before income tax.

Table 11. Mobility relative to the total filing population from 2009 to 2012.

Percentage

		2012	
		7.5-1%	1% or over
2009	7.5-1%	61.7	4.78
	1% or over	16.1	64.72

Source: Author's calculations based on tax data for 2009 and 2012, adjusted with Economic Census data
Note: Each cell entry indicates the percentage of total tax filers in sub-group *i* 2009 that are in sub-group *j* in 2012. Due to attrition, rows do not add to 100%. Estimates before income tax.

46. Table 12 shows how the incomes of taxpayers in each upper-fractile in 2009 changed relative to that same group of taxpayers in 2012. Since no new lower-income households enter the comparison population in this table, there is no considerable overall upward movement of these taxpayers within the overall income distribution. Thus, under this measure of income mobility, taxpayers in bottom percentiles are less likely to rise in to a higher quintile because the only new entrants to the bottom percentiles are taxpayers whose incomes have fallen (Auten and Gee, 2009). Nevertheless, in contrast to the last matrix, one can see that there was almost no upward mobility from individuals below the top 1% to the top 1%; $P_{1\times1}$ and $P_{2\times2}$ represented 86.09 and 82.34 percent, respectively. Meaning that less than 13% of those in the 7.5-5% in 2009 were able to experience upward mobility in 2012, whereas around 17.5% of those in the 5-1% in 2009 were able to enter into the top 1% in 2012. It appears that the richest panel individuals experienced low mobility in Mexico. Table 13 reduces the number of columns and rows, and it presents what is the probability (P_{ij}) of the top income fractiles to remain in the top 1% with respect to the Panel Population.

47. One calculated the Spearman's rank correlation coefficient between t_0 = 2009 and t_1 = 2012. It calculates the non-parametric strength of a monotonic relationship between income in t_0 and income in t_1. The higher the Spearman's coefficient is, one would see lower income mobility between t_0 and t_1. In effect, it was found a Spearman's ρ = 0.81 with a p-value of 0.001, indicating a strong dynamic relationship.

Table 12. Mobility relative to the Panel Population from 2009 to 2012.

Percentage

		2012						
		7.5-5%	5-1%	1-0.5%	0.5-0.1%	0.1-0.05%	0.05-0.01%	0.01% or over
2009	7.5-5%	86.09	11.14	1.29	1.1	0.18	0.16	0.04
	5-1%	9.42	82.34	6.31	1.8	0.08	0.05	0.01
	1-0.5%	3.57	23.44	52.04	20.14	0.54	0.24	0.03
	0.5-0.1%	3.78	10.1	12.64	66.04	5.57	1.7	0.17
	0.1-0.05%	4.4	5.51	3.72	28.39	39.55	17.38	1.05
	0.05-0.01%	4.28	4.48	2.5	12.37	15.81	53.55	7.01
	0.01% or over	3.37	2.38	1.17	4.81	4.04	23.57	60.67

Source: Author's calculations based on tax data for 2009 and 2012, adjusted with Economic Census data
Note: Each cell entry indicates the percentage of panel tax filers in sub-group *i* 2009 that are in sub-group *j* in 2012. Estimates before income tax.

Table 13. Mobility relative to the Panel Population from 2009 to 2012.

Percentage

		2012	
		7.5-5%	5-1%
2009	7.5-5%	92.82	7.18
	5-1%	19.92	80.08

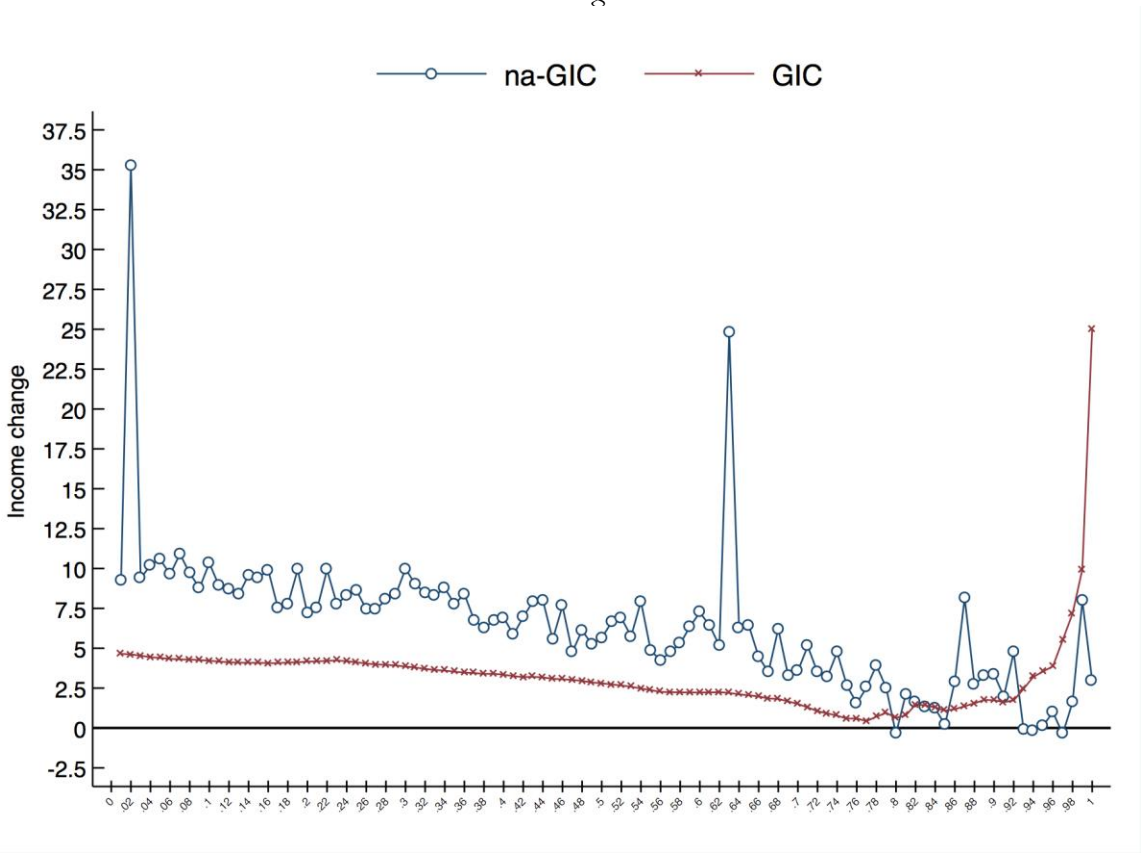
Source: Author's calculations based on tax data for 2009 and 2012, adjusted with Economic Census data
Note: Each cell entry indicates the percentage of panel tax filers in sub-group *i* 2009 that are in sub-group *j* in 2012. Estimates before income tax.

Absolute mobility

48. Figure 23 plots non-anonymous GIC and GIC with prices of 2010. For the non-anonymous GIC, it's worth noting that all individuals in the top 1% presented a positive income growth (or barely negative income growth) between 2009 and 2012. Individuals that gained a higher income growth are ranked at the left of the top 1%, meaning that positive economic growth decreases with the initial rank. However, it's worth noting that certain fractiles at the top of the top 1% had big economic growth, e.g., P99.87 and P99.99 had a positive economic growth of 8.15% and 7.97%, respectively. The GIC shows us that in 2012 the entire top 1% was on average richer than in 2009. Impressively, the "richest of the rich", top P99.93-100, experienced an impressive economic growth compared to 2009, P99.99 and P100 experienced a real growth of 9.98% and 24.98%, respectively.

Figure 23. Non-anonymous GIC and GIC

Percentage



Source: Author's calculations based on tax data of 2009 and 2012.
Note: Incomes excluding capital gains and estimates before income tax.

Conclusions and contributions

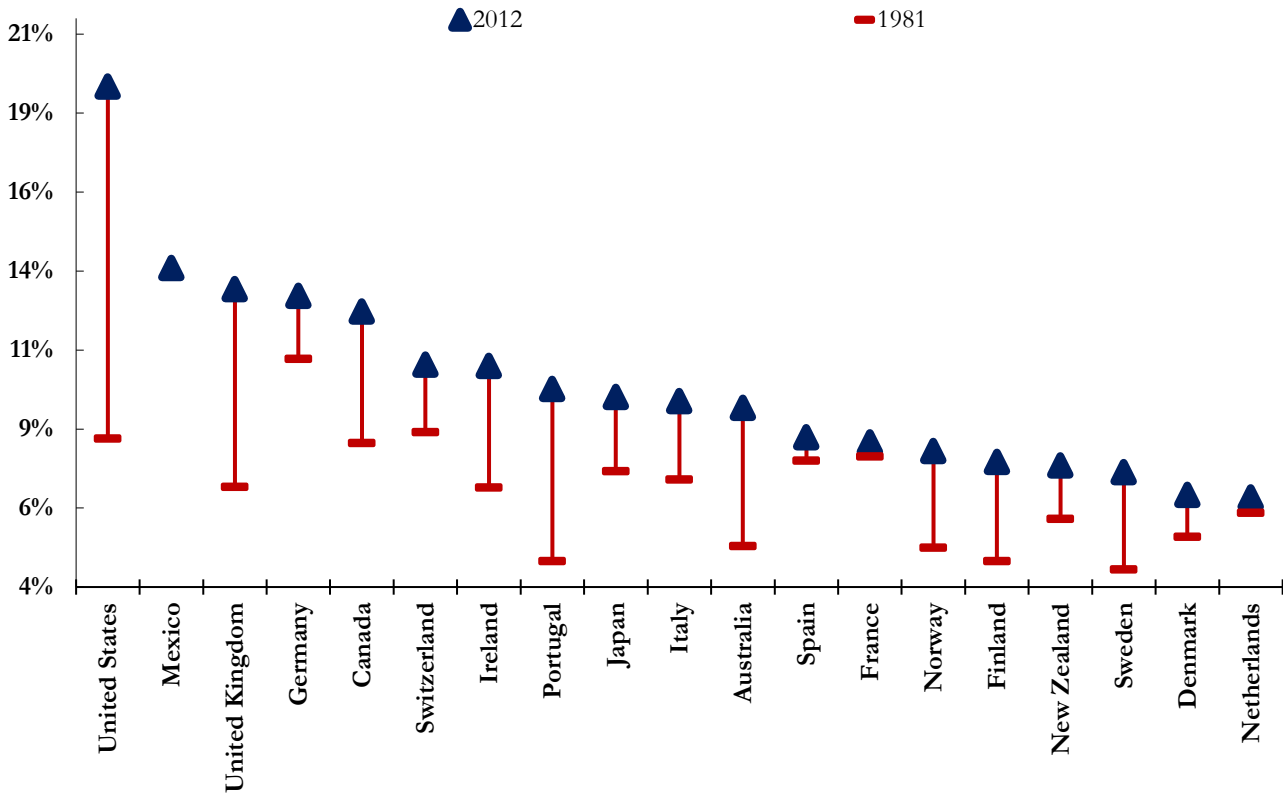
49. This work contributes to the literature in the following ways: 1) to our knowledge, one presented for the first time a detailed analysis of top incomes in Mexico by using personal tax returns and employer-reported wages for the period 2009 – 2012; 2) due to the issue of tax evasion, this work proposes a methodology to adjust the data in order to arrive to a better measurement of "true" income. The credibility of this methodology resides in the data quality of the data being used to make the adjustments; finally, one presented 3) results of the real income growth captured by the top groups, 4) Pareto Coefficients and Distributions 5) decomposition of top incomes, 6) an analysis of the taxation of top incomes, 7) tax deductions, 8) difference between household surveys and tax data, 9) historical income distributions, 10) top wages and 11) recent trends of top income mobility.

50. Figure 24 graphs the share of top 1% income in total pre-tax income for several countries between 1981 and 2012. The share of top-income recipients in total gross income increased significantly in most countries over the past three decades. The rise was most spectacular in the United States, where the share of the richest 1% in all pre-tax income has more than doubled since 1980, reaching almost 20% in 2012 (OECD, 2014). In other countries like Spain, France and the Netherlands, the share has stayed almost at the same level since

1981. For Mexico, one didn't have access to fiscal data to analyze the long-run trend of top income shares; however, for 2012, it reached 13.6%, which remains high for international comparisons.

Figure 24. Shares of top 1% incomes in total pre-tax income, 1981–2012 (or closest).

Percentage



Source: Author's calculations based on tax data of 2012 and adjusted with 2009 Economic Census data for Mexico and OECD (2014) based on the World Wealth and Income Database

Note: Incomes refer to pre-tax incomes, excluding capital gains, except Germany (which includes capital gains). Latest year refers to 2012 for the Netherlands, Mexico, Sweden and the United States; 2011 for Norway and the United Kingdom; 2009 for Finland, France, Italy and Switzerland; 2007 for Germany; 2005 for Portugal; and 2010 for the remaining countries.

51. Overall, the results suggest that self-employed and business over-estate their expenses in between 20-70%. When income is adjusted, top 1% and .5% incomes shares reached a maximum of 13.6% and 10.6%, respectively. This level of income concentration places Mexico over the majority of countries in The World Wealth and Income Database, but under other Latin American countries such as Colombia or Argentina. However, when calculating top .1% or .001% income shares, this situation changes by placing Mexico as one of the leaders in inequality; this result is in line with the big number of billionaires residing in Mexico.

52. As well, for the period 2009 - 2012, the fraction of total real growth captured by the top 1%, .1%, .01% and .001% was of 8%, 5%, 3% and 2%, respectively. With respect to taxation of top groups, average tax rates range from 3.6% to 13.36%, depending on the year and fractile chosen. Furthermore, income concentration depicted through the inverted Pareto coefficients achieves its maximum values in 2011, by ranging from 2.72 at P99.0 to 3.89 at P99.99. When using these coefficients to adjust a Pareto distribution, top 1% shares reach 16.9%, 17.0%, 17.6% and 18.3% for years 2009, 2010, 2011 and 2012, respectively. With respect to wages,

Mexico presented top wage shares of 58.15%, 43.49%, 31.31% and 13.81% for the top 20%, 10%, 5% and 1%, respectively.

53. Moreover, Gini coefficients were adjusted with the calculated top income shares, and they increased to 52.6 and 53.3 in years 2010 and 2012 from previous ones of 51.8 and 54.6, respectively. Finally, when analyzing income mobility, one founds that the high static income concentration previously depicted has been combined with a low re-ranking of individuals, and that the lasting inequality has not changed much.

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