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Fundamental accrued capital gains and the measurement of top incomes: An application to Chile

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ABSTRACT

Most previous studies of income inequality have either ignored capital gains or have used taxable realized capital gains to estimate top incomes. Neither of these approaches is fully satisfactory. We apply for the first time a new methodology that allows us to account for *fundamental accrued* capital gains as part of the top incomes in a theoretically consistent manner. We estimate the shares of the super-rich in Chile showing that accrued capital gains have a dramatic impact on these estimates. Also, the top income shares estimated using fundamental capital gains appear to exhibit a more stable and presumably more plausible time profile than estimates based on capital gains derived from asset market variations.

1. INTRODUCTION

Recent literature has pointed to the need of obtaining a picture of the distribution of income as complete and reliable as possible emphasizing the measurement of the top incomes (Alvaredo et.al 2013; Atkinson et.al. 2011). This has required the use of tax data as has been demonstrated that the household survey data are often insufficient to capture the income of the very rich whose income is highly affected by capital incomes (Atkinson et al., 2011; Bukhauser et al., 2012). Studies using tax declaration data have estimated the share accrued to the top income groups (the richest 1%, 0.1% and 0.01% of the population) for about 30 countries, most of them from the OECD (Atkinson and Piketty 2007 and 2010; Atkinson et. al. 2011).

However, a significant number of these studies has either ignored capital gains (e.g., Dell, 2005; Burdín, et al. 2014) or have used *taxable realized* capital gains (e.g., Saez and Piketty, 2003; Roine and Waldenstrom, 2012; Chu and Chon, 2015). The latter studies have shown the crucial importance of considering capital gains when analyzing the levels and trends of the income shares of the top 1%. However, the use of realized taxable capital gains as opposed to *accrued* capital gains has been criticized on several grounds.

In fact, using realized capital gains as part of the income of individuals in a particular period is generally wrong because they often reflect capital appreciations that have taken place over many years before the period in which the incomes are actually being measured (Armour et al, 2013; Smeeding and Thompson, 2010). Conversely, a large portion of the capital gains obtained by individual investors in a particular period are often not realized in the same year and, therefore, are omitted

when the conventional approach of accounting for only realized capital gains is used. In addition, Burkhauser et al. (2014) argue that… "taxable realized capital gains are a poor proxy for the theoretically more appropriate yearly accrued capital gains…because changes in the tax legislation within countries affect the definition of taxable capital gains over time". These drawbacks of using taxable realized capital gains has prompted researchers to start measuring accrued capital gains rather than taxable realized capital gains as part of the income of the top fractals (Armour et.al., 2013; Burkhauser et.al, 2014).

A distinctive feature of the present study is that we apply for the first time a new methodology that allows us to account for *fundamental business-accrued* capital gains as part of the top incomes in a theoretically consistent manner. Unlike the very few studies that have recently used accrued capital gains, we focus exclusively on fundamental accrued capital gains; that is, on capital gains that arise from fundamental conditions given by the enterprises` profitability. The basic principle is that fundamental accrued capital gains arise from retained profits by the firms which become capitalized into the value of the firm.

Other studies have used different approaches dictated by asset appreciations as measured by the fluctuations of the stock and/or real estate markets (Armour et al, 2013; Burkhauser et al, 2014). This approach includes the effects of both fundamental capital gains as well as capital appreciations generated by market speculation, which often generate temporary asset market bubbles or collapses. While this approach allows for a more comprehensive measure of capital gains than ours, it may encompass ephemeral gains arising for example in part from asset market speculation. An important question is whether or not the

unrealized ephemeral component of capital gains should be considered part of the income.

The present study is one of the few studies of income distribution based on tax data in Latin America. We measure the participation of the super-rich in Chile´s national income using annual tax data for the period 2004-2013. In Chile, capital gains are mostly not taxed and preliminary estimates suggest that they are a massive part of the income of the rich as many of the largest corporations have very few controller shareholders. Therefore, if we want to exclude ephemeral capital gains arising from asset bubbles that are often never realized, a reasonable approach is to estimate fundamental accrued capital gains arising from firms` retained profits.

Recent analyses for Chile (Fairfield and Jorrat, 2015; López et al., 2013;) have merely added undistributed profits to the other income sources of shareholders, an approach which we show is adequate only under very special conditions. We demonstrate that this procedure is generally incorrect in a context where many different taxes are in place and propose a theoretically consistent way of using undistributed profits to transform them into accrued capital gains. A dollar that remains undistributed inside the firm has a different effective value for the firm's shareholder than when it has been already distributed. As a result, the procedure of just directly adding the firms' undistributed profits to the shareholders' other sources of income generally overestimate the true income associated with retained profits. We show here that this important methodological innovation makes a large impact on the estimates of the share of the top incomes in national income in the case of Chile.

While several studies of income distribution using household survey data for Chile have been implemented (Sanhueza and Mayer 2011, Solimano and Torche 2008, Friedman and Hofman 2013; Contreras et al., 2001), the present study together with Fairfield and Jorratt (2015) are the only ones that use tax data.[1] A commendable feature of the Fairfield and Jorratt study is that it is one of the few that uses actual measures of income as reported to the tax office even for the very top segments of the income distribution, instead of relying on interpolations as many studies of the super-rich have done (Piketty and Saez, 2003; Atkinson and Piketty 2007). However Fairfield and Jorratt use actual data for only two years, so it is difficult to ascertain how representative of the true income distribution are the two years considered. They analyze other years using Pareto interpolations but excluding capital gains or retained profits as part of the top income. By contrast, while we also rely on Pareto interpolations to estimate the very top income shares (0.1%, 0.01% and 0.001%) we use data including fundamental accrued capital gains for a full decade, the period 2004-2013.

Thus, the present paper improves the existing literature on three fronts. First, it develops a methodology that allows us to estimate fundamental accrued capital gains obtained during the period in which they are being measured instead of merely realized capital gains or non-fundamental accrued capital gains. Second, it estimates the impact of retained profits on the income of individual shareholders by incorporating the value of retained profits obtained by enterprises into the flow

[1] While Bukhauser et al. (2012) have shown that household data and tax data can in principle be made consistent by defining incomes appropriately the fact that all the studies using household survey data for Chile have excluded capital income from the definition of income prevents such consistency. The omission of capital gains in these studies may cause a serious underestimation of the income shares of the top echelons of the distribution.

income of shareholders, instead of using the incorrect procedure of directly adding retained profits to the shareholder's income. Finally, we compare the estimated shares of top incomes using the two methods available for estimating accrued capital gains, the asset valuation approach and the fundamental accrued capital gains method proposed here. This comparison shows that while the average values of the top shares for the period are similar in both methods, these shares tend to be much more stable over time using the fundamental accrued capital gains method than those obtained using asset market appreciation.

2. NON-DISTRIBUTED CORPORATE PROFITS AND ACCRUED CAPITAL GAINS

While data from tax declarations are generally more reliable than data from surveys because tax declarations are made under legal warning, tax data is not exempt from biases. Biases from fraudulent tax declarations exist in all countries and are difficult to correct and estimating income due to capital gains is particularly challenging (Atkinson et al. 2011). In Chile, there are some peculiarities in the tax legislation that make the significance of retained profits and business-accrued capital gains as part of the total income of the super-rich even greater than in most other countries.

In particular, in Chile the owners of corporate shares have incentives to retain profits within their firms because in this way they avoid paying the personal income taxes for distributed profits which are much higher than the taxes on retained profits. These incentives to tax elusion are quite significant because the tax rate for capital gains is zero for corporate shares. Moreover, the Chilean tax system is integrated; which means that the so called 'first category tax' to corporate profits is

an automatic tax credit for the personal income tax that the owners of the firms must pay.[2] In most OECD countries the tax system is either not integrated or only partially integrated and business capital gains are taxed; therefore, while most countries do have tax incentives to retain profits these are not as great as in Chile.

3. METHODOLOGY

3.1 From undistributed profits to fundamental business-accrued capital gains

Haig (1921) and Simons (1938) defined personal income of individual i at time t is equal to her/his consumption plus the net change on wealth at time t. One may alternatively define total personal income,$I(t)$, as the sum of labor income, distributed dividends and other personal income, $\mathrm{y(t)}$, plus business-accrued capital gains, $G(t)$, and other capital gains $OG(t)$ (such as real state capital gains and others) at time t.

$$I(\mathrm{t}) = \mathrm{y(t)} + \mathrm{G(t)} + OG(t) \qquad (1)$$

In an economy subject to a variety of taxes, the value of a dollar of retained profits by a firm cannot be directly attributed to the accrued incomes of its stockholders because when this dollar is paid as dividends it is subjected to other taxes. This implies that the implicit value of a retained dollar in the market place is in most cases less than one. That is, accrued capital gains are determined through an

[2] The direct tax to accrued corporate profits is 20%, while the marginal income tax rate to taxpayers with highest income is twice as high (40%), which implies a powerful incentive to postpone indefinitely the distribution of corporate profits (or to distribute only the minimum required by law). Thus, undistributed profits become capitalized in the market value of the firms inducing capital gains that are mostly not subject to any tax.

arbitrage process where market participant value retained profits considering the tax implications of withdrawing such profits.

Define the opportunity cost of a retained dollar in terms of foregone dividend as,

$$\theta \equiv \frac{(1-\tau+\varphi\tau)[1-m(y(t))]}{(1-\tau)(1-z)} \qquad (2)$$

Where τ is *the* tax rate on firms` profits; $\mathrm{m}(\mathrm{y}(\mathrm{t}))$ (a non decreasing function of $y(t)$) is the personal tax rate on dividends; z is the tax rate on capital gains, and $0 \leq \varphi \leq 1$ is the fraction of the tax paid by the firm that is allowed as a tax credit to the stockholder. This formula is a slight generalization of the well-known formula developed by King (1974).

The following proposition shows the relationship between retained or undistributed profits (π_r) and business accrued capital gains $(\mathrm{G}(\mathrm{t}))$,

Proposition 1. (Gutierrez, López and Figueroa, 2014). *In equilibrium, business accrued capital gains are related to retained profits as follows:*

$$\mathrm{G}(\mathrm{t}) = \theta(\tau, \mathrm{m}(\mathrm{y}), \mathrm{z}; \varphi)\pi_{\mathrm{r}}(\mathrm{t}), \qquad (3)$$

Proof: *Equilibrium in the capital market implies (*King, *1974):*

$$(1-m)\, rV(t) = d(t) + (1-z)(V(t+1) - V(t)) \qquad (4)$$

where $V(t)$ is the value of the firm in time t and $d(t)$ is the net after tax dividend paid by the firm.

We generalize (5) to allow for different degrees of tax integration (φ),

$$\frac{1-\tau+\varphi\tau}{1-\tau}(1-m)rV(t) = d(t) + \big(V(t+1) - V(t)\big)(1-z) \qquad (5)$$

Using the definition of θ in equation (2), (5) can be written as:

$$\theta r V(\tau) = \frac{d(t)}{1-z} + \big(V(t+1) - V(t)\big) \quad (6)$$

Using that $\frac{d(t)}{1-z} = \theta\big((1-\tau)\pi - \pi_r\big)$ *and noting that in equilibrium* $rV(\tau) = (1-\tau)\pi$*,*

we have,

$$G \equiv V(t+1) - V(t) \quad (7)$$

Then, we obtain that:

$$G(t) = \theta\pi_r \quad (8)$$

Therefore, using equations (1) and (8), we obtain that total income is,

$$\mathrm{I(t)} = \mathrm{y(t)} + \theta(\tau, m(y(t)), z; \varphi)\pi_r(t) + OG(t) \quad (9)$$

Thus, only in the special case where $\theta = 1$ is legitimate to simple add retained profits to the other incomes of shareholders to estimate their true total income. Then directly adding retained profits to other income sources to estimate incomes of shareholders would be appropriate if the non-corporate tax system is neutral and if there is no tax integration (for example, if $\varphi = 0 \text{ and } \mathrm{m} = \mathrm{z}$). Otherwise, this procedure is incorrect.

However, under most tax regimes $\theta \neq 1$. The case where $\theta < 1$ is the most interesting one because in this case firms will have incentives to distribute the minimum possible dividends and, hence, retained profits are likely to be important. This is in fact the case of Chile where, using the prevailing (marginal) tax rates relevant to the top income earners, the estimated value of θ fluctuates between 0.72 and 0.75 throughout the period 2004-2013. The opportunity cost of one dollar of foregone dividend is therefore in the case of Chile about 72 to 75 cents, which

implies that firms have incentives to distribute either zero dividends or the minimum level required by law. Thus, the incomes measured by simply adding the retained profits to the rest of the shareholders' incomes overestimate their true incomes.[3]

Importantly, individuals in the top fractals are in most cases subjected to the maximum marginal tax rate. This implies that for rich individuals the personal income tax rate, m, is fixed and independent of their income as long as it is above the threshold that triggers the maximum tax rate. An important implication of this is that the value of θ is identical and constant for all the rich individuals which are at the top fractals of the income distribution. The value of θ only depends on tax parameters that are identical for all rich individuals. This greatly facilitates the empirical application of this methodology to estimate capital gains for the richest individuals, which is the focus of this paper.

3.2 Income interpolation

To accurately determining the participation of the top incomes of the income distribution, researchers generally face the common problem that the total amount of income of the various fractals above the 99% income fractal is not known. This informational limitation is usually overcome by using the Pareto interpolation of incomes, which allows estimating the income share of higher fractals using the known information on the income share of a lower contiguous fractal. Freenenberg and Poterba (1993) have shown that this interpolation provides good empirical estimates of the incomes of the top fractals. Subsequent studies of income

[3] However, in countries where $\theta > 1$ simply adding retained profits underestimates the total personal income.

distribution at the top have in fact confirmed the reliability of the Pareto interpolation, including among others Piketty and Saez (2003), Atkinson and Piketty (2007) and Atkinson, Piketty and Saez (2011) and recently Armour et al(2014).

3.3 Gini coefficient interpolation

Alvaredo (2011) has shown that data for the income shares of the top fractals of the distribution can be used to correct the estimates of the Gini coefficient obtained using household survey data that often ignore the income of the top fractals. This author proposed the following formula to perform such correction:

$$G \approx (1 - \sigma)\widehat{G} + \sigma \qquad (10)$$

where, G is the true Gini coefficient, σ is the share of a very small group in total income which accounts for a large portion of the total income, and $\widehat{G}$ is the GINI coefficient estimated without considering this small group.[4]

4. Empirical Implementation

4.1 Estimating fundamental business-accrued capital gains

Annual data on corporate profits reported to the tax office for the years 2004-2010 is available from Jorratt (2012). For the remaining three years (2011-2013) we use actual profit data reported by firms provided by Thomson One

[4] This formula is convenient because it does not depend on the number of the people that are generally excluded of household surveys; it does not depend either on the assumption about the income distribution. Moreover, it requires only two sources of information: One that accurately measures the income of the lower and middle income people of the whole population -for instance a household survey, and other that measures the income of the top income groups generally omitted in usual survey data -for example data obtained from the tax office- and complemented with accrued capital gains data.

Banker data base[5] linking it with the data from the previous seven years in a consistent manner.

To impute retained profits to the top fractal (richest 1% of the population) we need first to estimate the proportion of profits accruing to individuals in such fractal. Using empirical estimates by Cea et al. (2009) and Solimano and Pollack (2006) as well as data from the Santiago Stock Exchange we obtained an estimate of the corporate profits owned by the richest 1% of the population at about 70% of the total corporate profits on average for the period of analysis. With this information, we use Pareto interpolation to adjust total incomes of the richest fractals (above 1%) by business-accrued capital gains. We also correct these incomes for tax evasion using the data provided by Jorrat (2012).[6]

4.2 Basic Data

To perform our estimations we use official data from the Chilean Internal Revenue Service (SII, for its Spanish name 'Servicio de Impuestos Internos') on annual personal incomes declared by individuals for the decade of 2004-2013. These incomes include labor incomes plus distributed corporate profits and others. This information does not consider either undeclared incomes associated with tax evasion or capital gains which are mostly tax-exempted in Chile.

Table 1 shows data for the year 2013 on declared personal income by individuals included in the 8 income tax brackets established by law. Similar data are available for each year for the ten-year period of analysis, 2004-2013. The data

[5] Available in http://banker.thomsonone.com

[6] See online appendix (https://www.dropbox.com/sh/r3wwdl50yabzhe0/AADX2nxRhGvbGzhyAI_JOxPva?dl=0) for more information on the data used to correct for tax evasion.

in Table 1 constitute the starting point of the estimation of the non-capital gains component of the incomes of the top income brackets.

Table 1
Chile: Income brackets' participations in total declared income by individuals to the Tax National Service (SII); 2013

Income Bracket	Bracket's Limits		Monthly Income	Marginal Income Tax Rate	Number of Taxpayers	Proportion of Total Taxpayers	Bracket's Total Income	Proportion of total declared Income
	Lower	Higher						
	USD[a]		USD[a]	%	Individuals	%	millions USD[a]	%
1	-	1,119	473	-	7,005,895	76.90%	33,122	31.00%
2	1,119	2,488	1,924	4%	1,364,161	15.00%	26,247	24.60%
3	2,488	4,147	3,764	8%	381,237	4.20%	14,350	13.40%
4	4,147	5,807	5,818	14%	154,325	1.70%	8,979	8.40%
5	5,807	7,466	7,802	23%	81,264	0.90%	6,340	5.90%
6	7,466	9,954	10,176	30%	60,219	0.70%	6,128	5.70%
7	9,954	12,442	13,129	36%	25,407	0.30%	3,336	3.10%
8	12,442	---	25,164	40%	32,571	0.40%	8,196	7.70%

*US dollars of 2013
Source: Own elaboration with data from Chle's tax revenue service (SII).

The other basic data source concerns estimates of the fundamental business-accrued capital gains. Table 2 shows these data including estimated annual corporate profits pertaining to the top 1%, dividends, retained profits and accrued-capital gains for the period 2004-2013. Using equations (2) and (8) we transform retained profits into business-accrued capital gains by simply multiplying retained profits that correspond to the individuals in the top fractals by the parameter θ.

Table 2
Chile: Corporate profits and business-accrued capital gains (in millions of 2013 US dollars)

Year	Corporate profits	Dividends	Retained profits	θ	Business-accrued Capital Gains	Business-accrued capital gains imputed to 1%
2004	20,469	7,000	13,468	0.72	9,697	6,788
2005	27,399	7,453	19,947	0.72	14,362	10,053
2006	31,696	9,445	22,251	0.72	16,020	11,214
2007	40,455	13,795	26,660	0.72	19,195	13,436
2008	52,548	16,605	35,943	0.72	25,879	18,115
2009	51,310	15,701	35,609	0.72	25,639	17,947
2010	41,835	12,927	28,908	0.75	21,681	15,177
2011	33,646	10,498	23,148	0.75	17,361	12,153
2012	34,895	10,887	24,008	0.75	18,006	12,604
2013	38,127	11,896	26,231	0.75	19,673	13,771

Source: Own elaboration with data from Jorratt (2012) and Thomson One Banker

4.3 Estimating the shares of the richest fractals

This section presents the results of applying the methodologies explained in Section 3 aimed at correcting the reported incomes to Chile's National Tax Service to account for accrued corporate capital gains and tax evasion. As indicated in the methodology section, this is done by using the basic tax data shown in tables 1 and 2 for each year in the period 2004-2013. These data are used to implement the Pareto interpolation to obtain the income of the richest fractals. These data are corrected by tax evasion and then by adding business-accrued capital gains corresponding to the top fractals.

4.3.1 Estimating the top incomes excluding business-accrued capital gains

Table 3 shows the participation in the country's total income of the richest fractal of the population excluding fundamental accrued capital gains. The figures of this table have been calculated using the so-called Control for Total Income (CTI), an approximation for the households' gross total income. In the online appendix we describe the methodology used to estimate the CTI. The procedure to correct for tax evasion is based on data from Jorratt (2012) and is explained in the online appendix.

As can be seen in Table 3, just correcting for tax evasion makes a significant difference on the share of the top echelons of the income distribution. For example, the average participation of the top 1% over the period increases from 20.2% to 22.7%. This is so despite the fact that we assume that the rate of tax evasion is equal for all income groups liable to pay income tax. The main reason for the increased participation of the top incomes in national income is that in Chile only the richest 15% of the population is liable to pay any income tax; therefore, it is in this group where all tax evasion is concentrated.

Table 3
Chile: Share (%) of the richest fractals and Gini coefficients excluding accrued capital gains: uncorrected and corrected for income tax evasion. 2004-2013

	Year										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
SHARE OF THE RICHEST 1%											
Uncorrected for tax evasion	20,9	20,7	20,5	20,1	22	19,9	19,6	19,4	19,3	19,2	20,2
Corrected for tax evasion[a]	23,9	23,6	23,3	22,7	24,9	22,4	21,9	21,7	21,5	21,2	22,7
SHARE OF THE RICHEST 0.1%											
Uncorrected for tax evasion	6,3	6,3	6,1	6,1	7,9	6,0	5,9	6,0	6,2	6,3	6,3
Corrected for tax evasion[a]	7,2	7,2	6,9	6,9	8,9	6,7	6,7	6,7	7,0	7,0	7,1
SHARE OF THE RICHEST 0.01%											
Uncorrected for tax evasion	1,9	1,9	1,8	1,8	2,8	1,8	1,8	1,8	2,0	2,1	2,0
Corrected for tax evasion[a]	2,1	2,2	2,1	2,1	3,2	2,0	2,0	2,1	2,2	2,3	2,2
SHARE OF THE RICHEST 0.001%											
Uncorrected for tax evasion	0,6	0,6	0,5	0,6	1,0	0,5	0,5	0,6	0,7	0,7	0,6
Corrected for tax evasion[a]	0,6	0,7	0,6	0,6	1,1	0,6	0,6	0,6	0,7	0,8	0,7
GINI INEQUALITY COEFFICIENT											
Correction from Alvaredo,2011[b]	0,580	0,580	0,560	0,560	0,560	0,560	0,560	0,540	0,540	0,540	0,560

a) The procedure used to correct for tax evasion is explained in the online appendix.
b) The Gini coefficient is calculated from the estimates for income corrected for tax evasion.
Source: Own elaboration using data from SII, CASEN, Jorrat (2012) , Cea et al (2009) and Solimano and Pollack (2006)

Our estimates for the evasion-corrected shares of the top 1% in the years 2005 and 2009 were 23.6% and 22.4%, respectively. These estimates fall well within the interval estimated by Fairfield and Jorrat (2015) excluding capital gains, which was from 15.6% to 25.9%, depending on the income definitions used.

4.3.2 Participation of the richest fractals including business-accrued capital gains and corrected for tax evasion

Table 4 below shows the evolution of the income shares of the super-rich over the period 2004-2013 once correction for tax evasion has been implemented and fundamental business-accrued capital gains have been included. As can be seen the rate of income concentration in the top fractals is extremely high. The top 1%

concentrated on average for the period 28.7% of the total national income while the richest 0.1% obtained 14.4% and the richest 0.01% obtained 7.2% of the total income.

The great relevance of business-accrued capital gains in measuring income inequality in Chile is illustrated by comparing the figures in the upper panels of Tables 3 and 4. This comparison shows that the inclusion of capital gains has a large impact on the income of the richest fractals. Indeed, the share of the top 1% increases from 22.7 percent to 28.7 percent. This difference is proportionally even larger when we consider richer fractals. For example the share of the top 0.1% more than doubles when we include capital gains going from 7.1% to 14.4%. This reflects the great importance that capital gains have for the very top income fractals. Also, the average GINI coefficient for the period was 0.61 when we include capital gains, much higher than 0.56 obtained without capital gains. This is also much higher than the consensus estimates obtained from household data which is about 0.53 for the period considered here (MDS, 2013; Solimano and Torche, 2008).

Comparing our estimates with those obtained by Fairfield and Jorrat (2015) we note that our estimates of the income shares are in general lower than theirs. For example, for the year 2005 their most comparable estimate with ours was 32.9% versus 29.4% that we obtained. This difference largely arises by the fact that, unlike Fairfield and Jorrat, we correct retained profits following the procedure described in Section 3.2, which accounts for the fact that the opportunity cost of a dollar of retained profits in Chile is less than one throughout the whole period.

Table 4
Chile: Share (%) of the richest fractals and Gini coefficients estimated using fundamental business-accrued capital gains corrected by income tax evasion. 2004-2013

	Year										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
SHARE OF THE RICHEST 1%	28,4	29,4	29,4	29,4	31,8	30,5	28,5	26,9	26,6	26,4	28,7
SHARE OF THE RICHEST 0,1%	12,7	14,4	14,4	14,9	18,2	16,7	14,5	12,6	12,7	12,9	14,4
SHARE OF THE RICHEST 0,01%	5,7	7,1	7,1	7,6	10,4	9,1	7,3	5,9	6,0	6,3	7,2
SHARE OF THE RICHEST 0,001%	2,5	3,5	3,5	3,9	5,9	5,0	3,7	2,7	2,9	3,0	3,7
GINI INEQUALITY COEFFICIENT											
Correction from Alvaredo,2011[b]	0,620	0,624	0,618	0,618	0,629	0,620	0,611	0,586	0,584	0,584	0,609

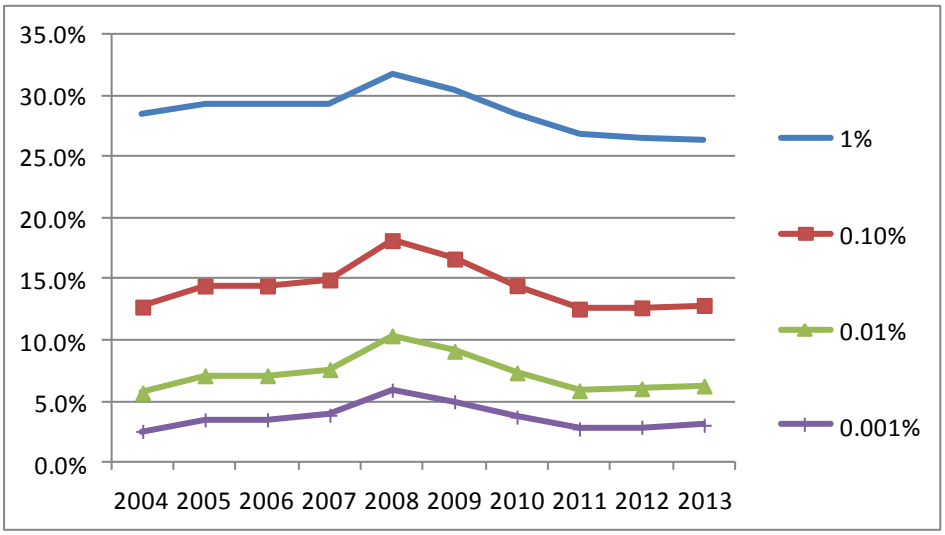
a) The procedure used to correct for tax evasion is explained in the online appendix.
b) The Gini coefficient is calculated from the estimates for income corrected for tax evasion.
Source: Own elaboration using data from SII, CASEN, Jorrat (2012) , Cea et al (2009) and Solimano and Pollack (2006)

4.4 Evolution of the top income shares over the decade

Using the estimates in Table 4, Figure 1 shows the evolution of the shares of the top income groups in total income over the decade after correcting for tax evasion and including fundamental business-accrued capital gains. The shares of the top 1% fall at a rate of 1.2% per year. All other richer fractals considered here do not show a significant trend. However, when we exclude capital gains the share of the top 1% declines at a faster rate,1.4% per annum. As in the previous case, the richest 0.1% and 0.01% of individuals do not exhibit any significant change over the period. The apparent fall in the participation of the top 1% in national incomes occurs in the period after the 2008-2009 international crisis (2009-2013). It appears that this is due to the fact that capital gain incomes never fully recover after the crisis.

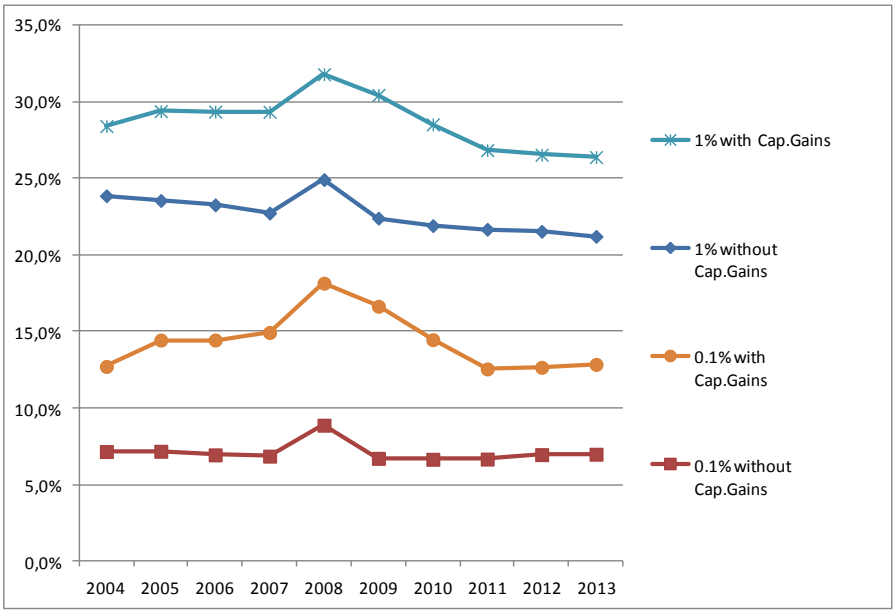
Figure 2 shows the evolution of the shares of the top 1% and 0.1% over the period with and without accrued capital gains. As can be seen, there is a turning point in 2009 possibly as a consequence of the world recession after which the shares appear to start declining. This decline is stronger when capital gains are included than when they are not. This is consistent with the idea that the greatest relative impact of the crisis was on the capital incomes, which affected the richest segments of society proportionally more intensely.

Figure 1
Chile: Time change of various top fractals shares; 2004-2013
(Incomes corrected for tax evasion and including fundamental accrued capital gains)



Source: Own calculations.

Figure 2
Chile: Time change of shares of top 1% and 0.1% with and without capital gains; 2004-2013



5. Shares of top incomes using asset market valuation as a proxy for business-accrued capital gains

Here we show the estimates of the top income shares using a different methodology to estimate business-accrued capital gains. Instead of fundamental capital gains as estimated from retained profits we present here measures based on capital gains obtained using data regarding appreciation of the asset markets[7].

Table 5 reports these estimates for the period of analysis. Also Figure 3 graphically illustrates the evolution of the estimated top shares over time. The average estimates for the period using this approach as reported in Table 5 are similar albeit slightly lower than those obtained using fundamental capital gains reported in

[7] In the online appendix we show the annual change in market value of the index of stock market valuation used here.

Table 4. However, the patterns of evolution over time are quite different. In fact, comparing Figures 1 and 3 it is apparent that the shares estimated using stock market valuation tend to be much more unstable than those shares estimated using fundamental capital gains. This is due to the fact that the estimates based on the stock market valuation incorporate an ephemeral component which is caused by bubbles and collapses of the stock market prices. By contrast fundamental capital gains tend to be less affected by temporary fluctuations on the asset markets.

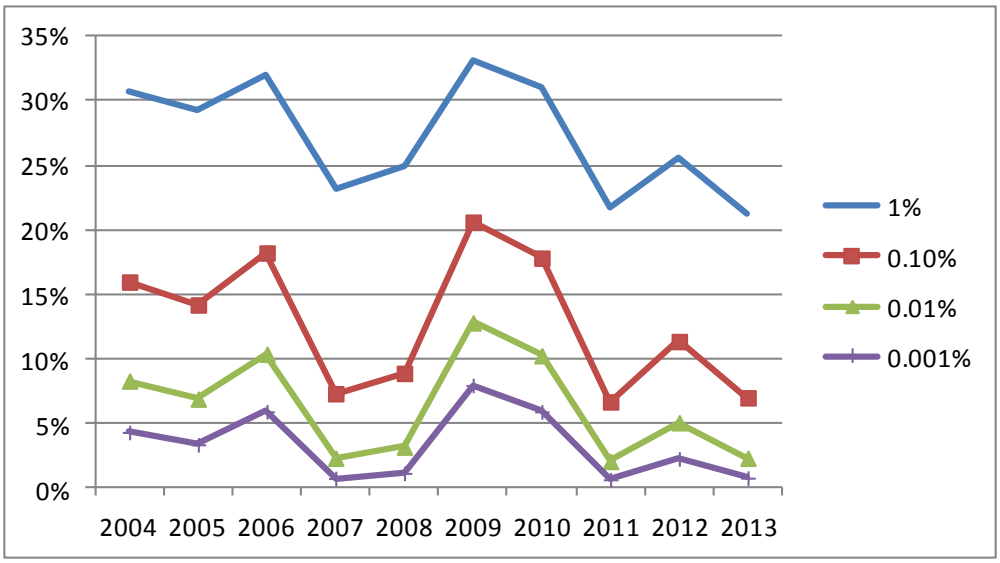
Table 5

Chile: Shares of the richest fractals and Gini coefficients estimated using business-accrued capital gains based on asset market appreciations; 2004-2013

	Year										
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Average
SHARE OF THE RICHEST 1%	30,7	29,2	32,0	23,2	24,9	33,2	31,0	21,7	25,5	21,2	27,3
SHARE OF THE RICHEST 0,1%	16,0	14,2	18,2	7,3	8,9	20,6	17,8	6,7	11,3	7,0	12,8
SHARE OF THE RICHEST 0,01%	8,3	6,9	10,4	2,3	3,2	12,8	10,2	2,1	5,1	2,3	6,3
SHARE OF THE RICHEST 0,001%	4,3	3,3	5,9	0,7	1,1	7,9	5,9	0,6	2,2	0,8	3,3
GINI INEQUALITY COEFFICIENT											
Correction from Alvaredo,2011[b]	0,630	0,623	0,630	0,590	0,598	0,632	0,622	0,561	0,579	0,559	0,603

a) The procedure used to correct for tax evasion is explained in the appendix.
b) The Gini coefficient is calculated from the estimates for income corrected for tax evasion.
Source: Own elaboration using data from SII, CASEN, Jorrat (2012) , Cea et al (2009) and Solimano and Pollack (2006)

Figure 3
Chile: Time change of various top fractals participation in total income; 2004-2013 (Incomes corrected for tax evasion and including accrued capital gains based on asset valuation)



Source: Own elaboration using data from SII, CASEN, Bloomberg stock market data, Jorrat (2012) , Cea et al (2009) and Solimano and Pollack (2006)

6. Conclusion

The most important contribution of this study is the use for the first time of a methodology that allows us to estimate fundamental accrued capital gains (as opposed to merely realized taxable capital gains or non-fundamental accrued capital gains) in a theoretically consistent manner. Also we demonstrate that directly adding undistributed profits to the shareholders` other income is in general a wrong procedure.

Our results confirm previous suspicions that the real problem of the distribution of income in Chile is due to the large concentration of incomes in the very top of the distribution. These results are greatly reinforced by the inclusion of accrued capital gains. It is really the richest 1%, and especially the richest 0.1%,

0.01% and 0.001% of the population which concentrate the 'lion´s share' of the country's income.

Our empirical estimations provide evidence on two additional facts regarding the distribution of income in Chile. First, comparing our estimates with the existing measures based on household surveys the inequality of the distribution as measured by the Gini coefficient increases significantly, from 0.55 to 0.62. Second, we show that the estimated shares of the top incomes obtained using fundamental accrued capital gains tend to be much more stable than when we instead estimate accrued capital gains relying on asset market appreciation data.

Subsequent studies should incorporate the new methodology proposed here to shed light on the real importance of fundamental accrued capital gains in determining the shares of the top incomes in other countries. Unfortunately, there is no data in Chile for the values of assets other than the corporate sector, especially for real estate values and for a longer period of time. This prevented us to obtain a more comprehensive measurement of accrued capital gains and throughout a longer period of time. It would be worthwhile studying whether the key qualitative results for Chile are valid in other contexts where more comprehensive data is available.

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